Trans Mountain Pipeline ULC
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May 23, 2013

National Energy Board
444 Seventh Avenue SW
Calgary, AB
T2P 0X8
Canada

Attention: Sherri Young, Secretary of the Board

Re: Application for Pipeline Facilities Certificate for the Trans Mountain Expansion Project

Dear Madam:

Trans Mountain Pipeline ULC (Trans Mountain) hereby submits to the National Energy Board (NEB) a project description for the Trans Mountain Expansion Project, prepared in accordance with the NEB's *Filing Manual*. The recent NEB Reasons for Decision RH-001-2012 concerning Trans Mountain's tolls and tariff application provides the solid financial grounding that Trans Mountain requires to proceed with development of an application under Section 52 of the *National Energy Board Act* (NEB Act) for the proposed project.

In response to growing market demand and customer contractual commitments, Trans Mountain proposes to expand the existing Trans Mountain Pipeline System by 93,800 m^3/d (590,000 bbl/d) from 47,690 m^3/d (300,000 bbl/d) to 141,500 m^3/d (890,000 bbl/d). If approved, the proposed expansion will comprise:

- pipeline facilities that complete a twinning of the pipeline in Alberta and British Columbia with about 981 km of new buried pipeline
- new and modified facilities, such as pump stations and tanks
- additional tanker loading facilities at the Westridge Marine Terminal in BC

Starting in 2012, Trans Mountain began a comprehensive engagement process with Aboriginal peoples, landowners, municipalities and stakeholders. During this process, these groups expressed their desire for Trans Mountain to address issues in its application, including environmental protection, potential spills, emergency response capabilities, jobs and economic opportunities. Trans Mountain is working with these groups to better define their issues and concerns and address them through development of its facilities application and the project.

The proposed project represents an expansion of the existing Trans Mountain pipeline system (i.e., most of the new proposed pipeline will be adjacent to the existing pipeline or along existing corridors), and as such, it is not clear to Trans Mountain if the project would be a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012). However, based on the level of public interest in

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the proposed project, Trans Mountain believes the expansion project should be a designated project, and subject to a rigorous environmental review required under both the NEB Act and CEAA, 2012. Therefore, Tran Mountain requests that the Trans Mountain Expansion Project be deemed a designated project under CEAA, 2012.

As Trans Mountain develops its application and project, Trans Mountain is committed to building upon its 60-year operating history and the relationships it has developed with Aboriginal groups, communities, landowners and stakeholders along the pipeline route. As president, I am personally committed to being actively engaged in these efforts as the application and proposed project are developed.

Please direct any questions regarding this project description to Carey Johannesson, regulatory lead, at (403) 514-6448.

Sincerely,

(original signed by)

Ian Anderson
President

TRANSMOUNTAIN
Trans Mountain Pipeline ULC

PROJECT DESCRIPTION
FOR THE PROPOSED
TRANS MOUNTAIN EXPANSION PROJECT

Submitted to the National Energy Board
by Trans Mountain Pipeline ULC

May 2013

Project Description for the Trans Mountain Expansion Project

May 2013

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1.0 EXECUTIVE SUMMARY

1.1 Project Summary

Trans Mountain Pipeline ULC (Trans Mountain) is a Canadian corporation with its head office located in Calgary, Alberta (AB). Trans Mountain is a general partner of Trans Mountain Pipeline L.P., which is operated by Kinder Morgan Canada Inc. (KMC), and fully owned by Kinder Morgan Energy Partners, L.P. Trans Mountain is the holder of the National Energy Board (NEB) certificates for the Trans Mountain pipeline system (TMPL system or system).

The TMPL system was established almost 60 years ago and currently has a capacity of about 300,000 bbl/d. The TMPL system transports a range of crude oil and petroleum products from western Canada to locations in central and southwestern British Columbia (BC), Washington and offshore.

Trans Mountain currently supplies much of the crude oil and refined products used in BC. The existing TMPL system is operated and maintained by staff located at Trans Mountain's regional and local offices in Alberta (Edmonton, Edson, Jasper, Clearwater) and BC (Kamloops, Hope, Abbotsford and Burnaby).

In response to growing market demand and customer contractual commitments, Trans Mountain proposes to expand the existing TMPL system by 93,800 m^3/d (590,000 bbl/d) from 47,690 m^3/d (300,000 bbl/d) to 141,500 m^3/d (890,000 bbl/d). If approved, the proposed expansion will comprise:

- pipeline facilities that complete a twinning of the pipeline in Alberta and British Columbia with about 981 km of new buried pipeline
- new and modified facilities, such as pump stations and tanks
- additional tanker loading facilities at the Westridge Marine Terminal in BC

The stated capacity is based on preliminary hydraulic analyses and will be confirmed in Trans Mountain's application to the NEB through a more detailed hydraulic analysis, with consideration for system variability based on estimated batch lineup and overall system reliability.

With the additional facilities and pipeline being proposed, the TMPL system will be comprised of two pipelines, the existing line (Line 1) and a new line (Line 2). The TMPL system will continue to operate as a batched pipeline system, allowing for transportation of light and heavy crude oils and refined products. As part of the project approval process, Trans Mountain will review its existing operations (i.e., staff levels, operations facilities, pipeline protection and integrity programs) and make appropriate adjustments to support the proposed expanded TMPL system.

If approved, the expanded Line 1 will be capable of transporting 55,640 m^3/d (350,000 bbl/d) and will provide a batched transportation service for refined products and light crude oils. Line 1 will also be capable of transporting heavy crude oils at a reduced capacity.

The proposed Line 2 will be capable of transporting 85,850 m^3/d (540,000 bbl/d) of heavy crude oils and will also be capable of transporting light crude oils, if necessary.

The proposed Trans Mountain Expansion Project (the project) will require a certificate pursuant to Section 52 of the *National Energy Board Act* (NEB Act) to permit construction and operation of the expanded pipeline system in Canada. Trans Mountain expects to file its application with the NEB in late 2013.

This Project Description (PD) does not constitute a project application. Once filed, the NEB Section 52 application will constitute Trans Mountain's formal application to the NEB seeking approval for the proposed facilities. The application will form the basis for the regulatory process and public hearings for the project.

In developing its NEB application, Trans Mountain has implemented an extensive program to consult with landowners, affected municipalities and stakeholders, and to engage Aboriginal peoples. The consultation program is intended to address questions and concerns, gather input from these groups for the application and the supporting environmental and socio-economic assessment (ESA), and also to assist Trans Mountain in the design and execution of the project. Trans Mountain is also working with various federal, provincial and municipal authorities to carry out additional reviews, studies and assessments for the project, and to address their questions and concerns.

1.2 Contact Information

All communication with Trans Mountain concerning this PD should be directed to:

Carey Johannesson, Project Lead Regulatory and Land
Kinder Morgan Canada Inc.
Suite 2700, 300 – 5th Avenue SW
Calgary, Alberta T2P 5J2
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Information on the project is also available at www.transmountain.com.

2.0 NATURE OF THE PROJECT

This PD for the Trans Mountain Expansion Project has been prepared in accordance with the NEB's guideline for pre-application project descriptions. For more information, see the NEB's website at:

http://www.neb-one.gc.ca/clf-nsi/rpblctn/ctsndrgltn/rrggnmgpnb/prpplctnprjctdscrptn-eng.html.

This document provides an overview of the proposed project, its future operation, consultation programs, and a description of the potential environmental and socio-economic interactions and effects of the project at the time of its publication. In accordance with the NEB's *Filing Manual*, Trans Mountain will continue to evaluate alternatives, such as:

- changes to facilities and equipment (e.g., pump stations, valves)
- route deviations, including start and end points

The PD will be used by the NEB to initiate several pre-application activities. It also serves to inform landowners, Aboriginal peoples, other regulatory authorities, communities and stakeholders of the project's proposed nature and intent.

Under Section 52 of the NEB Act, this PD does not constitute an application to construct the project. The PD is a preliminary submission provided for information purposes only. Under Section 52 of the NEB Act, Trans Mountain plans to file a project application in late 2013 to construct and operate the project. Once filed, the NEB Section 52 application will constitute Trans Mountain's formal application to the NEB seeking approval for the proposed facilities. The application will form the basis for the regulatory process and public hearings for the project.

Trans Mountain is proceeding with the project scope described in this PD for the regulatory application required to obtain a certificate under Section 52 of the NEB Act. A comprehensive ESA and associated public hearing process will be required as part of the NEB regulatory process for the project.

2.1 Background

In operation since 1953, the TMPL system transports a range of crude oil and petroleum products from Alberta, including:

- crude petroleum deliveries to Burnaby and the Westridge Marine Terminal for offshore export to California, the United States (US) Gulf Coast and Asia, and to the Sumas Terminal for deliveries on the Trans Mountain Pipeline (Puget Sound) LLC pipeline to Anacortes, Ferndale, and Cherry Point in Washington.

