FORTISBC

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December 14, 2007

FORTISBC INC.
OTR PROJECT CPCN EXHIBIT B-1-1

Via Email
Original via mail

Ms. Erica M. Hamilton
Commission Secretary
BC Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC V6Z 2N3

Dear Ms. Hamilton:

Re: An Application for a Certificate of Public Convenience and Necessity for the Okanagan Transmission Reinforcement Project

Please find enclosed for filing 20 copies of FortisBC Inc.'s Application for a Certificate of Public Convenience and Necessity for the Okanagan Transmission Reinforcement Project pursuant to Sections 45 and 46 of the Utilities Commission Act.

Sincerely,

David Bennett
Vice President, Regulatory Affairs
and General Counsel

FortisBC Inc.

OKANAGAN TRANSMISSION REINFORCEMENT PROJECT

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EXECUTIVE SUMMARY

The Okanagan Transmission Reinforcement Project (OTR Project) is required to address three primary needs. It will accommodate load growth in the Penticton area, provide full supply to Kelowna under normal and single-contingency conditions, and enhance double-contingency reliability for the Kelowna area. This reliability standard was recognized by the Commission as appropriate for Kelowna in its Decision issued concurrently with Order G-52-05.

The FortisBC Okanagan service area is supplied by two major interconnections with British Columbia Transmission Corporation (BCTC), from Vernon in the north Okanagan, and Vaseux Lake Terminal station in the south Okanagan, as well as a smaller transmission connection from the east connecting to the FortisBC Kootenay generation area.

The primary limitations of the Kelowna-Penticton system network are the following:

1. Capacity limitations at BCTC's Vernon Terminal to supply FortisBC areas during peak load periods;
2. South-to-North (Vaseux Lake-Penticton-Kelowna) transmission capacity limitations and bottleneck at Penticton due to overloading of RG Anderson Transformer 1 and Transformer 2;
3. Capacity limitations of the 161 kV, Vaseux Lake - RG Anderson Transmission 76 Line; and
4. Unavailability of Reactive Compensation facilities in the Okanagan System Network.

In 2005 FortisBC commissioned the Vaseux Lake Terminal station near Oliver as part of the South Okanagan Supply Reinforcement Project (SOK Project) to improve the power supply to the Okanagan Region. The new station provided for a second BCTC/BC Hydro source of supply, partially eliminating the area's power supply constraints thus improving system security and reliability. The SOK Project was approved on the basis that it resulted in a net provincial benefit and was the first of a two-stage development identified in the Okanagan System Impact Studies (FortisBC - October 2002) filed in support of the SOK Project. The second stage of the development is the subject of this Application, the OTR Project.

The OTR Project is comprised of a number of new and upgraded facilities that will result in a complete 230 kV transmission system between Kelowna and Oliver to alleviate system constraints, and to serve the growing load and enhance reliability in the Okanagan.

The OTR Project principal elements are:

- Modifying the BCTC and FortisBC portions of Vaseux Lake Terminal station to facilitate the conversion from 161 kV to 230 kV;
- 28 kilometres of two new parallel (double circuit) 230 kV transmission lines (75 Line/76 Line) from the Vaseux Lake Terminal station north of Oliver to RG Anderson Terminal station on the east side of Penticton;
- Replacing 11 kilometres of 161 kV line with 230 kV (40 Line) from the Vaseux Lake Terminal station to the new Bentley Terminal station;
- A new Bentley Terminal station in Oliver, which will connect to the new 230 kV line as well as existing lines including 11 Line (161 kV) from Warfield, 43 Line (138 kV) to Princeton as well as area 63 kV sub-transmission lines;
- Installation of capacitor banks at both the FA Lee and DG Bell Terminal stations in Kelowna; and
- The conversion of Oliver Terminal station to a distribution substation.

The OTR Project was referred to in the BCTC 2006 South Interior Bulk System Development Plan as well. The OTR Project, combined with BCTC planned transformer upgrades at the Selkirk Substation, will also help address current short-term capacity shortfalls within the BCTC transmission system, resulting in a provincial grid benefit, in addition to resolving the system limitations. The OTR Project is supportive of the 2007 BC Energy Plan, in particular the objective of “Ensuring a Reliable Transmission Network”.

The OTR Project, as proposed, uses the existing corridor between Penticton, Vaseux Lake and Oliver and is described as line route option 1, which has two alternatives (1A and 1B) using different pole configurations. Alternative 1A is constructed using primarily a single steel pole double circuit configuration, and Alternative 1B is constructed using primarily a double circuit H-frame configuration, at a lower cost than Alternative 1A. FortisBC acknowledges that a portion of this route, though situated on an existing transmission corridor, is a concern of some residents with regard to the effect on property values, EMF levels, and aesthetics. FortisBC’s analysis of these factors can be found in section 4 of the Application.

FortisBC also evaluated an alternative, greenfield transmission route to be constructed on new rights-of-way on a higher elevation route between Shuttleworth Creek and RG Anderson Terminal station in Penticton, using either a single pole double circuit (Alternative 2A) or a two-pole configuration (Alternative 2B), and lastly, Alternative 3, which has a single-circuit steel pole H-frame configuration on each of the existing and upland corridors, permitting the use of shorter poles compared to Alternatives 1 and 2. Each of the Alternatives 2A, 2B, and 3 is more costly than Alternatives 1A and 1B

FortisBC’s objective is to put forward a project solution that best balances safety, the environment, social and economic impacts, constructability, long term operations and customer rates. This approach is consistent with the Commission’s recent decisions ensuring projects are the most cost effective but not necessarily the least cost. FortisBC also considered previous Commission determinations regarding the use of existing corridors and avoidance of new greenfield utility infrastructure and the absence of significant incremental impacts on property values over the long term, and believes that the OTR Project, as proposed in Alternative 1A, best satisfies the broader public interest.

In addition to the OTR Proposed Project Solution, FortisBC investigated four supply options along with a “Do Nothing” option. These options include: East-West

Transmission Reinforcement; North-South Transmission Reinforcement; Westbank 230 kV BCTC Inter-Tie; and Local Gas Fired Generation in the Kelowna area. These supply options were rejected for a number of reasons including cost and schedule considerations.

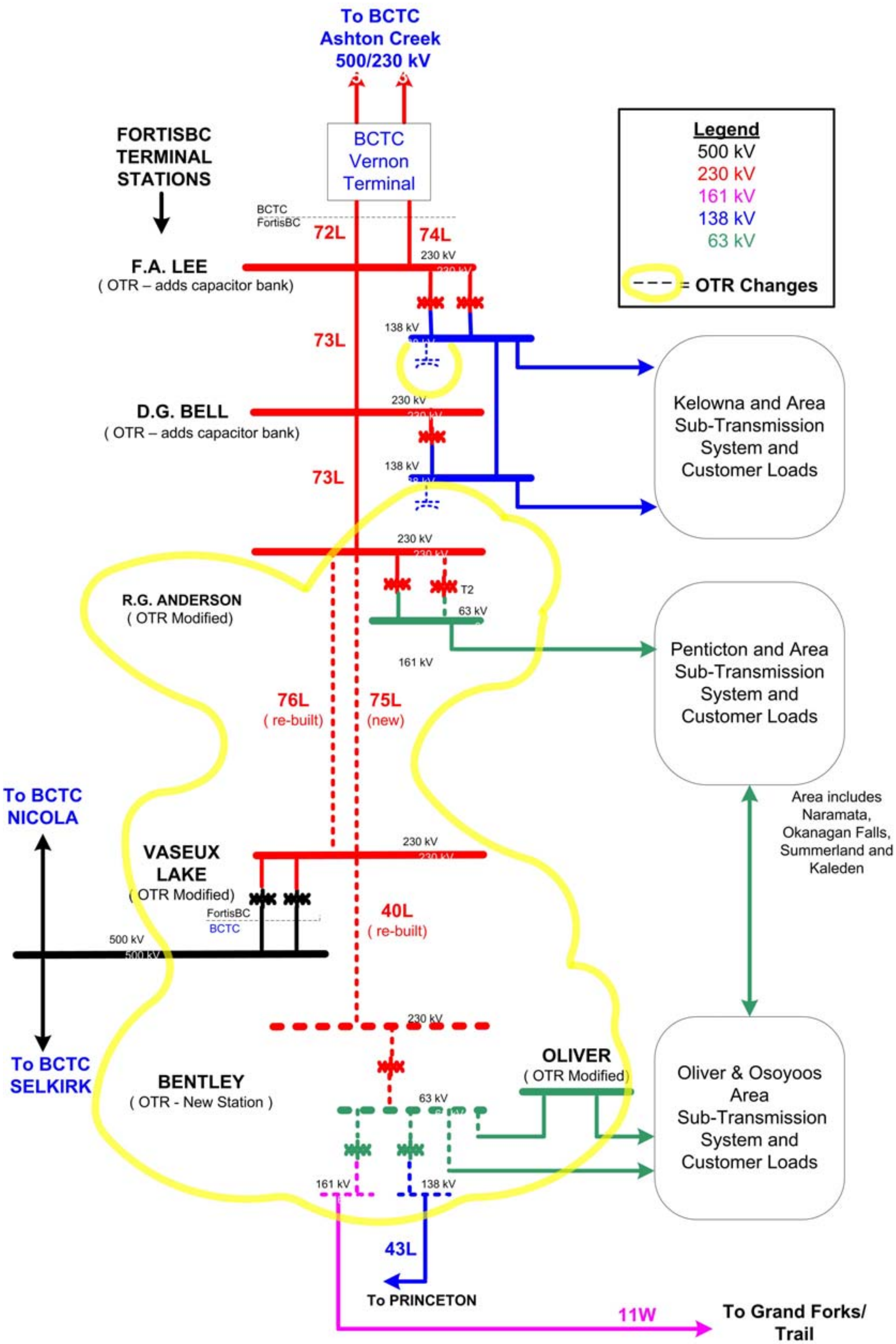
The OTR Project components were presented on a conceptual basis in the 2005-2024 System Development Plan and the 2007-2008 Capital Expenditure Plan. The Project components have been refined to a preliminary engineering estimate of $141.4 million.

The major project milestones are as follows:

Project Approval	Third Quarter 2008
Bentley Terminal Station construction	2009/10
New transmission line construction	2009/10
Vaseux Lake Terminal Station changes	2009/10
Oliver Terminal Station changes	2010
RG Anderson Terminal Station changes	2010
Energize 230 kV lines and new or modified stations	Fourth Quarter 2010
DG Bell and FA Lee Capacitor Bank modifications	Fourth Quarter 2010

A simplified diagram of the South Okanagan Transmission System, with the proposed OTR Project elements identified, is shown in Figure 4-1 below.