- refined product deliveries to Kamloops and Port Moody, BC

The system consists of:

- the pipeline
- 24 pump stations
- four terminals
- one marine loading terminal

The TMPL system is about 1,150 km long. Starting at the Edmonton Terminal, the pipeline runs west paralleling Highway 16 through Jasper National Park, then southwest along Highway 5 to the Kamloops Terminal, and continues southwest, generally paralleling Highway 5 to the Sumas Terminal near Abbotsford, terminating at the Burnaby Terminal. From the Burnaby Terminal, local distribution pipelines connect to Chevron's Burnaby Refinery, the Suncor marketing terminal, and the Westridge Marine Terminal.

The four TMPL system terminals have a combined storage capacity of 840,200 m^3 (5,284,700 bbl). The terminals also house ancillary equipment, such as meters and booster pumps. The Westridge Marine Terminal has a single loading dock, capable of accommodating tankers and barges with a capacity of up to 120,000 dead weight tonnes.

As authorized by NEB Certificate OC-2, the TMPL system was constructed in 1952 through 1953 and consisted of:

- a 609.6 mm (24 inch) outside diameter (OD) pipeline
- four pump stations
- the Westridge Marine Terminal

In August 2007, Certificate OC-2 was amended to Certificate AO-2-OC-2 to reflect the change in the name of the holder of the NEB certificate to Trans Mountain Pipeline Inc., as general partner to Trans Mountain Pipeline, L.P.

At the start of operations, the TMPL system had a capacity of 23,850 m^3/d (150,000 bbl/d) and served refineries in British Columbia and Washington. Shipments from the Westridge Marine Terminal started in 1956 and have continued since that time. Since the initial construction, a series of incremental expansions have occurred to the pipeline, pump stations and the Westridge Marine Terminal in response to changing market conditions, including:

- construction of two 80-km pipeline loop segments, pump stations and an expansion of the Westridge Marine Terminal dock in response to increasing demand (1957)
- addition of pump stations in response to increasing demand (late 1960s)
- demolition of a number of pump stations and idling of loop segments in response to reduced demand (early 1980s)
- modifications to enable transportation of refined products to Kamloops (1985)
- addition of pump stations to allow transportation of heavy crude oil, including tank builds (1986-1988)
- modifications to enable transportation of methyl tertiary-butyl ether (a fuel additive) (1992)
- modifications to enable transportation of refined products to the BC Lower Mainland – coincided with the closure of three Lower Mainland refineries (1993 and 1994)
- construction of a pump station and reactivation of one existing loop section in response to increasing demand (1996)
- construction of a pump station and reactivation of one existing loop section in response to increasing demand (2004)

The most recent TMPL system upgrades, constructed between 2006 and 2008, include:

- the pump station expansion, which involved constructing 12 new pump stations (approved by NEB Order XO-T099-15-2005, November 2005)
- the Blue River Pump Station Project, which involved constructing one new pump station (approved by NEB Order XG-T099-02-2007, April 2007)
- the Anchor Loop Project (approved by Certificate OC-49, November 2006. In August 2007, Certificate OC-49 was amended to Certificate AO-1-OC-49). The Anchor Loop Project involved:

- constructing two pipeline segments, one 762.0 mm (30 inch) OD segment and one 914.4 mm (36 inch) OD segment, totalling about 160 km

- installing two pump stations

The TMPL system now has an operating capacity of 47,690 m^3/d (300,000 bbl/d) using 24 active pump stations and 40 tanks.

Trans Mountain's Edmonton Terminal Expansion Project, which is currently underway, involves constructing 10 new tanks and associated facilities at the Edmonton Terminal. This project was approved by the NEB in March 2008 and is now being constructed under Amending Order AO-005-XO-T246-04-2008. In February 2013, Trans Mountain applied to the NEB to vary Amending Order AO-005-XO-T246-04-2008 to permit construction of four additional tanks at the Edmonton Terminal. The 10 new tanks will be in service in August to November 2013, and the additional four tanks will be in service in August to October 2014.

2.2 Commercial Basis for the Project

Trans Mountain held an open season that commenced on October 2011 and completed in November 2012. This process resulted in 13 shippers executing firm service transportation agreements for 15- and 20-year terms. The total contracted volume under these agreements is 112,480 m^3/d (707,500 bbl/d). The remaining 29,020 m^3/d (182,500 bbl/d) of pipeline capacity will be reserved for uncommitted or spot shippers.

In June 2012, Trans Mountain filed a toll application with the NEB respecting the contract terms and toll structure that would be implemented on the proposed Trans Mountain Expansion Project. On May 17, 2013, the NEB approved the toll application in its Reasons for Decision RH-001-2012. The toll application decision document is available on the NEB's website at:

> https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/130635/customview.html?func=ll&objId=130635&objAction=browse&redirect=3

The recent NEB decision RH-001-2012 reinforces the market support for the project and provides the necessary economic certainty to proceed with development of the Section 52 facilities application for the project.

2.3 Project Scope

The Trans Mountain Expansion Project will represent a major expansion of the existing TMPL system. Based on binding commercial support, Trans Mountain will apply, under Section 52 of the NEB Act, for a certificate to expand the pipeline to a capacity of 141,500 m^3/d (890,000 bbl/d).

The scope of the project will involve:

- using existing active 609.6 mm (24 inch) and 762.0 mm (30 inch) OD buried pipeline segments

- constructing three new 914.4 mm (36 inch) OD buried pipeline segments totalling about 973 km:

  - Edmonton to Hinton – 335 km long
  - Hargreaves to Darfield – 275 km long
  - Black Pines to Burnaby – 363 km long

- reactivating two 609.6 mm (24 inch) OD buried pipeline segments that have been maintained in a deactivated state:

  - Hinton to Hargreaves – 150 km long
  - Darfield to Black Pines – 43 km long

- constructing two 4 km long 762.0 mm (30 inch) OD delivery lines from the Burnaby Terminal to the Westridge Marine Terminal (the Westridge delivery line)

- removing the existing tanker dock at the Westridge Marine Terminal and constructing two new loading docks with a total of three berth faces, and a utility dock to support expanded operations

- adding 33 new pumping units at 10 locations (i.e., nine existing and one new pump station site)

- reactivating the existing Niton pump station that has been maintained in a deactivated state

- deactivating four existing pump stations at Albreda, Stump, Hope and Wahleach, if further studies indicate that these stations are not required for reliability

- adding 21 new tanks located at the Edmonton, Sumas and Burnaby terminals

The three new pipeline segments, together with the reactivation of the two existing deactivated segments, will result in two parallel pipelines:

- Line 1, consisting only of existing pipeline segments, will have a sustainable capacity of 55,640 m^3/d (350,000 bbl/d)

- Line 2, consisting of the new segments and two existing active segments (i.e., from Hinton to Hargreaves, and Darfield to Black Pines), will have a sustainable capacity of 85,850 m^3/d (540,000 bbl/d)

The twin parallel pipeline configuration of the proposed TMPL system expansion is shown in Figure 2-1.

2.3.1 Pipelines

Once completed, the expanded TMPL system will consist of two parallel pipelines (i.e., the existing Line 1 and the new Line 2). The pipeline segments that will form the existing Line 1 and the new Line 2, including the new segments, existing active and deactivated pipeline segments are shown in Table 2-1.

Table 2-1: Configuration of the Expanded TMPL System

Line 2 (New)					Line 1 (Existing)				
		NPS					NPS		
From	To	mm	Inches	Status	From	To	mm	Inches	Status
Edmonton, AB	Hinton, AB	914.4	36	New	Edmonton, AB	Edson, AB	609.6	24	Active
					Edson, AB	Hinton, AB	762.0	30	Active
Hinton, AB	Hargreaves, BC	914.4	36	Active	Hinton, AB	Hargreaves, BC	609.6	24	Reactivated
Hargreaves, BC	Darfield, BC	914.4	36	New	Hargreaves, BC	Darfield, BC	609.6	24	Active
Darfield, BC	Black Pines, BC	762.0	30	Active	Darfield, BC	Black Pines, BC	609.6	24	Reactivated
Black Pines, BC	Burnaby, BC	914.4	36	New	Black Pines, BC	Kamloops, BC	762.0	30	Active
					Kamloops, BC	Burnaby, BC	609.6	24	Active

Note:
New = pipeline segments that will be constructed as part of the project.
Active = existing segments that currently provide transportation service.
Reactivated = existing segments that have been maintained in a deactivated state that will be reactivated as part of the project.
AB = Alberta, BC = British Columbia

Figure 2-1: Trans Mountain Expansion Project Configuration

The Westridge delivery line connecting the Burnaby Terminal to the Westridge Marine Terminal will be expanded by installing two new lines.

2.3.1.1 Line 1 (Existing Line)

Line 1, including the components of the project, will consist of:

- active 609.6 mm (24 inch) OD buried pipeline segments from:
    - Edmonton to Edson
    - Hargreaves to Darfield
    - Kamloops to Burnaby
- active 762.0 mm (30 inch) OD buried pipeline segments from:
    - Edson to Hinton
    - Black Pines to Kamloops
- reactivated 609.6 mm (24 inch) OD buried pipeline segments from:
    - Hinton, AB, to Hargreaves
    - Darfield to Black Pines

Once fully active, Line 1 will have a sustainable capacity of about 55,640 m^3/d (350,000 bbl/d) based on an assumed slate of light crude oils and refined products. Although it is expected that Line 1 will be dedicated to lighter petroleum products, it will be designed to allow for the batching of heavy crude oils, if required.

2.3.1.2 Line 2 (New Line)

Line 2 will consist of:

- three new 914.4 mm (36 inch) OD buried pipeline segments from:
    - Edmonton to Hinton
    - Hargreaves to Darfield
    - Black Pines to Burnaby
- the existing and active 914.4 mm (36 inch) OD buried pipeline segment from Hinton to Hargreaves
- the existing and active 762.0 mm (30 inch) OD buried pipeline segment from Darfield to Black Pines

These existing and new segments will form Line 2 and will have a sustainable capacity of about 85,850 m^3/d (540,000 bbl/d) based on an assumed slate of heavy crude oils.

Line 1 and Line 2 will be able to provide a batched transportation service for a variety of crude types and products, with a combined sustainable capacity of 141,500 m^3/d (890,000 bbl/d). This operating capacity assumes an availability factor of 0.95 to allow for planned and unplanned system shutdowns and maintenance. Assuming 20% of the batch lineup is heavy oil, the current operating capacity of the TMPL system is 47,690 m^3/d (300,000 bbl/d). On this basis, the project will increase the existing TMPL system capacity by 93,800 m^3/d (590,000 bbl/d).

2.3.1.3 Westridge Delivery Line

The Westridge delivery line will be expanded by constructing two new 762.0 mm (30 inch) OD pipeline segments between the Burnaby Terminal and the Westridge Marine Terminal. These two additional lines will work in conjunction with the existing 609.6 mm (24 inch) OD line to provide increased loading capability to the expanded Westridge Marine Terminal.

2.3.1.4 Valve Automation

The expanded pipeline design will include remotely operated mainline block valves (MLBVs) for emergency shutdown and isolation of pipeline segments. New MLBVs will be installed on Line 2 with automation or check valves, as required. Reactivated segments of Line 1 will include automation of MLBVs. As part of the current operations, sections of Line 1 currently in operation are subject to a technical review with supplemental automation of MLBVs addressed as part of ongoing operations.

2.3.2 Pump Stations

2.3.2.1 New Pump Stations

A total of 11 new pump stations will be required for the project:

- nine at existing pump station sites
- two at a new common site

Nine new pump stations will be located at existing pump station sites. These pump stations will have 27 3,730 kW (5,000 hp) pump units. Each new pump station will require a new electrical substation adjacent to the existing substation. Eight of the pump stations will require a new power feed from the existing adjacent transmission or distribution lines. The new pump station at Kingsvale will require a new transmission line. Additional land and access road requirements at these existing sites are expected to be minimal.

Two new pump stations will be required at a new common site at Black Pines. One pump station will have two 3,730 kW (5,000 hp) pump units, and the other pump station will have two 1,865 kW (2,500 hp) pump units. The final location of the two new pump stations will be based on hydraulic optimization, utility power availability, land use, environmental considerations and Aboriginal and landowner input. Each pump station site will require a new electrical substation both of which will be served by a new power line from the utility transmission serving the area. New land will be required for this common site.

The pump station located at Edmonton will be a five-unit station, and the pump station at Kamloops will be a four-unit station. Each of these critical stations will include an installed spare pump unit to prevent pipeline operations from being substantially affected if an operating pump unit were to fail. The pump stations located at Gainford, Edson, Hinton and Blackpool will be three-unit stations. All other new pump stations will be two-unit stations.

2.3.2.2 Pump Station Expansions

Two existing pump stations will be expanded by adding pump units. A third 3,730 kW (5,000 hp) pump unit will be added at Blue River, and a fifth 1,865 kW (2,500 hp) pump unit will be added at Sumas.

2.3.2.3 Pump Unit Replacements

Four existing pump units at the existing pump stations at Wolf and Blue River are not capable of providing sufficient pumping capacity for Line 2. These four pump units will be replaced to achieve higher flow or lower pressure characteristics, using the same motors, pump bases and piping, if practicable. However, the extent of the infrastructure modifications required, and the complexity of the logistics in keeping the existing pumps operational, might require installation of new pump bases and piping. If this is the case, new pump buildings will be constructed adjacent to the existing pump buildings, and the existing pump buildings will be decommissioned once the new pumps are ready for service. The new pump buildings would use the existing power and control infrastructure.

2.3.2.4 Pump Station Reactivations and Deactivations

The existing deactivated pump station on Line 1 at Niton has two 1,492 kW (2,000 hp) pump units, which will be reactivated. In addition, the active pump stations located at Albreda, Stump, Hope and Wahleach might be deactivated, if they are not required for reliability.

2.3.2.5 Pump Station Configuration

Of the 11 new pump stations, one will be connected to Line 1, and 10 will be connected to Line 2. In addition, two of the existing pump stations (i.e., Wolf and Blue River) that are currently connected to Line 1 will be disconnected and reconnected to Line 2. The pump station at Jasper, which is currently connected to the active 914.4 mm (36 inch) OD segment from Hinton to Hargreaves, will be disconnected and reconnected to the 609.6 mm (24 inch) OD segment from Hinton to Hargreaves. This segment will be reactivated to form part of Line 1.

Table 2-2 summarizes the planned changes to pump stations and units.

Table 2-2: Planned Changes to Pump Stations and Units

Location	Pump Stations			Pump Units			Unit Size		Line No.
	New	Expanded	Reactivated	New	Reconfigured [1]	Reactivated	kW	hp	
Existing Pump Station Sites									
Edmonton, AB	1	–	–	5	–	–	3,730	5,000	2
Gainford, AB	1	–	–	3	–	–	3,730	5,000	2
Niton, AB	–	–	1	–	–	2	1,492	2,000	1
Wolf, AB	–	–	–	–	2	–	3,730	5,000	2
Edson, AB	1	–	–	3	–	–	3,730	5,000	2
Hinton, AB	1	–	–	3	–	–	1,865	2,500	2
Jasper, AB	–	–	–	–	2	–	1,865	2,500	1
Rearguard, BC	1	–	–	2	–	–	3,730	5,000	2
Blue River, BC	–	1	–	1	2	–	3,730	5,000	2
Blackpool, BC	1	–	–	3	–	–	3,730	5,000	2
Kamloops, BC	1	–	–	4	–	–	3,730	5,000	2
Kingsvale, BC	1	–	–	2	–	–	3,730	5,000	2
Sumas, BC	1	–	–	2	–	–	3,730	5,000	2
	–	1	–	1	–	–	1,865	2,500	Puget
New Common Pump Station Site									
Black Pines, BC	1	–	–	2	–	–	1,865	2,500	1
	1	–	–	2	–	–	3,730	5,000	2
Total	**11**	**2**	**1**	**33**	**6**	**2**			
Aggregate Total	**14**			**41**					

Note:
1. For higher flow/lower pressure, to enable the existing motors to be used.

Where new pump stations are to be constructed adjacent to existing pump stations that will remain operational, the only components that will be shared are utility power and non-operating site infrastructure (i.e., access roads, fencing, drainage systems, offices, workshops, washrooms). This is to ensure that a failure in equipment providing service to one pipeline does not adversely affect the other pipeline. Design considerations will address overall system independence and reliability.

2.3.2.6 Pump Station Infrastructure

The new pump stations will be similar to the existing pump station at Chappel (see Figure 2-2). Each new pump station will include the following components contained within a fenced and gravelled area:

- an electrical substation
- an electrical services building
- a pump building
- an operator building
- station piping
- at least one variable frequency drive capable of controlling the pump unit

Figure 2-2: Existing Chappel, BC, Pump Station

2.3.2.7 Ancillary Facilities and In-line Inspection Tool Traps

Ancillary facilities, including scraper traps and pressure reduction or relief stations, and any required containment, might be required at one or more locations. Scraper traps are used to send and receive in-line inspection (ILI) tools and scraper tools. The scraper traps segment the pipeline to facilitate ILI and maintenance pigging. Pressure reduction and relief stations are used to provide overpressure protection. A hydraulic surge study, including hydraulic analysis and pipeline profile, will be completed to determine the number and locations of these facilities.