Figure 4-1: Proposed Okanagan Region Transmission System Post OTR Project



The OTR Project development stage commenced in September 2006 with the signing of an Engineering, Procurement, and Construction (EPC) contract with BC Hydro as a continuation of the successful working relationship that began with the engineering and construction of the Vaseux Lake Terminal station to provide a 500 kV interconnection with the BCTC grid as part of the SOK Project.

The Company has undertaken extensive public consultation relating to the Project. The formal public consultation process began in March 2007 with the first series of open houses in Oliver, Okanagan Falls and Penticton. A second series of open houses, in the same locations, followed in May 2007 along with formal and informal meetings with various levels of government, business and environmental organizations, other stakeholders and First Nations.

The Cities of Penticton and Kelowna, the Town of Oliver, the District of Summerland, the Regional Districts of Okanagan Similkameen and Central Okanagan as well as the Penticton and Kelowna Chambers of Commerce have recognized the need for the OTR Project in conjunction with the associated costs. These parties either directly or indirectly represent approximately two thirds of FortisBC direct or indirect customers. Correspondence has also been received from the Ministry of Environment, the British Columbia Integrated Land Management Bureau, the Penticton and Osoyoos Indian Bands and Okanagan Nation Alliance supporting and encouraging the use of the existing corridor. This and other OTR Project correspondence can be found in Appendix A.

In conclusion, the OTR Project is necessary to meet load growth and to provide the level of reliability that is necessary in the Penticton and Kelowna areas. The Company is of the opinion that doing nothing is not a viable option and is therefore not prudent. Presently as a result of a bottleneck in the Penticton area there is insufficient available transmission capacity to meet the Kelowna and Penticton area load if certain critical elements are lost. In addition, over the past 10 years, the Kelowna area has experienced on average one or two blackouts per year due to a loss of supply from the north. There was then insufficient capacity from the south to supply the Kelowna area.

As load growth continues in the Okanagan region the risk and frequency of blackouts will likely grow and will begin to encompass a larger area.

The Company evaluated several possible solutions including the proposed OTR Project, three transmission options and one local generation option. This analysis was undertaken in order to confirm the findings of the 2002 Okanagan System Impact Studies which identified the OTR Project as the second stage (following the SOK Project) of the two stage development to improve system security and reliability in the Okanagan area.

With respect to the specific elements of the proposed OTR Project, the Company also evaluated various transmission routes and structure configurations and determined that using the existing right-of-way with a 30 metre high single steel pole double-circuit configuration (Alternative 1A) is the best balanced solution in terms of overall effectiveness, regardless of the in-service date.

The Company is of the opinion that an in-service date of 2010, which is achievable for Alternative 1A, is required in order to address the three primary drivers. Any deferral of the Project, in addition to exposing customers to deteriorating reliability, may cause cost increases due to the high material and contractor inflation rates currently being experienced in the construction industry. The Company believes that deferring this Project would not be in the best interest of FortisBC customers.

LIST OF ABBREVIATIONS

2005 SDP	2005-2024 System Development Plan
AFUDC	Allowance for Funds used During Construction
AIA	Archeological Impact Assessment
APPE	Adjusted Power Purchase Expense
ASCR	Aluminum Conductor Steel Reinforced
BCH	BC Hydro
BCTC	British Columbia Transmission Corporation
BCUC	British Columbia Utilities Commission
Bentley	Bentley Terminal Station
CCA	Capital Cost Allowance
CEA	Canadian Electrical Association
CEAA	Canadian Environmental Assessment Act
CIAC	Contribution in Aid of Construction
COFAHVOL	Citizens of Okanagan Falls Against High Voltage Overhead Lines
Commission	British Columbia Utilities Commission
CPCN	Certificate of Public Convenience and Necessity
CSA	Canadian Standards Association
Cu	Copper
CWIP	Construction Work in Progress
DSM	Demand Side Management
DFO	Department of Fisheries and Oceans
DG Bell	DG Bell Terminal Station
EF	Electric Field
EMF	Electric Magnetic Field
EMP	Environmental Management Plan
EH&S	Environment, Health and Safety
EPC	Engineering, Procurement and Construction
ESDP	Electric System Development Plan
ESIA	Environmental and Social Impact Assessment
FA Lee	FA Lee Terminal Station
FO	Forced Outage
GOLB	Gang Operated Load Break (switch)
GWh	Giga Watt hour
HADD	Harmful, Alteration, Disruption or Destruction of Fish Habitat
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ILMB	Integrated Land Management Bureau
INAC	Indian and Northern Affairs Canada
kcmil	Thousand Circular Mil (wire size; formerly MCM)
kV	kilo Volt
kVA	kilo Volt Amp
LRMP	Land and Resource Management Plan
LTC	Load Tap Changer
MF	Magnetic Field
MOD	Motor Operated Disconnect
MVA	Mega Volt Amp

Mvar	Mega Volt Ampere Reactive
MW	Mega Watt
NBV	Net Book Value
NFPA	National Fire Protection Association
Nicola	Nicola Terminal Station
N-0	Normal Operating Conditions
NPV	Net Present Value
O&M	Operating and Maintenance
OCB	Oil Circuit Breaker
OIB	Osoyoos Indian Band
Oliver	Oliver Terminal Station
ONA	Okanagan Nation Alliance
OTR	Okanagan Transmission Reinforcement
PIB	Penticton Indian Band
Q1	First Quarter
Q2	Second Quarter
Q3	Third Quarter
Q4	Fourth Quarter
RAS	Remedial Action Schemes
RDOS	Regional District of Okanagan Similkameen
RDCO	Regional District of Central Okanagan
RG Anderson	RG Anderson Terminal Station
RoW	Right-of-Way
SAR	Species at Risk
SCADA	System Control and Data Acquisition
SCC	System Control Centre
SDP	System Development Plan
SOFAR	South Okanagan for Alternate Route
SOK	South Okanagan Reinforcement
SOSCP	South Okanagan Similkameen Conservation Program
SOSIPS	South Okanagan Similkameen Invasive Plant Society
SRP	Supply Reinforcement Project
SVC	Static VAR Compensator
T&D	Transmission and Distribution
TBD	To Be Determined
TDG	Transportation of Dangerous Goods Act
UCC	Undepreciated Capital Cost
UPLAND	High Elevation Route
VAC	Volts Alternating Current
var	Volt-Ampere Reactive
Vaseux	Vaseux Lake Terminal Station
WAN	Wide Area Network
Warfield	Warfield Terminal Station
Westbank	BCTC’s Westbank Substation
WHMIS	Workplace Hazardous Materials Information System
YTD	Year-to-Date

GLOSSARY

ACSR Conductors - An electrical conductor made of interwoven aluminum wires with steel wires in the core of the bundle for mechanical strength, used as a transmission or distribution line conductor. Stands for "aluminum conductor steel reinforced".

British Columbia Transmission Corporation (BCTC) – A provincial Crown corporation, formed in May 2003, responsible for managing, operating, planning and maintaining most of the provincial electrical power transmission system and its interconnections with the larger North American grid.

British Columbia Utilities Commission (Commission) – The British Columbia Utilities Commission is an independent regulatory agency of the Provincial Government that operates under and administers the *Utilities Commission Act.* The Commission's primary responsibility is the regulation of British Columbia's natural gas and electricity utilities to ensure that the rates charged for energy are fair, just and reasonable, and that utilities provide safe, adequate and secure service to their customers.

Bulk transmission – Transmission equipment that is used to transport large amounts of electrical power, typically between generating, terminal or switching stations.

Bus - A conductor, which may be a solid bar or pipe, normally made of aluminum or copper, used to connect one or more circuits to a common interface. An example would be the bus used to connect a substation transformer to the outgoing circuits

Bus split – a bus that is split by a circuit breaker or other switch.

Bus-tie (or bus-coupler) circuit breaker – A circuit breaker connecting two buses.

Compact bus design – Bus design in a substation that minimizes space needed for the circuit breakers, switches and bus.

Digital elevation modeling - A computer model of land survey information that allows the use of computer aided design tools for transmission lines.

Distribution – In FortisBC, high voltage equipment energized at 35 kV or below.

Double contingency security - A power system is able or secure enough to continue to supply customer load even in the event of the loss of two major transmission components.

Dynamic reactive compensation facility - A device that supplies or consumes variable amounts reactive power. It is shunt-connected on transmission lines to provide reactive power compensation.

Electric Magnetic Field (EMF) – The electric and magnetic fields that exist wherever energized electrical equipment or appliances are located. The electric fields are associated with voltage; and the magnetic fields are associated with the amount of current being used.

Emergency Loading Limits – Extreme maximum loading on an electrical device for short durations under emergency conditions. The heating or other stress on the device during such loading will typically reduce some of the remaining service life of the unit.

Environmental Management Plan (EMP) – A management plan developed to reduce the environmental risks and mitigate the impacts of a project. It includes items such as identifying the appropriate scheduling for the work as well as work procedures to minimize or avoid environmental harm.

Environmental and Social Impact Assessment (ESIA) - A study to identify the environmental and socio-economic resources associated with a project and predicted the impact of the project on those same resources.

kcmil – A cmil is the area of a circle with a diameter of one mil (1/1000 inch), used to describe the cross-sectional area of a conductor. One cmil equals approximately 0.0000008 square inches, a kcmil is 1,000 cmils.

kV - A kilovolt (kV) is 1,000 volts. A volt is unit of electromotive force defined as the electrical potential needed to produce one ampere of current with a resistance of one ohm.

MW – Mega watt = One million watts (see “Real Power”).

Mvar - One million vars (see “Reactive Power”).

Mega Volt-Amp (MVA) Electrical capacity or electrical load, expressed as Volts x Amps. Volt Ampere rating designates the output which a transformer can deliver at rated voltage and frequency without exceeding a specified temperature rise. Also referred to as "apparent power". An MVA is 1,000,000 VA.

N-0 – All major elements of the power system are required to be in service to avoid a load loss (customer outage).

N-1 Outage of a single element with all other elements of the power system in service (a single transmission line, transformer, generating unit, power conditioning unit like a shunt capacitor bank, a shunt reactor bank, a series capacitor, a series reactor, etc.) with no load loss. This is a normal bulk transmission system design criteria.

N-1-1 - Outage of an element of a power system during the prior outage of another element e.g. the outage of a transmission line while another transmission line is already out for maintenance with no load loss. This typically is a transmission system design criteria used for a major urban centre.