In total, nine new sending traps will be required at the following pump stations:

- Edmonton (Line 2)
- Edson (Line 2)
- Hinton (Line 1)
- Rearguard (Line 1 and Line 2)
- Black Pines (Line 1 and Line 2)
- Kamloops (Line 2)
- Burnaby (Westridge delivery line)

Nine new traps for receiving ILI tools will be required at the following pump stations:

- Edson (Line 2)
- Rearguard (Line 1 and Line 2)
- Darfield (Line 2)
- Black Pines (Line 1 and Line 2)
- Kamloops (Line 2)
- Burnaby (Line 2)
- Westridge (Westridge delivery line)

Existing sending traps will remain in service at the following pump stations:

- Edmonton (Line 1)
- Edson (Line 1)

- Darfield (Line 2)
- Kamloops (Line 1)
- Sumas (Line 1 and tank lines)

Existing sending traps on Line 1 will be deactivated and removed at the Hinton pump station.

Existing receiving traps on Line 1 will remain in service at the following pump stations:

- Edson
- Hinton
- Kamloops
- Sumas
- Burnaby

The existing receiving trap on Line 1 at the Darfield pump station will be deactivated and removed. The existing trap facility at the Hargreaves pump station, which does not have operational traps normally installed, will also be deactivated and removed.

Table 2-3 lists the run distances between sending and receiving traps, once the pipelines and traps have been constructed and configured.

Table 2-3: Run Distances between Sending and Receiving ILI Traps

Pipeline Segment	Pipeline OD (mm)	Run Distance (km)
Line 1		
Edmonton to Edson, AB *	609.6	229
Edson to Hinton, AB	762.0	89
Hinton, AB, to Rearguard, BC	609.6	159
Rearguard to Black Pines, BC	609.6	308
Black Pines to Kamloops, BC	762.0	38
Kamloops to Sumas, BC	609.6	259
Sumas to Burnaby, BC	609.6	65
Line 2		
Edmonton to Edson, AB *	914.4	247
Edson, AB, to Rearguard, BC	914.4	251
Rearguard to Darfield, BC	914.4	271
Darfield to Black Pines, BC	762.0	43
Black Pines to Kamloops, BC	914.4	39
Kamloops to Burnaby, BC	914.4	329
Note *: The Edmonton to Edson, AB, run distances are unequal between the two pipelines primarily because of alternative routing for Line 2 through the Edmonton Transportation And Utility Corridor.		

2.3.3 Tanks

As shown in Figure 2-3, the TMPL system has terminals located at:

- Edmonton
- Kamloops
- Sumas
- Burnaby

These terminals include tanks, meters, pumps, buildings and ancillary facilities. Collectively, the TMPL system has 40 tanks with a combined total shell capacity of 840,200 m^3 (5,284,700 bbl).

Figure 2-3: Burnaby Terminal

A preliminary assessment indicates that, to accommodate the expanded pipeline operation, the project will require 21 new tanks. The new tanks will range in shell capacity from 27,820 m^3 (175,000 bbl) to 63,590 m^3 (400,000 bbl). Further study is underway to verify the optimal number and capacities of the new tanks. It is expected that the new tanks will be constructed within the existing terminal fence lines, requiring no additional land. The location, number and capacity of the new tanks are shown in Table 2-4.

Table 2-4: New Tanks

Terminal	No. of Tanks	Tank Size (Nominal or Shell Volume)						
		m^3	27,820	34,980	39,750	43,720	51,670	63,590
		bbl	175,000	220,000	250,000	275,000	325,000	400,000
Edmonton, AB	6	–	–	2	2	–	–	2
Sumas, BC	1	–	1		–	–	–	
Burnaby, BC	14	–	–		2	10	2	
Total	**21**	**–**	**1**	**2**	**4**	**10**	**2**	**2**

All tanks will be designed and constructed in accordance with the American Petroleum Institute (API) Standard 650, Welded Steel Tanks for Oil Storage, with foundations designed based on site-specific geotechnical conditions. Secondary containment will be provided in accordance with National Fire Protection Association (NFPA) Standard 30 and federal or provincial fire codes, as applicable. Each tank will be equipped with a radar gauging system for liquid overfill protection. Fire suppression equipment and capacity will be in accordance with the NFPA Standard 30 and federal or provincial fire codes, as applicable. Additional air monitoring units will be installed, as required. The existing tanks, new project tanks and total tank capacity by location are shown in Table 2-5.

Table 2-5: Existing and New Tank Capacities

Terminal	Existing		New		Total	
	Number of Tanks	Total Capacity (m^3)	Number of Tanks	Total Capacity (m^3)	Number of Tanks	Capacity (m^3)
Edmonton, AB	19 [1]	430,400	6	276,300	25	707,030
Kamloops, BC	2	25,600	0	0	2	25,600
Sumas, BC	6	113,800	1	27,822	7	141,622
Burnaby, BC	13	270,400	14	620,032	26 [2]	890,432
Total	**40**	**840,200**	**21**	**924,154**	**60**	**1,764,684**
				Total Increase in Capacity		**110%**

Note:
1. Before completion of the Edmonton Terminal Expansion Project.
2. It is expected that one 12,700 m^3 tank will be replaced with one 43,700 m^3 tank.

2.3.4 Westridge Marine Terminal

The Westridge Marine Terminal is located on the south shore of Burrard Inlet, east of the Second Narrows in the City of Burnaby, within the jurisdiction of the Port Metro Vancouver (PMV). The Westridge Marine Terminal is used for:

- loading synthetic or crude oil onto Aframax or Panamax class tankers and barges
- off-loading jet fuel from tankers and barges

Jet fuel received at the terminal is delivered to Vancouver International Airport by Trans Mountain's affiliate, Trans Mountain (Jet Fuel) Inc. In addition to the dock, the Westridge Marine Terminal also has three tanks, containing a total volume of 45,950 m^3 (289,000 bbl), currently being used for staging jet fuel.

The PMV manages vessel traffic in accordance with its *Harbour Operations Manual* available at:

http://www.portmetrovancouver.com/en/users/marineoperations/navigation.aspx

The immersed depth (i.e., draft) of loaded vessels transiting the Second Narrows is limited to 13.5 m, under the current operating rules. Furthermore, the PMV's *Harbour Operations Manual* also limits laden tanker transits to near slack water during daylight hours, and requires a minimum of 10% under-keel clearance over a channel width of 2.85 times the beam of the vessel. The requirement to maintain under-keel clearance at the edges of the channel (channel width) is typically the limiting factor in determining the allowable draft of the vessel. An assessment of available tidal windows over the 19-year tidal cycle shows that a draft of 11.75 m on a 44 m beam Aframax tanker is sufficient to ensure sustainable take-away capacity from the Westridge Marine Terminal. For a 44 m beam Aframax tanker, the 11.75 m draft corresponds to a heavy oil capacity of 87,400 m^3 (550,000 bbl) and a light oil capacity of about 92,200 m^3 (580,000 bbl). These capacities have been used to determine the post-expansion estimate of 34 Aframax tanker loadings per month. Depending on the available tides, the actual draft of laden tankers will be up to 13.5 m.

While loadings at the Westridge Marine Terminal fluctuate based on market conditions, currently five tankers and three barges are typically handled each month (i.e., two barges outbound with crude oil shipments and one inbound with jet fuel). It is expected that this will increase up to the equivalent of 34 partially loaded Aframax tankers (with an 11.75 m draft) and three barges, an increase of about 30 vessels per month. Crude oil and jet fuel barge traffic is not expected to increase because of the project. Jet fuel receipts will not change because of the project.

Vessels bound for the Westridge Marine Terminal currently account for about 3% of the total traffic in the PMV's jurisdiction. Because of the expanded TMPL system, vessel movement and loading facilities are expected to account for 14% of the total traffic in the PMV based on current activity, which represents an increase of about 11% over current traffic levels.

Preliminary design of the additional facilities at the Westridge Marine Terminal is currently underway. These plans include constructing two new docks:

- one dock with two berths for Aframax and Panamax tankers and oil barges
- one dock with one operational berth for Panamax tankers and barges (oil and jet fuel)

In addition, the plans include construction of a utility dock with multiple berths for pilot launches, tugs, spill response vessels and equipment.

The dock facilities at the Westridge Marine Terminal were constructed in 1957 and will require significant upgrades or reconstruction before 2020. If cost-effective upgrading can be done to the existing dock while it is operational, this will replace the need for a single berth face dock. Otherwise, the existing dock will be removed and replaced.

The exact configuration of the new docks has yet to be determined, and depending on their location some nearshore dredging might be necessary to accommodate construction of the new docks.

The Westridge Marine Terminal docks will be equipped with:

- fender and mooring structures
- vessel access towers
- delivery and receipt pipeline systems
- loading and unloading arms
- vapour recovery systems and fire-suppression systems, similar to those that currently exist at the terminal

Additional tanker support systems that are being considered include refuelling from barges and using shore power to limit generator use. Currently, only 5% of the international tanker fleet is equipped to take shore power, so it might not be feasible to enforce the use of shore power at this time.

Figure 2-4 is a historical photo of the Westridge Marine Terminal. Figure 2-5 is a current photo of the Westridge Marine Terminal.

Figure 2-4: Westridge Marine Terminal – Historical

Figure 2-5: Westridge Marine Terminal – Current

2.4 Project Execution

2.4.1 Project Schedule

The process to establish commercial support for the project began in 2011 and continued through to November 2012. This process defined the size of the project based on 15- and 20-year contractual commitments of 112,480 m^3/d (707,500 bbl/d) made by Trans Mountain's shippers.

For the project, Trans Mountain has initiated contact with landowners, engagement with Aboriginal peoples, public consultation and discussion with communities, and communications with regulatory authorities, which will continue through the post-construction phase of the project. As described further in Sections 4.0, Aboriginal Engagement and Section 5.0, Public Consultation, one of the objectives of the Aboriginal engagement and public consultation programs is to determine a project corridor that closely parallels the existing system, while incorporating the input, interests and concerns of landowners, Aboriginal peoples, communities, stakeholders and regulatory authorities.

As these consultation activities continue, Trans Mountain will gain important information that will affect the detailed engineering of the project and assist in preparing the NEB application. Preliminary engineering for the project began in early 2012 based on expected contractual commitments. Detailed engineering will continue through to early 2016.

The ESA process also began in early 2012 with the collection of baseline data and the establishment of supporting studies. As part of the ESA, Trans Mountain will continue to meet with, and gather information from, landowners, Aboriginal peoples, communities and stakeholders on questions and concerns. These issues and concerns will assist Trans Mountain in identifying topics to include in the ESA. Issue identification and environmental and socio-economic studies will continue through to late 2013, and the results will form part of the NEB application. Some environmental and socio-economic studies are expected to continue through to construction and operations to support project execution.

In late 2013, Trans Mountain plans to file an application, under Section 52 of the NEB Act, for a certificate to construct and operate the project. Trans Mountain expects that the regulatory review process for this project could extend up to two years from the application submission date.

If the NEB grants a certificate for the project by late 2015, construction activities would be scheduled to start as early as possible in 2016 and end by fall 2017. The expanded TMPL system could start service in December 2017. This scheduling information is based on a conceptual design and might change, or be refined, based on a variety of factors, including field data collection, the regulatory review process and the results of consultation and engagement programs. Figure 2-6 shows the conceptual project schedule.

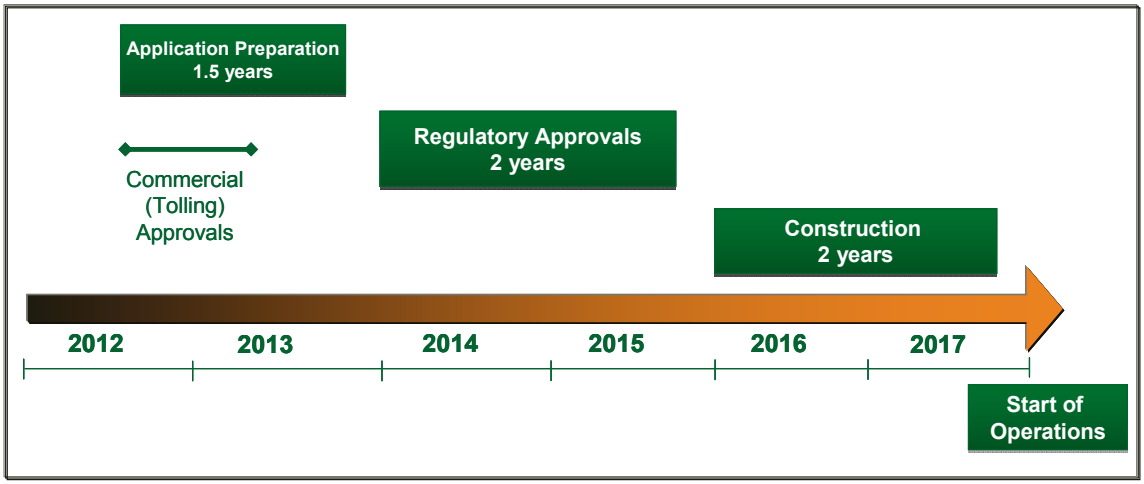

Figure 2-6: Conceptual Project Schedule

2.4.2 Project Activities

Various activities will be conducted to successfully execute the project, including:

- planning and engineering
- site preparation
- construction
- cleanup and reclamation

2.4.2.1 Planning and Engineering

Project planning and engineering design activities will be completed as part of the regulatory application process. Input from Aboriginal peoples, regulatory authorities and stakeholders will be assessed and incorporated into project plans. The objectives of planning and engineering are to meet the NEB's requirements for the project and have the necessary information in place to ensure that all phases (from site preparation to decommissioning and abandonment) of the project are implemented in a socially and environmentally responsible manner.

Routing analysis and determination are currently underway as part of preliminary engineering design for the project. The primary design objective is to construct the project within the existing pipeline right-of-way, and where this is not possible, minimize any new linear disturbance. The project corridor will be selected to minimize impacts on the environment, maximize worker and public safety, and minimize other social impacts. As such, portions of the new pipeline segments might be located outside of the existing pipeline right-of-way. Routing considerations include minimizing, where practicable, effects on:

- local residents
- soil and soil productivity
- water quality and quantity
- air quality and the acoustic environment
- fish and fish habitat
- watercourses
- wetlands
- vegetation

- wildlife and wildlife habitat
- species at risk or species of concern
- heritage and archaeological resources
- Aboriginal traditional and contemporary land use

Although routing of the pipeline segments will closely follow the existing alignment of the TMPL system, route refinements will be considered based on:

- improvements to the environmental footprint. For example, selection of appropriate routing to avoid or minimize the number of watercourse crossings (i.e., rivers or streams) or disturbance to wetlands and environmentally sensitive areas.
- avoidance of culturally sensitive areas
- avoidance of effects on Aboriginal peoples and urban residents, where practicable
- opportunities for improved constructability
- safety and operability

Trans Mountain will endeavour to minimize new disturbance taking into consideration safety, the environment and stakeholder feedback.

2.4.2.2 Site Preparation

Site preparation activities will include:

- surveying the boundaries of the pipeline right-of-way (e.g., line-of-sight clearing with chain saws, flagging and staking)
- clearing, timber salvage and slash disposal
- grading and pipeline right-of-way preparation
- constructing the pipeline right-of-way, temporary workspace and facility sites
- marking the trench line and existing utilities
- fencing and flagging avoidance areas, such as protected wildlife habitat, rare plant communities, archaeological sites or Aboriginal cultural sites

Snow, trees, stumps, brush and other vegetation will be cleared from the construction right-of-way, temporary work sites and permanent facilities that are not located on existing, previously cleared easements. Timber and brush disposal options will be subject to agreements with landowners and appropriate government authorities. Equipment used during clearing activities will include:

- chainsaws
- feller-bunchers or other tree-clearing equipment
- log skidders
- mowers
- bulldozers
- backhoes

Where present in non-forested areas, topsoil or strippings will be salvaged to ensure that soil productivity is maintained. The width and depth of topsoil or strippings salvage will depend on the land use, soil conditions, microtopography, regulatory agency requests and grading requirements. Any salvaged topsoil or strippings will be segregated and stockpiled along the construction right-of-way, and at facility sites in low-profile berms or in piles adjacent to the site perimeter. Equipment used during topsoil or strippings handling activities will include bulldozers, graders and backhoes.

Following topsoil or strippings salvage, grading will be conducted on irregular ground surfaces, including temporary workspaces, to provide a safe work surface. Graders, backhoes and bulldozers will be used for this activity. Blasting will be required where hard bedrock is encountered.

2.4.2.3 Construction Activities

Pipeline

Construction of the pipeline will be completed in construction spreads. Segmentation of the pipeline construction will divide the work into manageable portions based on length and expected construction challenges. The work schedule will alternate between winter and summer construction periods, based on regional conditions, and will provide for a continuous construction schedule. It is expected that construction will take place in four or five pipeline construction spreads in each of the three construction seasons (two in summer and one in winter) for a total of 15 spreads. Each construction spread is expected to range from 30 to 100 km in length. The number of construction spreads might change based on more detailed engineering and environmental studies and construction planning.