N-2 - Simultaneous outage of two elements of a power system e.g. the simultaneous outage of both circuits of a double circuit transmission line or outage of two single circuit transmission lines on a common right of way due to outage events like lightning. This is a transmission system design criteria also used for a major urban centre with the difference from N-1-1 being the size of the sudden, or transient change in the supply capacity that the system must be able to ride through with no customer load loss.

Power wheeling - The use of the transmission facilities of one system to transmit power and energy by agreement of, and for, another system generally with a corresponding wheeling charge.

Reactive power - A component of apparent power (volt-amps) which does not produce any real power (watts) transfer. It is proportional to the sine of the phase angle between the current and the voltage and is measured in vars (volt-amps reactive).

Real power - A component of apparent power (volt-amps) which is capable of performing real work. It is measured in Watts.

Remedial Action Scheme (RAS) – An automatic system that reacts to disconnect load or generation to balance the electric system, typically after an unplanned outage of a transmission line or a generator. As the power system load and generation must always be balanced, these schemes help prevent system wide collapses (blackouts).

Rendering – computer-generated imagery overlaid on photographic images that gives a simulated representation of an installation or location.

Ring-bus configuration – A Bus configured in a ring to allow a circuit breaker or device to be removed from service while power can flow the other direction around the ring to maintain service.

Single contingency security – A power system is able or secure enough to continue to supply customer load even in the event of the loss of one major transmission component.

Static VAR Compensator (or SVC)- Is an electrical device for providing fast-acting reactive power compensation to regulate voltage within the prescribed limits voltage and contribute to steady-state stability on high-voltage electricity transmission networks. The term "static" refers to the fact that the SVC has no moving parts other than circuit breakers and disconnects. The dynamic nature of the SVC lies in the use of thyristors which can switch capacitors or inductors in and out of the circuit on a per-cycle basis, allowing for very fast and fine control of system voltage.

Step-down / step-up transformer - A power transformer that converts from one voltage level to another, referred to as “stepping up” or stepping down” the voltage.

Substation – In FortisBC, a site that provides transformation from a transmission-level voltage to a distribution-level voltage.

Subtransmission – transmission level equipment (lines or transformers) that typically is used to provide a supply source only for distribution substations (i.e. not part of the bulk transmission system).

Switching station - In FortisBC, a site that provides switching or fault protection for transmission lines. No transformation is installed.

Terminal Station – In FortisBC, a site that provides transformation from one transmission-level voltage to another transmission-level voltage.

Terrestrial Habitat – the land environment used by animals and plants.

Transmission – in FortisBC, all electrical equipment energized at a voltage of 63 kV or higher.

Transformer Tertiary winding - A power transformer typically has two windings (a primary and secondary) to convert from one voltage level to another. Some transformers are equipped with a third (tertiary) winding for harmonic control or to provide a third lower voltage supply that is usually a fraction of the main winding's capacity.

var - A var is a component of apparent power (volt-amps) which does not produce any real power (watts) transfer. It is proportional to the sine of the phase angle between the current and the voltage.

Okanagan Transmission Reinforcement Project

(OTR Project)

Section 1: The Application

FortisBC Inc.

1.0 THE APPLICATION

FortisBC Inc. ("FortisBC" or the "Company") hereby applies to the British Columbia Utilities Commission, (the "Commission" or "BCUC") pursuant to Sections 45 and 46 of the Utilities Commission Act, for a Certificate of Public Convenience and Necessity (CPCN) for the Okanagan Transmission Reinforcement Project (OTR Project). In its 2007-2008 Capital Expenditure Plan (2007/08 Capital Plan), the Company proposed a CPCN process for the OTR Project. This Application is filed pursuant to Commission Order G-147-06 approving the 2007/08 Capital Plan.

As described in section 7 of the Application, a number of other approvals and/or permits are required. FortisBC anticipates that a CPCN for the OTR Project will be granted subject to receipt of the necessary regulatory approvals and permits.

For the purposes of this Application, British Columbia Transmission Corporation (BCTC) is the neighbouring utility with respect to the FortisBC interconnections to the provincially-owned transmission grid. While BC Hydro is the owner of these assets, BCTC is the provincial Crown corporation responsible for planning, constructing, maintaining and obtaining all regulatory approvals for investments in the transmission system. As well, BCTC is responsible for entering into commitments and incurring expenditures for capital investments in the transmission system.

1.1 STRUCTURE OF THE APPLICATION

Section 2 provides the financial and technical capacity and contact information for the OTR Project. Section 3 describes the need for the OTR Project, the FortisBC transmission system in the Okanagan, and the benefits of the OTR Project upon completion. Section 4 provides a detailed description of the OTR Project and an examination of various transmission line alternatives. Section 5 provides the OTR Project cost and schedule, risks to project completion, and contingency plans for possible project delays. Section 6 provides an analysis of other supply options considered. Section 7 summarizes other approvals and permits that will be required for the OTR Project, and section 8 describes the public consultation process.

1.2 PROJECT OVERVIEW

The OTR Project is comprised of a number of new and upgraded facilities that will result in a complete 230 kV transmission system between Kelowna and Oliver to alleviate system constraints, enhance reliability, and serve emerging load in the Okanagan.

Throughout the Okanagan region of FortisBC's service territory, supply constraints and emerging load growth are increasing the risk of outages to customers. The need for a supply capacity and reliability solution for the Okanagan is driven by strong load growth over the past five years which is forecast to continue. The proposed OTR Project will strengthen the capacity to move power supplied from the interconnections with the BCTC system to loads within the Okanagan and restore N-0 and N-1 reliability, which has been eroded through growth.

1.3 SUPPORT FOR THE OTR PROJECT

FortisBC undertook a comprehensive public consultation program for the OTR Project. This included a number of formal and informal meetings with various levels of government, business organizations, other stakeholders and First Nations, to ensure that all interested parties had the opportunity to review the OTR Project plan and provide feedback prior to FortisBC filing a CPCN Application. The consultation process was both iterative and responsive. A number of issues were brought forward through these discussions, leading to the identification and evaluation of alternatives for consideration by the OTR Project team. The most notable are modifications to transmission line design and evaluation of alternate upland transmission routes, both of which are described in section 4.

FortisBC has received letters in support of the OTR Project from various levels of government and stakeholder groups which are attached as Appendix A. Most of the stakeholders agree with the need to resolve the supply or reliability issues that are addressed by the OTR Project. The single greatest issue of concern is the appropriate route for the double circuit 230 kV transmission line segment between the Vaseux Lake Terminal station near Oliver and the RG Anderson Terminal station in Penticton.

The OTR Project proposes that the 28 kilometre line remain on the existing right-of-way (established in 1965) along the east side of Skaha Lake, where it crosses 2 kilometres of farm acreage in the Shuttleworth Creek area and approximately 2 kilometres of vineyards and the Heritage Hills residential area south of Penticton. The remaining 24 kilometres are a combination of private and Crown land. This route is preferred because it is the most cost effective and has the least environmental impact of the routes considered.

In response to concerns of residents along the existing right-of-way, FortisBC investigated the feasibility of a higher elevation transmission line route (Upland route) for approximately 20 kilometres between Shuttleworth Creek and Penticton. The Upland route was determined to be a viable technical alternative to the existing right-of-way but is not a recommended route based on environmental, technical and cost considerations.

1.4 Prior Commission Decisions

The Commission has addressed a number of issues relevant to the review of the OTR Project in earlier proceedings. In this section of the Application, FortisBC identifies portions of certain Decisions that are relevant to the OTR Project.

Specifically, FortisBC believes that the OTR Project is consistent with the Commission decisions in respect to the issues identified below.

1.4.1 Cost Effectiveness

The Commission has stated on a number of occasions that, in considering public convenience and necessity the task is not to select the *"least cost"* project but to select the "*most cost effective"* project. (Vancouver Island Generation Project - VIGP, Decision pages 74-77, Vancouver Island Transmission Reinforcement - VITR Decision, page 15; Naramata Substation Project Decision, pages 7-10)

The principal distinction between a least-cost and a most cost-effective assessment is the scope of considerations that are relevant. Least-cost only considers the price of a project. Most cost-effective includes broader consideration of a project's characteristics in addition to price, and may include: safety, reliability, schedule, financing arrangements, the cost to ratepayers, the impact on the financial capability of the utility, and other impacts. (VIGP Decision, page 77; VITR Decision, page 15)

FortisBC considers both financial and non-financial factors in this Application and is proposing a project that is believed to be the most cost effective of the alternatives considered.

1.4.2 Electric and Magnetic Fields (EMF)

In the VITR Decision the Commission concluded, at page 70:

> *"[T]he EMF exposure guidelines established by organizations such as the World Health Organization, ICNIRP, and Health Canada provide a relevant and useful reference point for considering the safety of EMF levels from existing transmission lines and the proposed VITR."*

The Commission found in VITR that the EMF levels of the existing and proposed transmission lines were below these guidelines, and that this was sufficient compliance despite the concerns of private interests living near the transmission line:

> *"The Commission Panel acknowledges that the EMF-related health concerns described by Intervenors living near the existing transmission line may be causing stress and anxiety in some residents, but concludes that the science does not support their fears. … **In the absence of convincing new evidence that indicates that change is warranted and/or imminent, the***

> ***Commission Panel concludes that it should not impose lower EMF exposure standards on VITR.*"** (page 71)

Similarly, The OTR Project, as proposed, will be compliant with these exposure guidelines and will, in fact, present lower EMF levels at the edge of the right-of-way.

1.4.3 Property Values

In the VITR Decision the Commission concluded that the VITR would not have a significant impact on average property values over the long term, and that any impact over the short term should be afforded little weight, because the proposal involved the use and upgrade of an existing right of way and transmission line:

> *"VITR does not involve the addition of a transmission line in an area where there is currently no line, but instead involves the replacement of an existing line. Because all but one of the Tsawwassen and Maracaibo property owners purchased their properties after the existing lines were installed, the current owners realized the benefit of the reduced cost of their properties when they purchased them. The Commission Panel also finds that any evidence that the properties owners were not informed purchasers is outweighed by the ROW agreements that are registered against their property titles."* (page 77)

This analysis applies to the preferred OTR route, which also uses an existing right-of-way.

1.4.4 Use of Existing Corridor

In the Naramata Substation Project Decision the Commission found that neither proposed site was an obvious choice over the other on the basis of the technical and qualitative evidence (page 42). The Commission Panel decided between the sites on the basis of the "*principle of maximum utilization of common utility corridors*", stating, at page 43:

> *"The Commission Panel is reluctant to establish a new utility corridor when an existing and well established corridor can be utilized."*

The OTR Project can be fully constructed on existing brownfield transmission corridors without the need to impact greenfield area, and can satisfy the principle of maximum utilization of existing corridors.