Large mainline work crews will construct most of the pipeline within each construction spread. Smaller specialty work crews will work in parallel with the mainline work crews to complete construction of non-standard pipeline sections at road, rail, utility and watercourse crossings, for example. To ensure safe pipeline and facilities installation, specialty contractors will also be used for construction in urban or industrial areas to ensure safe pipeline and facilities installation.

From the point of manufacture, the pipe might be transported by ship or by rail to temporary stockpile sites along the construction corridor. From the temporary stockpile sites, the pipe will be transported by truck to the construction right-of-way. The pipe will then be bent, lined up, welded, joint-coated and inspected before being lowered into the trench. Inspection activities will involve using high-voltage methods (such as using a jeep meter) to check the coating for any defects, and X-ray or ultrasonic examinations of all welds.

The trench will be excavated using tracked excavators to a depth sufficient to ensure that the depth of cover meets or exceeds applicable codes. The minimum depth of cover will be about 0.8 m, with appropriate variances depending on land use. Primary road and railway crossings will be bored to minimize interference with existing activities and usage.

Sideboom tractors will lower the pipe into the trench. Trench dewatering might be necessary at certain locations during lowering in (e.g., to ensure acceptable bedding for the pipe, to prevent the pipe from floating or for performing tie-in welds).

Before backfilling, subsurface erosion control structures, such as trench breakers, will be installed on steep slopes along with subdrains, where required, to manage springs. The trench will be backfilled using backhoes, graders, bulldozers or specialized backfilling equipment. Generally, backfill material will consist of native trench spoil material.

Hydrostatic testing (i.e., pressure testing using water) will be used to verify the pipeline integrity after welding is complete. At major watercourse crossings, pipe sections will be pretested before installation. Water will be drawn from suitable sources and returned to the appropriate watersheds in accordance with permit requirements. To minimize the total amount of water withdrawn for test purposes, where practicable, water will be moved along the pipeline segments for reuse in multiple tests. Upon successful test completion, the test sections will be dewatered using pigs (foam or rubber sealing plugs) propelled through the pipeline by compressed air. Testing programs will be subject to NEB approval. Appropriate designs and construction practices will be implemented to meet technical standards and protect the safety of workers and the public.

New pipeline segments will cross numerous wetlands, unnamed watercourses and major watercourses, such as the North Saskatchewan, Pembina, McLeod, Fraser, Raft, Clearwater, North Thompson, Thompson and Vedder rivers. Pipe installations at watercourse crossings can be classified as either wet

(trenched) or dry (trenched with water flow control or trenchless) crossings. With a wet crossing (e.g., open cut), the trench can be excavated through flowing water, if present. With a dry crossing where a trench is necessary, excavation normally occurs through the streambed once the water flow has been isolated, either by a dam and pump-around mechanism, or by using a flume over the excavated trench. Horizontal directional drill techniques could also be used for watercourse crossings, where feasible. Crossing methods specific to each watercourse will be determined in consultation with engineering and environmental specialists, as well as applicable regulatory authorities.

Above-ground facilities, such as scraper traps (to allow for pigging of the pipeline) and MLBVs will be installed at strategic locations along the pipeline. All-season access roads and power lines to the facilities will be established and the installations will be fenced.

Pump Stations

For the new pump stations on existing or new sites, the area will be surveyed, cleared of vegetation, and topsoil or strippings salvaged, segregated and stockpiled. Once the sites are graded for new pump stations, the foundation piles will be driven or drilled using pile drivers or augers, and buildings will be installed on the foundation piles. The electrical and pipeline connections will be completed once the buildings have been installed. Gravel will be placed over high-traffic areas. Following construction, all systems and processes will be connected and tested. Equipment used during these activities could include cranes and trucks.

In addition, constructing the new pump station sites at Black Pines will require installing a power line, substation and permanent access roads. Constructing the power line will include:

- clearing and preparing the right-of-way
- erecting power poles
- stringing wire
- cleaning up and restoring work areas

Constructing access roads will require site grading, placing gravel, where necessary, and installing culverts at road ditches.

Tanks

Once site preparation activities are complete and foundations are constructed, the new tanks will be assembled and installed at the Edmonton, Sumas and Burnaby terminals. Secondary containment, consisting of compacted clay or a geo-synthetic liner, will be constructed under and around the tanks. All necessary fire suppression and vapour control equipment will be installed. A combination of gravel and asphalt surfaces will be placed over high-traffic areas of the terminals, and fencing will be maintained around the sites. Following construction, all systems and processes will be connected and tested.

Westridge Marine Terminal

Expansion of the Westridge Marine Terminal might require dredging.

Piles will be driven to support the new dock structures. Once the docks are built, berthing and mooring structures will be constructed. In addition, topside equipment will be installed, such as piping systems, loading arms, vapour control systems and fire protection systems. The number of piles and other structures will depend on the results of ongoing planning and engineering. Marine construction equipment likely required for expansion activities will include:

- barges
- dredging equipment
- pile drivers
- cranes

Temporary Facilities

Temporary facilities required for the project are expected to include:

- material stockpile and staging areas (e.g., pipe stockpile sites)
- off-load areas
- construction work camps
- construction office sites
- temporary access roads
- borrow pits
- equipment storage sites

Installation of facilities will include building temporary accommodation for construction workers, establishing site construction offices and installing electrical services and lighting. Depending on the intended site's use, gravel and fencing will be installed, as required.

2.4.2.4 Cleanup and Interim Reclamation

Appropriate mitigation (e.g., soil handling, erosion control) and monitoring activities will be implemented during construction to maximize reclamation success. Project-generated garbage or debris will be removed regularly from along the construction right-of-way and facility sites. Waste will be disposed of in accordance with applicable regulations.

After the pipeline trench has been backfilled, and once weather and soil conditions permit, cleanup and reclamation activities will start along the disturbed portions of the pipeline right-of-way. This will be done using bulldozers, backhoes, graders and farm equipment, where required. The topsoil or strippings will be replaced, and cross ditches and diversion berms will be installed on moderate and steep slopes to reduce the risk of erosion. In forested areas where erosion is not expected, natural revegetation or seeding using a native seed mix will be the preferred methods of reclamation. In agricultural areas, an appropriate seed mix will be planted in consultation with the landowner and regulatory authority. Restoration and monitoring activities typically extend for a number of years following construction to ensure that areas disturbed during construction are satisfactorily restored.

Reclamation of the facility sites will start once the building activities have been completed. Facility site contours and surface drainage will be returned to a stable and maintenance-free condition. The topsoil or strippings will be returned to non-use areas and seeded with an appropriate seed mix. Remaining strippings or topsoil storage berms will be seeded with an appropriate seed mix pending future use and will be monitored to ensure that any erosion problems are addressed. At new facility sites, a gravel surface will be placed over high-traffic areas of the site and fencing will be erected to enclose the site.

As required, additional reclamation measures will be applied to the following to return these disturbed areas to a stable and maintenance-free condition:

- banks at watercourse crossings
- the construction right-of-way
- temporary workspaces
- temporary access routes
- facility sites

2.4.3 Pipeline Operation and Maintenance

Once the project has been commissioned, it will be fully integrated into the existing TMPL system operation. The elements that are central to the operation and maintenance of the TMPL system include:

- an environment, health and safety (EHS) policy

- an integrity management programs (IMPs) that includes risk assessments, corrosion control, inspection and preventative maintenance, hydrostatic testing and damage prevention

- an emergency preparedness and response program that includes an Emergency Response Plan (ERP) and spill response resources for spills on land and water (e.g., at the Westridge Marine Terminal)

The TMPL system is remotely controlled and monitored from a control centre located at the Edmonton Terminal using a supervisory control and data acquisition (SCADA) system. The SCADA system provides continuous operating information to control centre operators who are responsible for operating the TMPL system. The SCADA system contains a real-time transient leak detection system that monitors flow metering and other instrumentation across the pipeline. This information provides input to a hydraulic model that simulates pipeline operating conditions and compares the simulated result to the actual operating conditions along the pipeline. Through this analysis, the SCADA system will generate alarms if flow imbalances exceed threshold levels. Control centre operators are responsible for immediately shutting down the pipeline if the SCADA system analysis indicates that a leak might have occurred.

Scheduling of operations and maintenance, and regular aerial and ground patrols are part of the standard operations activities for the TMPL system. Line 1 and Line 2 will be maintained from existing bases at Edmonton, Edson, Jasper, Blue River, Kamloops, Hope and Burnaby.