1.5 BC Energy Plan

The 2007 Energy Plan, under the heading "Ensuring a Reliable Transmission Network" states:

> *"An important part of meeting the goal of self-sufficiency is ensuring a reliable transmission infrastructure is in place as additional power is brought on line. Transmission is a critical part of the solution as often new clean sources of electricity are located away from where the demand is. In addition, transmission investment is required to support economic growth in the province and must be planned and started in anticipation of future electricity needs given the long lead times required for transmission development. New and upgraded transmission infrastructure will be required to avoid congestion and to efficiently move the electricity across the entire power grid. Because our transmission system is part of a much larger, interconnected grid, we need to work with other jurisdictions to maximize the benefit of interconnection, remain consistent with evolving North American reliability standards, and ensure British Columbia's infrastructure*

> *remains capable of meeting customer needs."* 2007 BC Energy Plan, page 10

The OTR Project is consistent with this objective of the 2007 BC Energy Plan in all respects, including support of economic growth, contributing to the efficiency of the provincial grid by reducing losses and eliminating congestion, and consistency with North American reliability standards.

1.6 COSTS AND SCHEDULE

The capital cost of the OTR Project is estimated at $141.4 million with an in-service date of November 2010.

BC Hydro Engineering Services, under the terms of an Engineering, Procurement, and Construction (EPC) contract, has been engaged as an independent contractor to perform project planning, engineering, procurement and construction management services. The overall OTR Project is the responsibility of the FortisBC OTR Project Manager, under the sponsorship of the Vice-President, Transmission and Distribution. Management of the OTR Project is described in Appendix B.

The OTR Project schedule is as follows:

Project Approval	Third Quarter 2008
Engineering for long lead equipment/materials	Third Quarter 2008
Right-of-way preparation begins	Third Quarter 2008
Bentley Terminal station construction	2009/10
New transmission line construction	2009/10
Vaseux Lake Terminal station changes	2009/10
Oliver Terminal station changes	2010
RG Anderson Terminal station changes	2010
Energize 230 kV lines and new or modified stations	Fourth Quarter 2010

DG Bell and FA Lee Capacitor Bank modifications	Fourth Quarter 2010

1.7 PROPOSED REGULATORY PROCESS

FortisBC proposes the following initial regulatory timetable for the OTR Project CPCN Application:

Commission Information Request No. 1 (IR1)	January 18, 2008
Intervenor Registration Deadline	February 1, 2008
FortisBC Response to Commission IR1	February 15, 2008
Pre-Hearing Conference	February 27, 2008

The Pre-Hearing Conference will refine the issues list for the Application and the subsequent regulatory schedule.

Okanagan Transmission Reinforcement Project

(OTR Project)

Section 2: The Applicant

FortisBC Inc.

2.0 THE APPLICANT

2.1 Name, Address, and Nature of Business

FortisBC Inc.
1975 Springfield Road, Suite 100
Kelowna, BC V1Y 7V7

FortisBC is an investor-owned, integrated utility engaged in the business of generation, transmission, distribution and sale of electricity in the southern interior of British Columbia. The Company serves approximately 152,000 customers directly and indirectly, and employs approximately 570 people. It was incorporated in 1897 and is regulated under the Utilities Commission Act of British Columbia.

2.2 Financial and Technical Capacity

FortisBC owns assets of approximately $750 million, including four hydroelectric generating plants with a combined capacity of 223 megawatts and approximately 6,750 kilometres of transmission and distribution power lines for the delivery of electricity to major load centers and customers in its service area. FortisBC has been engaged in the construction and operation of facilities of the type described in this Application since its inception in 1897.

FortisBC maintains a capital structure in the range of 60% debt to 40% equity. Accordingly, the Company plans to finance 60% of any incremental financing requirements as a result of this project via banks and/or capital markets. The 40% equity component will be provided by the Company’s Shareholder.

BC Hydro Engineering Services, under the terms of an Engineering, Procurement and Construction (EPC) contract, has been engaged as an independent contractor to perform planning, design, engineering, procurement, construction and construction management services. BC Hydro has been responsible for the planning, design and construction of generation, transmission and distribution facilities since 1962.

2.3 Contact Persons

Communications with respect to this Application should be directed to:

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Okanagan Transmission Reinforcement Project

(OTR Project)

Section 3: Project Justification

FortisBC Inc.

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3.0 PROJECT JUSTIFICATION

3.1 PROJECT NEED

3.1.1 Background

Throughout the Okanagan region of FortisBC's service territory, supply constraints and native load growth are increasing the risk of outages to customer load. In 2005, FortisBC commissioned a new terminal station at Vaseux Lake as part of the SOK Project, which provided a 500 kV source of supply from BCTC, supplementing the 230 kV supply from Vernon Terminal. Commission Order C-3-03 approved the SOK Project which also included modifications and upgrades to terminal stations in Warfield, Oliver, Grand Forks, and Penticton to enable meshed operation of the 11 Line / 40 Line paths for use in an integrated transmission system.

The SOK Project strengthened the Okanagan supply network and improved service to FortisBC's previously radial-supplied load in the Boundary and South Okanagan areas. It also identified a future need for facilities to alleviate the potential overloading of RG Anderson Transformer 2 during normal operating conditions by converting 40 Line from 161 kV to 230 kV, upgrading the Oliver substation to 230 kV and installing a 230 kV ring bus at RG Anderson Terminal station. This would remove the 161 - 63 - 230 kV step-down-step-up arrangement of RG Anderson Transformer 1 and Transformer 2 from the bulk transmission path, and eliminate the capacity bottleneck at that point. Installation of these facilities was forecast to begin in 2012, depending on the rate of area load growth. The Vaseux Lake Terminal station has been operated at 161 kV pending the voltage conversion from 161 kV to 230 kV between Penticton and Oliver.

In fact, Okanagan area load growth has outpaced the previous forecast resulting in the need to advance the second phase of the supply reinforcement initiative. The OTR Project will also resolve certain remaining supply limitations, which are described in section 3.1.2.3.

In summary, three primary requirements of the OTR Project need are:

1. To accommodate load growth in the Penticton area;

2. To provide full supply to Kelowna under normal and single-contingency conditions[1]; and
3. To enhance double-contingency reliability for the Kelowna area.

3.1.2 Load Growth and System Capacity Limitations

FortisBC serves approximately 100,000 customers in its Okanagan service area. Of the Company's direct customer base of approximately 66,600, approximately 87% are residential customers, a further 2.3% are irrigation and lighting customers, and the remainder are general service customers. FortisBC also supplies indirectly through its wholesale customers, the Cities of Kelowna and Penticton and the District of Summerland, approximately 34,200 additional customers. The composition of the customer base is summarized in the table below.

Table 3-1-2: Customers by Area and Rate Class

Customer Class	Oliver and Area	Penticton and Areas	Kelowna and Area	Total
Residential	11,055	6,232	41,119	58,406
Irrigation & Lighting	797	272	472	1,541
General Service & Others	1,624	643	4,356	6,623
FortisBC Direct Customers (*)	**13,476**	**7,147**	**45,947**	**66,570**
Indirect Customers	0	21,211	12,955	34,166
FortisBC Direct and Indirect Customers	**13,476**	**28,358**	**58,902**	**100,736**

(*) Customer count as of October 31, 2007

This represents about two thirds of FortisBC's direct and indirect customer base, which exceeds 152,000 in total.

[1] Definitions of contingency reliability criteria are found in Table 3-1-3-2.

3.1.2.1 Load Forecast

The need for supply capacity and reliability solutions for the Okanagan is driven by strong load growth over the past several years and forecast for the immediate future.

The population of the Central Okanagan and Okanagan/Similkameen areas has grown by 9% since 2002. This exceeds the provincial average by 4%. The number of business incorporations in the area has doubled since 2002 and is 40% higher than the provincial average.

Figure 3-1-2-1A below shows that the total load in the Okanagan region, served by the FA Lee and DG Bell Terminal stations in Kelowna, RG Anderson Terminal station in Penticton and the Oliver Terminal station, is expected to grow by 250 MVA or 50% within 20 years, at an average rate of 2.5% per year. Growth in the range of 4% per year is expected until 2011/12, beyond which the growth rate is forecast to ease slightly.

Figure 3-1-2-1A: FortisBC Okanagan Region Load Forecast

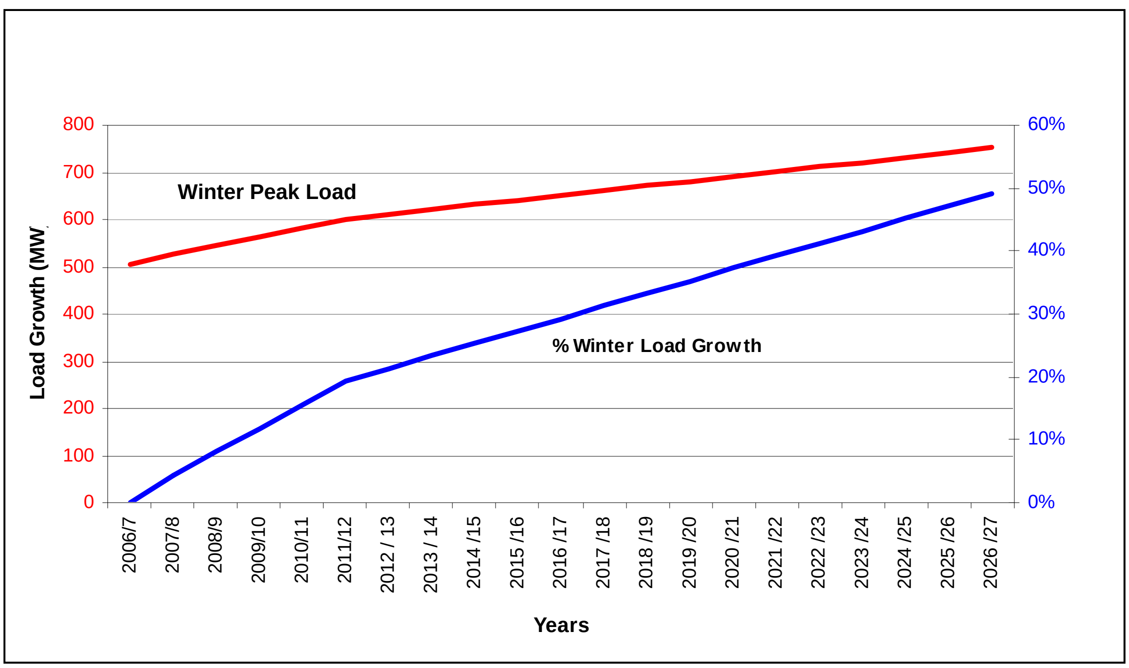
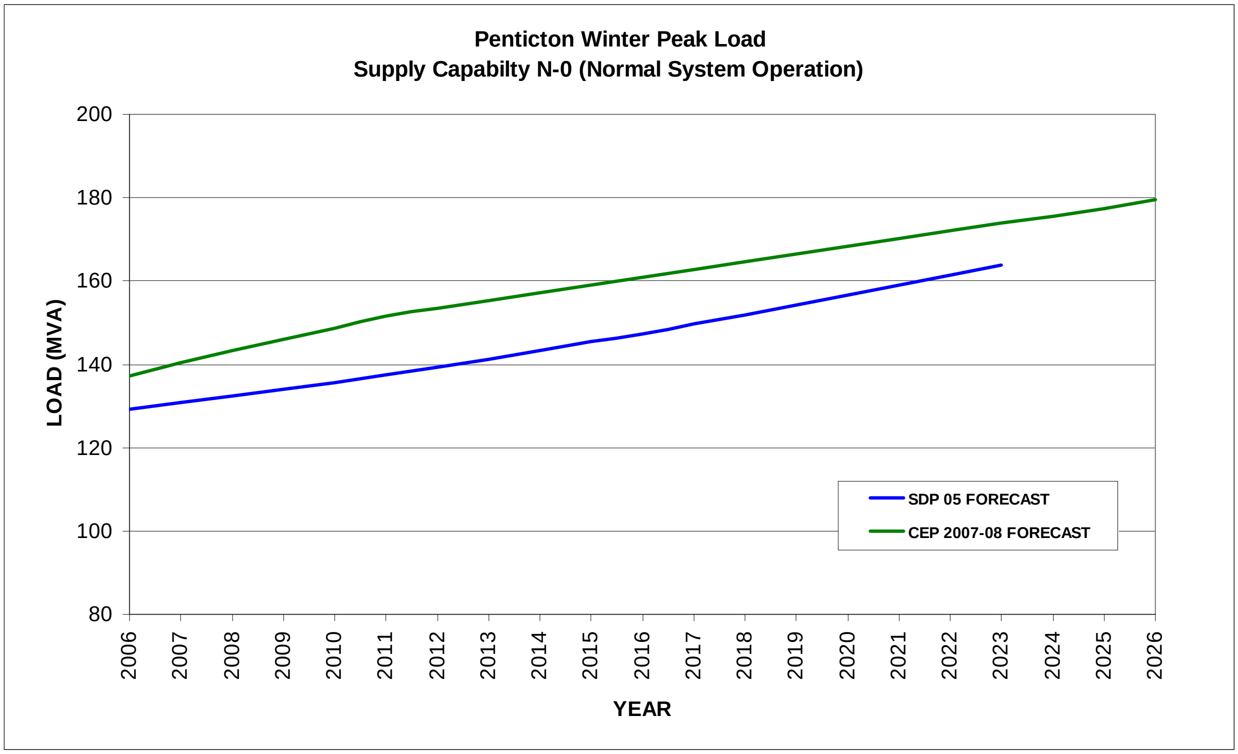


Figure 3-1-2-1B below shows the increase in relative load growth between the current 2007/08 System Development Plan Update and earlier 2005-2024 System Development Plan forecasts in the Penticton area.

Figure 3-1-2-1B: Winter Load Forecast for the Penticton area served by RG Anderson Terminal Station



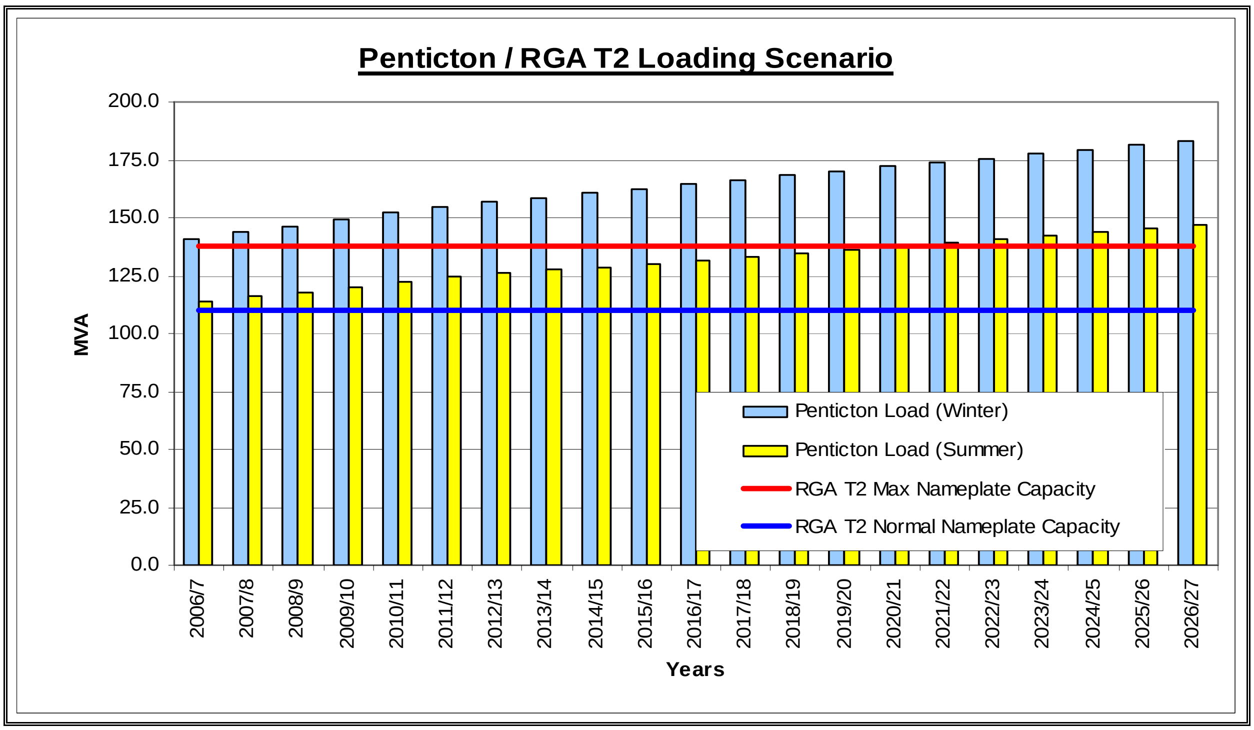
The current load forecast is higher than forecast in the 2005 SDP, which has resulted in an acceleration of the OTR Project timeline. As seen in Figure 3-1-2-1C the normal capacity[1] rating of RG Anderson Transformer 2 (110 MVA) has already been exceeded and the maximum capacity[2] limit has also been exceeded in 2006 under normal conditions with a system peak of 138.6 MVA, an occurrence that was previously forecast to occur in 2011. The load is being served by elevating the transformer to its short-time emergency rating, which is associated with the possibility of a reduction in equipment life. This situation of overload at peak times will increase in severity as the load continues to grow. System winter peak demand in the Kelowna-Penticton area overall is forecast to exceed system capacity, under normal operating conditions, by 2009.

[1] The FortisBC definition of transformer "normal capacity" is the single-stage fan cooled rating. This rating is used as a System Planning trigger. When the transformer reaches this load level, Planning studies for any required upgrades are initiated.
[2] The FortisBC definition of transformer "maximum capacity" is the second-stage fan cooled rating. This is the maximum continuous loading that will be allowed on the transformer for use in Planning studies.

RG Anderson Transformer 2 has reached its maximum capacity. The normal and maximum nameplate capacities of 110 MVA & 137.5 MVA were both surpassed, under normal system conditions, during the summer and winter peak of 2006/07 respectively. Load sharing between Transformer 1 and Transformer 2 could be achieved by opening the 63 kV bus at RG Anderson, This is not a practical option, since this would reduce the power supply network in the south Okanagan to a radial configuration (Transformer 1 is fed from 73 Line and Transformer 2 from 76 Line) and degrade the reliability of the system by exposing loads to interruption during single (N-1) contingencies.

Figure 3-1-2-1C below shows the present and projected peak loading relative to RG Anderson Transformer 2 nameplate capacity.

Figure 3-1-2-1C: Peak Loading on RG Anderson Transformer 2



3.1.2.2 Energy Supply Planning

FortisBC undertakes a comprehensive review of long-term energy supply options periodically, in order to ensure reliable and low cost electrical service for its customers. The most recent Resource Plan was undertaken in 2004 and accepted by the

Commission in Order G-52-05. The resource planning process considers, among other issues, the feasibility, from both a cost and social perspective, of various supply options. These options may include alternative supply sources or technologies in addition to load management measures. FortisBC has not identified any options or measures that could significantly impact the scope or timing of the OTR Project.