2.4.3.1 Environment, Health and Safety Policy

The engrained philosophy behind all activities on the TMPL system is KMC's EHS policy. The EHS policy is a formalization of KMC's commitment to conducting business in a safe and environmentally responsible manner. The EHS policy states:

> *Every employee is expected to share Kinder Morgan's commitment to pursue the goal of not harming people, protecting the environment, using material and energy efficiently and promoting best practices, thereby earning the confidence of customers, security holders and society at large, being a good neighbor and contributing to sustainable development. Kinder Morgan's policy is to comply with all health, safety, security and environmental laws, rules and regulations, not just because it is legally required but also because we believe it is the responsible way to conduct our business. Kinder Morgan has systems in place that prepare for emergencies and procedures that coordinate our response plans with emergency response organizations in the communities where we operate. Kinder Morgan has a systematic approach to health, safety, security and environmental management designed to ensure compliance with the law, to train employees to be aware of and meet their responsibility for protection of health, safety and the environment, and to achieve continuous performance improvement. In addition to the Kinder Morgan commitment, contractors are required and joint ventures under Kinder Morgan's operational control are expected to apply this policy. Employees, supervisors or operational managers who knowingly engage in or condone environmental health or safety violations are subject to disciplinary action including suspension or termination.*

Trans Mountain has in place an environmental management system designed to manage environmental risks and provide assurance of compliance with all applicable laws. Based on the EHS policy, the environmental management system applies to all of Trans Mountain's activities (i.e., project development, planning, construction, operation, maintenance, decommissioning and reclamation of facilities). All Trans Mountain employees, contractors and consultants are responsible for performing their work in a manner consistent with the EHS policy.

2.4.3.2 Integrity Management Programs

Trans Mountain's pipeline and facility IMPs use an integrated approach to ensure the long-term functional integrity of its assets used for transporting or storing petroleum products. The IMPs help to coordinate the various integrity-related programs and to identify opportunities for increased economic efficiency in integrity-related initiatives. The main components of the IMPs are hazard identification, prevention and monitoring, and implementing consequence reduction measures.

The philosophy behind the IMPs is that pipeline and facility integrity is not a one-time activity. Rather, it is a continuous and conscious process of monitoring, collecting data, analyzing risk and mitigation that is conducted throughout the life of the pipeline system. New technologies and assessment methods are evaluated and implemented, as appropriate, and the IMPs are adapted to the evolving nature of integrity management.

The objectives of the IMPs are to:

- establish an integrated program, which promotes the long-term integrity of the TMPL system
- contribute to KMC's EHS policy commitment of conducting its business in a safe and environmentally responsible manner
- ensure compliance with applicable regulations and standards

Based on a comprehensive annual risk assessment, the pipeline IMP is continuously improved through monitoring performance measures and the reduction of risk.

The IMPs encompass the following elements:

- risk management
- hazard identification and monitoring
- ILI
- corrosion control
- natural hazards management
- third-party damage prevention
- consequence reduction

Risk Management

Since the original construction and operation of the TMPL system, Trans Mountain has incorporated risk management practices and risk reduction measures into its operations and maintenance of the pipeline. The risk reduction measures have focused on decreasing the frequency and potential for an incident occurring and the resulting potential consequence. In 2010, the risk management program was formalized in a semi-quantitative pipeline risk assessment model with the objectives of continuous improvement and reduction of risk levels on an annual basis.

Hazard Identification and Monitoring

To prevent hazards from affecting pipeline and facility integrity, every effort must be made to identify all relevant hazards. Integrity hazards are defined as conditions or situations that could result in the release of products. Hazard identification is considered an ongoing process to identify all potential threats to the safe operation of pipelines and facilities. Through operating experience, accepted industry practice, recommended guidelines and regulatory requirements, programs have been developed to control the risk for each hazard relating to a loss of containment. Both the pipeline and facility hazard listings are available in their respective program documents. The commonly accepted hazards for low-vapour-pressure pipelines are corrosion, cracking, third-party damage, material and construction defects, outside forces and operator error. The following sections summarize the measures used by Trans Mountain to minimize the damage potential of these hazards.

In-Line Inspection

Since 1974, ILIs have been conducted on the TMPL system. The data gathered forms the foundation for the anomaly investigation and pipeline repair programs. The ILI tools commonly used include:

- circumferential magnetic flux leakage (MFL)
- axial MFL
- ultrasonic
- calliper

Depending on the tool selection, the inspection provides an indication of anomalies, such as:

- metal loss (corrosion, gouges, grooves)
- metal addition (weld fill-ins, fittings)
- manufacturing defects (inclusions, laminations)
- weld defects
- cracks and deformations (dents, wrinkles, buckles)

Data obtained through ILI is compiled and analyzed to identify anomalies that require further investigation. In many cases, excavations are required to expose the pipeline at specific locations to inspect and assess an anomaly using industry-recognized standards. An engineering assessment would be conducted to evaluate the defects that have the potential to impair the structural integrity of the pipeline or that do not comply with current Canadian Standards Association (CSA) Z662 standards. These types of defects are then addressed with a permanent repair, such as:

- recoating the pipe
- grinding down the anomaly
- installing a sleeve
- cutting out and replacing a pipe section

From 1964 to 2003, Trans Mountain had a program of periodic hydrostatic retesting to complement the ILI program. With the development of accurate and reliable high-resolution ILI tools, hydrostatic retesting is now only conducted in situations where ILI is not feasible. In accordance with applicable regulations, hydrostatic testing is required before initiating regular service on new pipeline construction.

Corrosion Control

An impressed-current cathodic protection system is used to reduce the potential of external corrosion occurring on the TMPL system. This protection system consists of 79 rectifiers and anode beds that are continuously monitored using remote sensors. Combined with the protection afforded by the coal tar enamel coating on the existing system, the probability for metal loss resulting from external corrosion is substantially reduced. Although an effective pipeline coating, coal tar enamel has been replaced on new pipelines with a high-performance fusion-bond epoxy coating. This new coating system complies with current industry practice and the current CSA Z662-11 standards.

The use of cleaning tools (pigs) is a preventive maintenance practice to help mitigate internal corrosion by cleaning deposits from the internal surface of the pipe, such as paraffins, asphaltenes, scale and free water. In general, cleaning pigs are run monthly on mainline sections of the TMPL.

Natural Hazards Management

Trans Mountain uses its natural hazards management program to monitor and protect against damage to the pipeline from unstable slopes, stream crossings and seismic events. Established in 1998, this program uses a custom database to document inspections and preventive maintenance work at more than 600 sites along the pipeline right-of-way and to schedule future inspection frequency based on risk.

Ongoing ground maintenance includes clearing vegetation along the pipeline right-of-way to ensure visibility during aerial inspection. Aerial inspections are used to monitor for potential water erosion and exposure of the pipeline in areas where streams cross the pipeline right-of-way. Trans Mountain employees and contractors will be dispatched to investigate and correct any issues, if required. Corrective actions might include armouring a streambed against erosion with natural materials, including large boulders and rock substrate, commonly referred to as rip-rap.

Third-Party Damage Prevention

Risks associated with third-party damage to the pipeline are mitigated through a combination of surveillance activities, notification requirements for work along the right-of-way, and a public education program focused on educating landowners, communities and contractors about the presence of the pipeline, and how to work and operate safely around the pipeline. Routine air and ground patrols are conducted to monitor for unauthorized encroachment activities and other integrity threats. Pipeline maintenance personnel are also trained to look for these conditions while executing their regular job duties.

Trans Mountain is a member of Alberta One Call and British Columbia One Call agencies. These agencies serve as a clearinghouse for notifications of any ground disturbances near or across any underground utilities that are registered with them. Through a single telephone number in each province, Trans Mountain is notified of the location and timing of a proposed activity and provided with a contact name. If affected, Trans Mountain will dispatch a technician to identify the pipeline's location and monitor the activities related to the ground disturbance or crossing to ensure that the pipeline is not adversely affected.

Consequence Reduction

In the event of a release, and in addition to prevention measures, steps will be taken to minimize the consequences of a release by quickly shutting down and isolating the damaged section of the pipeline or facility. Trans Mountain has developed comprehensive emergency response procedures that control centre and local operators must follow. Every employee has the authority to order a pipeline shutdown, but the pipeline can only be restarted following a strict protocol with sign-off from senior management. These procedures, together with aerial and ground patrols, calls from the public to Trans Mountain's toll-free emergency number, and continuous SCADA monitoring and leak detection, combine to form the first line of defence in reducing the consequences of a spill.