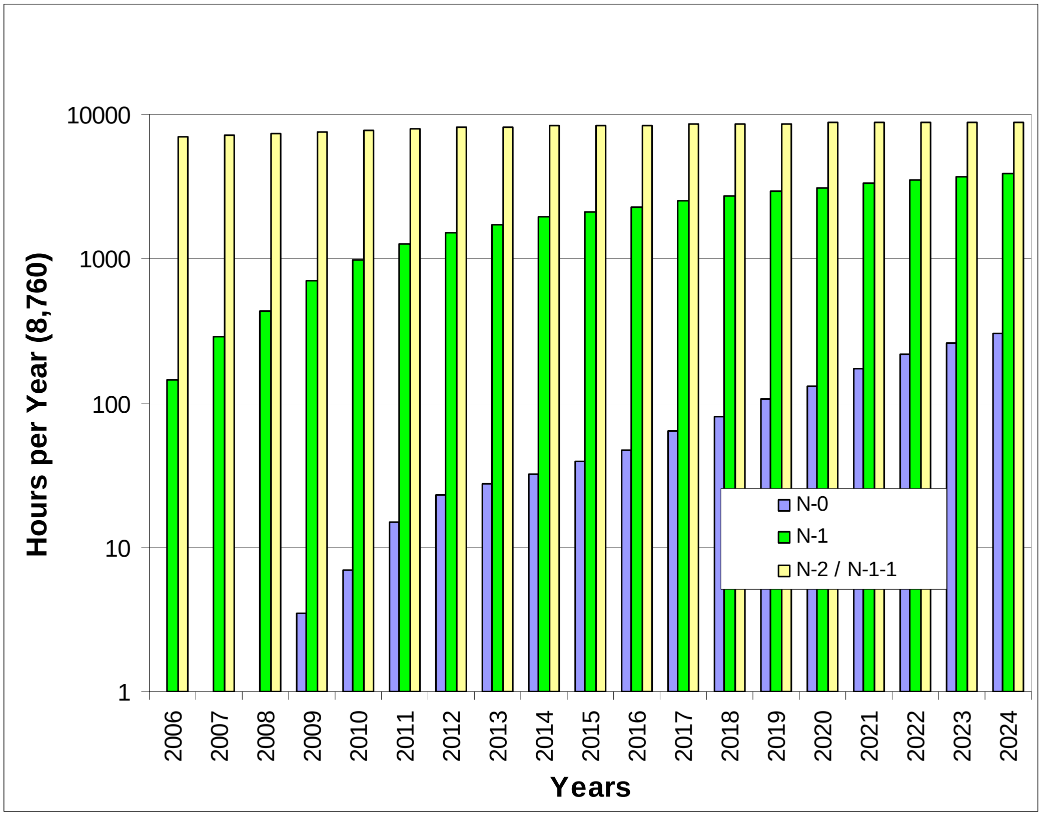
3.1.2.3 System Capacity Limitations

The result of the overloading of RG Anderson Transformer 2 shown in Figure 3-1-2-1C above, together with the limitations of the 161 kV 76 Line from Vaseux Lake to RG Anderson, which has a capacity of 170 MVA (summer)/204 MVA (winter), results in a bottleneck of transmission capacity between the two major interconnections with BCTC at Vernon Terminal and Vaseux Lake.

This bottleneck prevents optimum utilization of the two BCTC supply interconnections to maintain system security and supply customer load during single (N-1) and double (N-2 or N-1-1) contingency transmission outage events. For example, a double contingency such as the concurrent loss of 72 Line and 74 Line, which would require maximum power flow from the Vaseux to Penticton section (76 Line) of the transmission line, would then require the offloading of some portion of the Penticton load via 42 Line in order to minimize customer outages in Penticton and Kelowna.

In its present normal operating (N-0) configuration, the inability of the system to meet load could reach 300 hours annually by 2024, as shown in Figure 3-1-2-3 below, and customer outages during peak load periods may be unavoidable. As shown in the same figure, the inability of the system to meet the utility standard of N-1 reliability criterion could reach over 1,000 hours annually by 2011.

Figure 3-1-2-3: Load Hours per Year Exceeding System Capacity



RG Anderson Transformer 2 could be upgraded to restore N-1 capacity for Penticton, however 76 Line (204 MVA, winter capacity) would continue to be a bottleneck limiting N-1 capacity in the central Okanagan region.

Reconfiguration of RG Anderson Terminal station in conjunction with the conversion of 76 Line to 230 kV will complete the transmission backbone and alleviate the capacity bottleneck between Kelowna and Vaseux Lake by removing RG Anderson Transformer 2 from the transmission path.

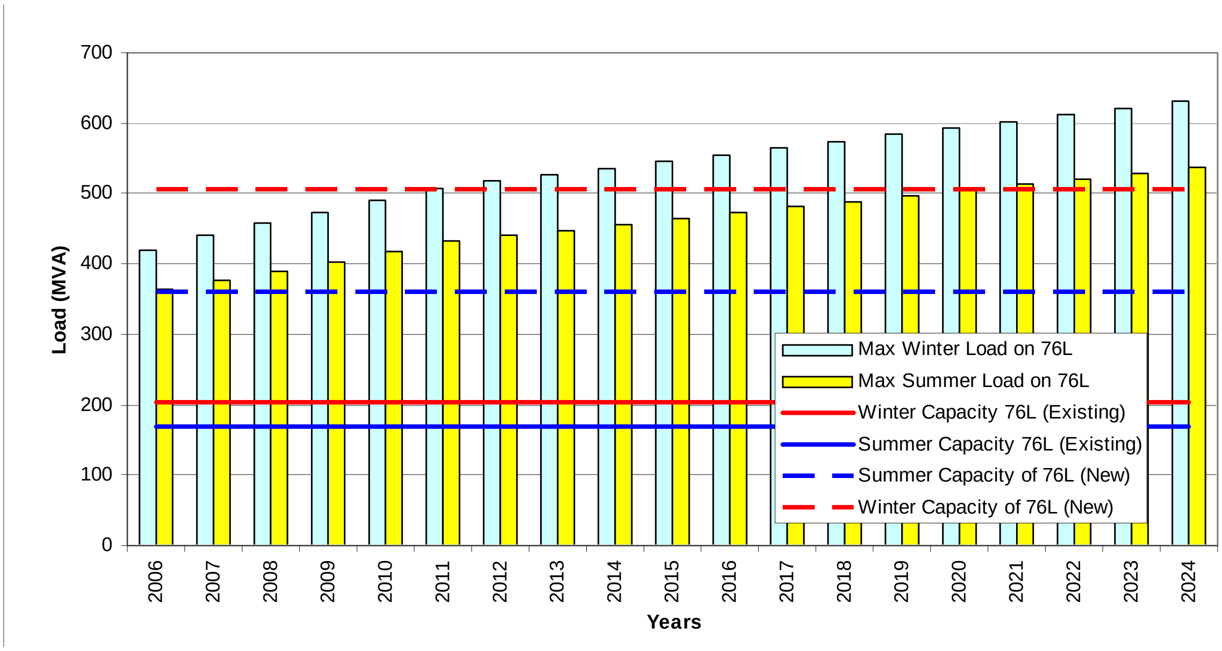
To alleviate the loading on RG Anderson Transformer 2 and create adequate power transmission capability, Vaseux Lake Terminal station needs to be upgraded to 230 kV operations along with a double circuit 230 kV connection between Vaseux Lake and RG Anderson Terminal stations with adequate reactive compensation in Kelowna.

Due to inadequate station expansion capability at the Oliver Terminal station, a new 230 kV substation (Bentley Terminal) is required along with transmission line upgrades.

3.1.2.4 Capacity and Reliability Constraints for a Single Circuit Option

Figure 3-1-2-4 below depicts the present and possible future capacity with a single circuit 76 Line configuration. The graph indicates the severe capacity constraint of the present transmission network and the possible constraints in near future for a single circuit upgraded transmission line whether 161 kV as at present, or 230 kV. The potential for a high capacity bundled conductor is also discussed below:

Figure 3-1-2-4: Vaseux-Penticton Transmission Capacity Limits and Requirement



3.1.2.4.a Capacity Constraints for a single Vaseux Lake-RG Anderson circuit option

The option of installing just a single circuit upgraded/new transmission line was investigated and rejected as inadequate to meet the combined Kelowna/ South Okanagan capacity requirement during a double contingency (N-2) event. Figure 3-1-2-4 shows winter and summer loading requirements under N-2 contingency, and winter and summer line capacity assuming 76 Line is (a) 161 kV, 477 kcmil conductor (the existing line), and (b) the proposed voltage and conductor, 230 kV, 795 kcmil (identified in the graph as “new”). In either case, a single circuit line, under N-2 contingency, failed to meet its summer loading requirement levels in 2007. Winter capacity requirements would be sufficient only through Project completion in 2010.

3.1.2.4.b Reliability Constraints for a single Vaseux Lake-RG Anderson circuit option

A single circuit line could be constructed that would be capable of meeting peak load over the planning horizon using high capacity (bundled, or in excess of 795 kcml) conductor, but this is not a recommended solution, primarily due to reliability considerations. Any single event leading to an outage on such a high capacity line will actually be equivalent to a double contingency (N-2) scenario in the proposed OTR solution (i.e., equivalent to simultaneous outages of the proposed 75 Line and 76 Line) in terms of capacity loss. A simultaneous outage of a second element (either 72 Line or 74 Line) will generate a real double contingency (N-2) and a virtual triple contingency (equivalent to the loss of three normal capacity 230 kV lines in the proposed OTR solution) which cannot be handled. Moreover, securing maintenance outages will also be challenging for these same reasons.

3.1.3 Reliability

3.1.3.1 Background

The Regional Districts of Central Okanagan and Okanagan Similkameen are home to more than 250,000 residents. Together, they are the most populated regions of the province outside the Lower Mainland and Capital regions.

The City of Kelowna and immediately surrounding region, with a population base of more than 120,000, is the largest city in the British Columbia interior. Apart from being ranked as the twenty-second largest metropolitan area in Canada, it has also become one of the fastest growing cities in North America.

Supporting such rapid growth requires a stable and secure power system infrastructure. However, based on the record of the past decade, the Kelowna area does not enjoy the reliability performance that would be expected for a large metropolitan area. From March 1997 to July 2007, there were 38 transmission related outages of which one third (14 or 37%) resulted in complete or partial black-outs in the Kelowna area with associated impacts. These incidents cumulatively affected more than a million customers over the period with customer-hour losses exceeding 200,000. The yearly average data (1997-2007) indicates that approximately 84,000 Kelowna customers are being affected by electricity transmission related outages with an approximate loss of 17,000 customer-hours each year. In June 2007, a single event resulted in a black-out of Kelowna that affected 70,000 customers and resulted in a loss of approximately 28,600 customer-hours. Based on historical data, the Kelowna area has averaged between one and two blackouts each year for the past ten years.

3.1.3.2 Reliability Criteria

Please refer to Table 3-1-3-2 below which defines the various Contingency Levels and the related reliability planning criteria.

Table 3-1-3-2: Contingency Reliability Criteria Definitions

Contingency	Definition
N-0 (No contingency)	All major elements of the power system are required to be in service to avoid a load loss (customer outage).
N-1 (Single contingency)	Outage of a single element with all other elements of the power system in service (a single transmission line, transformer, generating unit, power conditioning unit like a shunt capacitor bank, a shunt reactor bank, a series capacitor, a series reactor, etc.) with no load loss. This is a normal bulk transmission system design criteria.
N-1-1 (Double contingency)	Outage of an element of a power system during the prior outage of another element e.g. the outage of a transmission line while another transmission line is already out for maintenance with no load loss. This typically is a transmission system design criteria used for a major urban centre.

N-2 (Double contingency)	Simultaneous outage of two elements of a power system e.g. the simultaneous outage of both circuits of a double circuit transmission line or outage of two single circuit transmission lines on a common right of way due to outage events like lightning. This is a transmission system design criteria also used for a major urban centre with the difference from N-1-1 being the size of the sudden, or transient change in the supply capacity that the system must be able to ride through with no customer load loss.

3.1.3.3 Regulatory History

The Company believes the reliability history described in section 3.1.3.1 is inappropriate for the City of Kelowna. In 2004, the Company filed with the British Columbia Utilities Commission (BCUC) its long-term 2005 – 2024 System Development Plan (2005 SDP). The 2005 SDP addressed certain bulk transmission system deficiencies inherent in a single (N-1) contingency planning criterion, stating that:

> *"In considering N-1-1 or N-2 contingencies, it must be noted that the contingency classification designates only that one or more system elements are simultaneously out of service rather than suggesting the infrequent coincidence of several low-probability events. Many N-2 contingencies actually result from a single credible event, including protection failure, stuck breaker or breaker failure, double circuit structure collapse or bus failure. For example, both 230 kV circuits between FA Lee Terminal and Vernon Terminal have been simultaneously forced out of service on at least four occasions in the last five years. As the load increases in the Kelowna area this event will create significant outages in Kelowna."* (2005 SDP, page 9)

Since that time, Kelowna has experienced two blackouts, one in 2006 and one in 2007.

Following the commissioning of the SOK Project components, a degree of double contingency reliability was achieved in the Penticton area. The 2005 SDP identified the complete integration of the Vaseux Lake Terminal station into the Okanagan transmission system as a requirement for addressing reliability deficiencies for the City of Kelowna. This would be achieved by the construction of a 230 kV circuit to replace the existing 161 kV 76 Line between the Vaseux Lake Terminal station near Oliver and RG Anderson Terminal station in Penticton. Other load-driven bulk system additions included in the 2005 SDP were identified for Kelowna, Penticton, Oliver and Osoyoos.

Commission Order G-52-05 with respect to the 2005 Revenue Requirements, System Development Plan and Resource Plan supported a double contingency reliability planning criterion for Kelowna. As stated on page 59 of the Reasons for Decision:

> "With respect to the appropriate reliability levels for the City of Kelowna, the Commission panel notes that the criteria of N-1 is a minimum standard set by the WECC for bulk transmission systems and adopted by most utilities. The Commission Panel acknowledges that there are situations (particularly in large urban centers) where the consequence of a lower probability occurrence of an N-1-1 or N-2 event requires the N-1 standards to be exceeded. Each case is a judgment call and must be evaluated on its own merits. However it is common practice to have N-2 contingency levels for certain load centers in large urban centers (e.g. Vancouver and Victoria). **The Commission Panel accepts that an N-1-1 contingency level for Kelowna is appropriate at this time.**"

FortisBC has prepared two updates to the 2005 SDP. The most recent, the 2007 System Development Plan Update (2007 SDP Update), was filed in July 2006. The umbrella Okanagan Transmission Reinforcement Project was presented as an aggregate of the following related projects previously identified in the 2005 SDP:

- Double Circuit 230 kV Vaseux Lake Terminal to RG Anderson Terminal;
- New 230/161/138 kV Bentley Terminal station;
- New 230 kV Vaseux to Bentley;
- Kelowna Shunts and Static VAR Compensator; and
- Convert the existing Oliver Terminal station to a 138/63/13 kV distribution source station.

The components of the OTR Project are described in section 3.4, and in more detail in section 4.

3.1.3.4 Transmission Line Outage Exposure

The co-existence of transmission circuits on a single right of way in both the FortisBC and BCTC systems increases the likelihood of a single event creating a double contingency failure (N-2). The Kelowna and Penticton areas are exposed to outages if there is a coincident outage of FortisBC's 72 Line and 74 Line or BCTC lines 2L255 and 2L256. The risk of such occurrences on lines 2L255 and 2L256 is higher because the lines are of wood pole construction. Within the FortisBC corridor, 72 Line is wood construction, and 74 Line, constructed in 1996, is steel.

Figure 3-1-3-4A and Figure 3-1-3-4B show the FortisBC and BCTC transmission corridors.

Figure 3-1-3-4A: FortisBC 72 Line/74 Line Corridor

Figure 3-1-3-4:B BCTC 2L255/2L256 Corridor

Figure 3-1-3-4C and Figure 3-1-3-4D show a section of the fire-damaged 73 Line near Kelowna following the Okanagan Mountain Park fire in August 2003. Crews were not allowed into the area for approximately one week, and repairs were not completed for several more days. The line remained out of service for more than 310 hours, nearly 13 days (see Table 3-4, line 37). In this case, loads in the Penticton area were carried by 40 Line (currently 76 Line). During this outage of 73 Line, 40 Line tripped on a number of occasions as the result of another forest fire in the area, resulting in customer outages in the Penticton area. The event illustrates the vulnerability of the wood poles to such occurrences.

Figure 3-1-3-4C: 73 Line Corridor after 2003 Okanagan Mountain Park Fire

(Photograph July 2007)

Figure 3-1-3-4D: Fire Damage to 73 Line

A summary of outage incidents initiated by transmission circuit failures from March 1997 to July 2007 is provided in Table 3-1-3-4 below. All of the double contingency outages initiated by simultaneous failures of the BCTC 230 kV lines 2L255 and 2L256, or of 72 Line and 74 Line, are highlighted for clarity. These double contingency (N-2) outages resulted in complete loss of power from the BCTC point of interconnection at Vernon Terminal with consequent blackouts to the City of Kelowna. The rest of the outages generally represent N-1 outages to the system.

Table 3-1-3-4: Kelowna/Penticton Area Transmission Outages 1997 – July 2007

	Description of Cause	Element	Down Timestamp	Up Timestamp	Duration	Total Direct & Indirect Cust.	Total Direct & Indirect Cust. Hrs.
1	WIND	72 & 74 LINE	3/9/1997 12:44:49 PM	3/9/1997 6:49:08 PM	06:04:19	46,570	84,589
2	INSULATOR	72 LINE	3/10/1997 12:35:28 PM	3/10/1997 12:35:42 PM	00:00:14	46,570	181
3	INSULATOR	72 LINE	4/1/1997 6:39:00 PM	4/1/1997 6:39:06 PM	00:00:06	0	0
4	LOSS OF SUPPLY	2L255 & 2L256	7/5/1997 5:03:00 PM	7/5/1997 5:05:00 PM	00:02:00	46,767	1,559
5	LIGHTNING	72 & 74 LINE	7/21/1997 2:50:42 PM	7/21/1997 2:52:11 PM	00:01:29	46,767	1,156
6	LIGHTNING	72 & 74 LINE	7/21/1997 3:34:45 PM	7/21/1997 3:44:26 PM	00:09:41	46,767	4,851
7	LIGHTNING	72 & 74 LINE	7/21/1997 4:15:20 PM	7/21/1997 4:15:31 PM	00:00:11	46,767	143
8	LIGHTNING	72 & 74 LINE	9/5/1997 4:10:49 PM	9/5/1997 4:30:03 PM	00:19:14	15,947	5,112
9	LIGHTNING	72 LINE	6/20/1998 4:39:26 PM	6/20/1998 4:39:37 PM	00:00:11	0	0
10	LIGHTNING	72 LINE	6/25/1998 9:54:22 PM	6/25/1998 9:59:26 PM	00:05:04	0	0
11	INSULATOR	74 LINE	1/31/1999 5:36:28 AM	1/31/1999 5:50:41 AM	00:14:13	0	0
12	LIGHTNING	74 LINE	8/19/1999 3:22:04 AM	8/19/1999 3:22:08 AM	00:00:04	567	1,702
13	LOSS OF SUPPLY	72 LINE	5/18/2000 10:37:00 AM	5/18/2000 11:21:00 AM	00:44:00	0	0
14	LOSS OF SUPPLY	2L255 & 2L256	7/8/2000 5:05:49 PM	7/8/2000 5:05:53 PM	00:00:04	47,141	52
15	LOSS OF SUPPLY	2L255 & 2L256	7/20/2000 6:39:12 PM	7/20/2000 6:47:19 PM	00:08:07	47,141	6,377
16	LOSS OF SUPPLY	74 LINE	7/22/2000 7:02:00 PM	7/22/2000 7:08:00 PM	00:06:00	0	0
17	LIGHTNING	72 & 74 LINE	7/25/2000 1:09:25 PM	7/25/2000 1:09:38 PM	00:00:13	47,141	170
18	VEHICLE	73 LINE	8/16/2000 2:10:45 AM	8/16/2000 2:18:25 AM	00:07:40	6,233	796
19	TREE ON LINE	72 LINE	7/2/2001 2:24:05 PM	7/2/2001 8:28:09 PM	06:04:04	0	0
20	LIGHTNING	LEE TERMINAL	8/22/2001 4:01:12 AM	8/22/2001 4:18:38 AM	00:17:26	54,101	8,918
21	UNKNOWN	74 LINE	11/8/2001 2:14:30 AM	11/8/2001 2:14:42 AM	00:00:12	0	0
22	LIGHTNING	73 LINE	6/18/2002 2:26:20 AM	6/18/2002 2:26:28 AM	00:00:08	18,361	41
23	LIGHTNING	74 LINE	8/6/2002 6:26:22 AM	8/6/2002 6:26:37 AM	00:00:15	0	0
24	LIGHTNING	72 & 74 LINE	8/19/2002 7:45:21 PM	8/19/2002 7:45:34 PM	00:00:13	61,544	222
25	CROSSARM	73 LINE	3/24/2003 5:21:34 PM	3/26/2003 5:57:23 PM	48:35:49	35,789	2,185
26	FOREST FIRE	73 LINE	8/19/2003 9:36:14 PM	9/1/2003 8:14:00 PM	310:37:46	0	0
27	STRUCTURE	73 LINE	3/26/2004 2:49:50 AM	3/26/2004 3:28:10 PM	12:38:20	24,741	4,000
28	LIGHTNING	72 & 74 LINE	5/20/2004 7:25:46 PM	5/20/2004 7:25:59 PM	00:00:13	51,741	187
29	UNKNOWN	72 LINE	7/24/2004 8:59:04 AM	7/24/2004 8:59:16 AM	00:00:12	0	0
30	LIGHTNING	RGA TERMINAL	6/21/2005 7:01:18 PM	6/21/2005 7:08:02 PM	00:06:44	24,918	3,222
31	LOSS OF SUPPLY	2L255 & 2L256	3/3/2006 1:38:30 PM	3/3/2006 2:50:37 PM	01:12:07	52,121	24,721
32	LIGHTNING	73 LINE	6/9/2006 4:23:18 PM	6/9/2006 4:23:24 PM	00:00:06	0	0
33	LIGHTNING	73 LINE	7/5/2006 7:24:54 PM	7/5/2006 7:25:00 PM	00:00:06	25,699	43
34	POLE FIRE	73 LINE	8/30/2006 10:53:38 PM	8/30/2006 11:47:00 PM	00:53:22	3,534	3,143
35	LIGHTNING	73 LINE	6/16/2007 4:03:23 PM	6/16/2007 4:03:33 PM	00:00:10	0	0
36	LOSS OF SUPPLY	2L255 & 2L256	6/29/2007 3:56:43 PM	6/29/2007 4:11:18 PM	00:14:35	69,965	28,587
37	LIGHTNING	RGA TERMINAL	7/19/2007 2:56:48 PM	7/19/2007 2:58:25 PM	00:01:37	24,782	668
38	LIGHTNING	73 LINE	7/23/2007 6:39:18 PM	7/23/2007 6:39:25 PM	00:00:07	0	0

An example of an incident creating risk, but not resulting in an outage, occurred in January 2007, when the BCTC 230 kV Line 2L255 from Ashton Creek to Vernon Terminal experienced a forced outage of 83 hours. The Kelowna area remained vulnerable during this extended period of time to a potential loss of load from a concurrent outage on the remaining Ashton Creek-Vernon Terminal transmission line 2L256 that could have very well resulted in an N-1-1 scenario.