The SCADA and leak detection systems continuously monitor the pipeline for changes in operating parameters that would indicate a possible leak. The SCADA system monitors the pipeline flow rate, pressure, temperature and density of product, among other things. These parameters are then compared to a theoretical flow model and any differences outside of prescribed norms that might indicate a problem are identified. If a variance is found, an alarm will sound that is received by a control centre operator. All operators undergo rigorous training, including simulator testing, to qualify for critical operations positions. Operators may not operate unsupervised until they have passed all testing and are fully qualified.

2.4.3.3 Emergency Preparedness and Response Program

Trans Mountain has in place a comprehensive emergency preparedness and response program in accordance with the EHS policy and Section 32 of the NEB *Onshore Pipeline Regulations, 1999*. The emergency preparedness and response program consists of:

- an ERP
- a response management system
- training and spill response exercises
- spill response resources for the pipeline and for the Westridge Marine Terminal

Emergency Response Plan

Trans Mountain maintains a geographically based ERP that includes:

- information pertaining to notification requirements
- emergency checklists and contacts
- response team organization
- facilities and pipeline information
- material safety data sheets
- health and safety plans
- route maps depicting control points and environmentally sensitive areas

The ERP, including field guides containing route maps and critical initial response procedures, has been provided to key field operations and maintenance personnel. A project-specific ERP will be prepared for construction and commissioning activities. The existing operations ERP will be revised to reflect the response requirements of the expanded system in advance of starting operations.

Response Management System

Since 1990, Trans Mountain has been delivering its community awareness and emergency response program to emergency services organizations and government agencies along the TMPL system corridor. The objectives of the program are to familiarize first responders with the pipeline location, explain the properties of the pipeline's contents, and promote information exchange and coordination of response efforts in the event of an incident. As part of the response management system, Trans Mountain staff are trained in the emergency response procedures and conduct regular emergency exercises, some of which include local first responders. Trans Mountain also has standing agreements for contract resources to provide response equipment and labour, air and human health monitoring, environmental assessment and emergency management.

Trans Mountain has adopted the incident command system (ICS) as the basic response structure for its emergency response teams. The ICS, developed in the US almost 30 years ago, is now the system preferred by emergency response organizations around the world to handle a wide variety of emergency situations, including oil spills.

Training and Spill Response Exercises

Emergency response training is provided to head office and field personnel to promote readiness in the event of a spill. The training includes classroom instruction on the ICS, with general knowledge of the system and procedures, and more specific training for individuals with specific roles in the event of an emergency. Regularly scheduled ICS training is used to ensure that Trans Mountain employees, government personnel and first responders (e.g., local fire departments and police detachments) are trained to fulfill the key ICS roles. A combination of tabletop and field deployment exercises are used to simulate an emergency and to ensure that employees are fully trained in activation of the emergency response plans and are familiar with the deployment and capability of the equipment used. Trans Mountain will revise its ICS for the expanded operation before the start of pipeline commissioning.

Spill Response Resources

Pipeline

Trans Mountain owns, maintains and operates dedicated spill response equipment at strategic points along the TMPL system corridor.

Oil spill containment and recovery (OSCAR) units are located at Trans Mountain's facilities in Alberta (Edmonton and Jasper) and British Columbia (Blue River, Kamloops, Hope and Burnaby). Each OSCAR unit contains about 300 m of oil recovery boom and support equipment, including a river jet boat for deployment. All equipment is helicopter transportable for delivery to remote locations not accessible by road. A separate OSCAR unit containing 1,524 m of river boom is also located at the Kamloops Terminal. Specialized equipment has been developed in-house by Trans Mountain employees for

intercepting and recovering oil, if required, from beneath the ice on frozen rivers and lakes. This equipment is stored in the Jasper and Edmonton OSCAR units.

Westridge Marine Terminal

If an incident occurs at the Westridge Marine Terminal, the presence of the Trans Mountain loading master on board the vessel ensures an immediate coordinated response. The loading master has command experience and remains on board the tanker throughout the loading operation to monitor the performance of the vessel and its crew and to ensure effective communication between the terminal staff and the vessel's officers and crew.

Once a vessel is secured alongside the dock it is encircled by a containment boom. This is as a precautionary measure to confine potential spills to the immediate area of the terminal and to facilitate rapid response and recovery. Trans Mountain also maintains a secondary boom and a boat at the terminal for immediate deployment in the event of an incident.

In addition to its own equipment, and as required by the *Canada Shipping Act*, Trans Mountain is a member of Western Canada Marine Response Corporation (WCMRC) and is contracted with them to provide spill response services. The WCMRC is the Transport Canada certified marine spill response organization that serves the West Coast. To ensure it can meet the requirements set out by Transport Canada, the WCMRC maintains caches of spill response equipment. Their main operating base is located in Burnaby, near the Westridge Marine Terminal, and they maintain several response vessels on the water in Vancouver Harbour to ensure a prompt response, including a skimming vessel kept at the Westridge Marine Terminal.

Trans Mountain maintains an Emergency Preparedness and Response Plan for the Westridge Marine Terminal that would be used to manage the response to a spill. This plan will be evaluated for its suitability to the expanded operation and will be revised as necessary to ensure the safety of people and the environment. This plan forms the basis for regular emergency response training and exercises that are conducted with terminal staff and other agencies.

Trans Mountain works closely with the PMV, Transport Canada, the Pacific Pilotage Authority (PPA) and other agencies to ensure the safety and efficiency of vessels calling at the Westridge Marine Terminal. In 1976, Trans Mountain was a founding member of the spill response cooperative that has become the WCMRC, and continues to be a part owner of the organization.

2.4.4 Westridge Marine Terminal Operation

All vessels visiting the Westridge Marine Terminal are vetted by KMC to ensure they meet Trans Mountain's vessel quality criteria. In addition to Trans Mountain's own vessel screening and inspection program, tankers docking at the Westridge Marine Terminal will meet all applicable local and international rules and regulations, and will be inspected by Transport Canada for compliance. The PMV manages vessel traffic within the harbour in accordance with their *Harbour Operations Manual*. The Canadian Coast Guard (CCG) (a Special Operating Agency of the Department of Fisheries and Oceans Canada [DFO]) monitors vessel movements within Canadian waters, including PPA mandated areas. The PPA ensures safe conduct of vessels in mandated pilotage areas, which includes the shipping corridor between Westridge and Vancouver Island. Where designated vessel traffic lanes exist, the vessels will normally follow those lanes.

In addition to inspections conducted by Transport Canada and other agencies, Trans Mountain conducts a physical inspection of each vessel before it is allowed to berth at the Westridge Marine Terminal. At the Westridge Marine Terminal, all vessel screening and loading operations have been and will continue to be supervised by Trans Mountain's loading master, who has tanker command experience and is on board during all vessel loadings. The loading master's key responsibilities are:

- screening, inspection and acceptance of tankers
- continuously monitoring the condition of each vessel, and its crew, while berthed at the terminal
- supervising loading operations to ensure safety and conduct, in accordance with Trans Mountain's procedures and applicable regulations
- taking actions necessary to ensure the safety and protection of the environment, including refusal to berth, interrupting loading or casting-off of the vessel
- monitoring the performance of the ship and its crew and to ensure effective communication between terminal staff and the vessel's officers and crew

2.4.5 Abandonment

The existing TMPL system has been successfully operating for almost 60 years through proactive maintenance and integrity programs. At the end of the pipeline system's useful or economic life, the system will be abandoned in accordance with the legislation and regulations in place at that time. At the time of abandonment, Trans Mountain expects that all above-ground equipment and structures will be removed and the sites reclaimed to an appropriate land use. Generally, reclamation activities are expected to include:

- conducting assessments to identify and remediate any potential soil contamination on project lands
- recontouring the facility sites and pipeline right-of-way
- removing drainage structures (e.g., culverts)
- replacing stored subsoil, topsoil and strippings windrows
- decompacting the soil
- allowing either natural revegetation or seeding with an appropriate seed mix, depending on land use of the surrounding area and recommendations by the appropriate regulatory authorities

For the buried pipeline, one of the following two scenarios might occur at the time of abandonment:

- abandonment-in-place
- a combination of abandonment-in-place and pipeline removal

These methods would be considered in light of conditions and regulatory requirements relevant at the time of abandonment. The physical activities associated with pipeline abandonment are expected to include:

- purging and cleaning pipeline contents with nitrogen-propelled pigs
- physically separating the pipeline from any in-service pipeline as well as cutting, capping and sealing it below grade
- reclaiming any land disturbed as a result of physical activities

If the TMPL system permanently ceases operations at some point in the future, Trans Mountain will file an application with the NEB. Abandonment will be conducted in accordance with the legislation and requirements in place at the time of the application.

A Preliminary Abandonment Plan will be developed for the project in accordance with the NEB's *Filing Manual* requirements and will form a part of the Section 52 application to the NEB. Any abandonment activities will require approval by the NEB.