During the past year transmission lines 2L255 and 2L256 were out of service for a total of about 100 hours due to planned maintenance. FortisBC 230 kV lines 72 Line and 74 Line undergo similar planned maintenance outage durations. This in turn exposes the Kelowna area to the potential of loss of firm supply due to a single coincident forced outage on the remaining operational transmission lines (either Ashton Creek—Vernon Terminal or Vernon Terminal—Kelowna corridors) during these periods of planned outages creating the potential for N-1-1 vulnerability for approximately 200 hours per year.

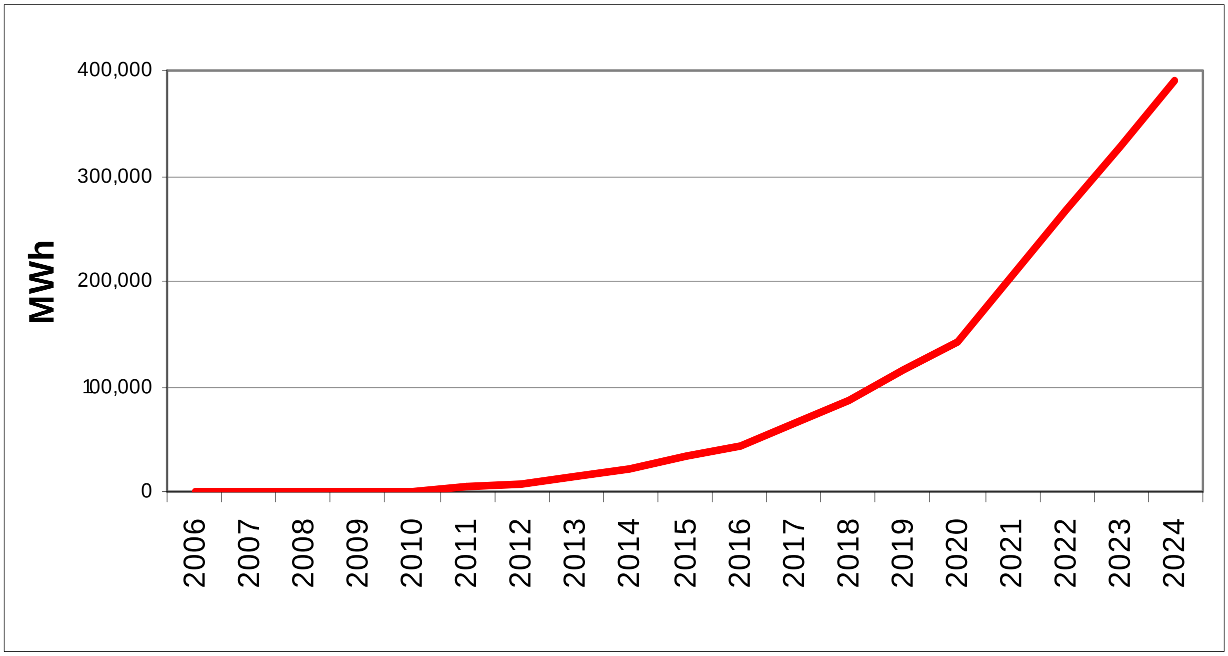
3.1.3.5 Contingency Analysis

Normal operating conditions (N-0)

By 2009, overall transmission system capacity for the Kelowna to Penticton region under normal operating conditions will be exceeded. Figure 3-1-3-5A below shows the extent to which this limitation would lead to energy supply shortfall in the Kelowna-Penticton area. This shortfall could result in forced load curtailment such as voltage reductions or customer outages.

Assuming normal operating conditions for all transmission system elements, the shortfall in expected energy serving ability will become significant with load growth. Under the present network configuration by 2024 the energy serving ability shortfall (assuming operations within normal rated capacity of system elements) could reach 390 GWh per year.

Figure 3-1-3-5A: Annual Energy Shortfall, Normal Operating Conditions



Single Contingency (N-1)

The single contingency capacity of the Kelowna to Penticton system has already been exceeded during system peak load periods. The capacity deficit is approximately 109 MVA in 2007 (25% of Kelowna/ Penticton system peak), meaning that, under conditions of a single element failure, a subsequent equipment failure at any point in the area would result in forced load shedding.

As the Okanagan load continues to increase, the transmission system will be severely affected by a single contingency, for example the failure of 76 Line interconnecting Vaseux Lake and RG Anderson Terminal stations. The loss of 76 Line will have a greater impact than the loss of either 72 Line or 74 Line. By 2024, approximately 48% of regional peak demand, approximately 300 MVA, will be at risk.

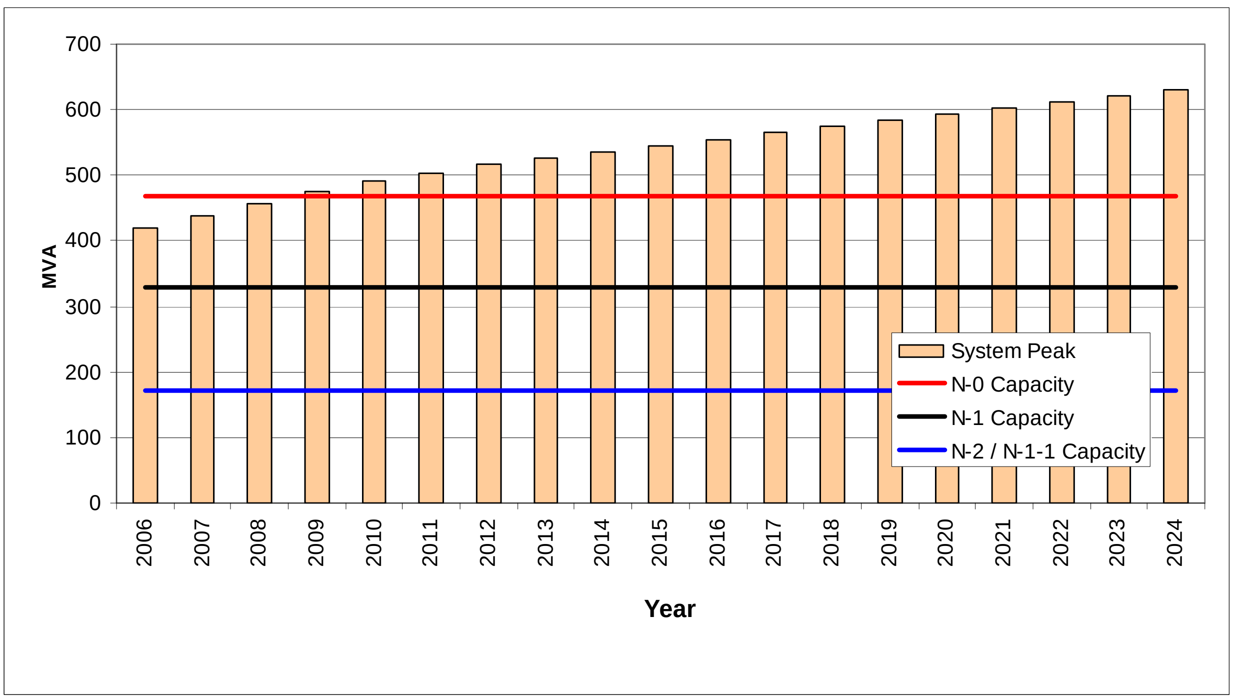
Double Contingency (N-1-1/N-2)

The present Kelowna to Penticton system does not meet double contingency criteria. The N-1-1/N-2 criteria can only be met for approximately 1,575 hours (18%) during 2007; outside of this, any sequential or coincidental outage of two system elements could result in the complete blackout of the Kelowna area. By 2014, double contingency criteria will only be met for approximately 440 hours (5%) per year.

Under the most severe scenario (the N-2 contingency arising from a simultaneous failure of 72 Line and 74 Line or BCTC's 2L255 and 2L256), the load loss in the Kelowna to Penticton region could reach approximately 65% of regional peak demand or approximately 320 MVA in 2010, and approximately 73% of regional peak demand or approximately 460 MVA by 2024. This type of event has occurred one to two times per year in the past ten years.

Figure 3-1-3-5B below shows the forecast peak loads and the peak capacity supported under each of the contingency criteria.

Figure 3-1-3-5B: Existing System Capacity vs. Forecast Peak



3.1.3.6 Oliver Area Distribution

Most of the distribution source substations in the South Okanagan area are served at the 63 kV sub-transmission voltage level, however in Oliver the 13 kV distribution system is fed from the Oliver Transformer 1 tertiary winding. This is now considered an obsolete practice and the current FortisBC standard is to supply distribution load from dedicated distribution transformers.

With the completion of the Black Mountain Substation (approved by BCUC Order C-7-07) which removes the distribution load from FA Lee Transformer 3 and Transformer 4, Oliver Transformer 1 will be the only tertiary winding distribution source in the FortisBC system. A risk evaluation prepared for FortisBC and filed in support of the Black Mountain Substation Project CPCN Application is attached as Appendix D. Although the risk evaluation was prepared with reference to the FA Lee Terminal station, its conclusions with respect to transformer reliability are also applicable to Oliver Transformer 1.

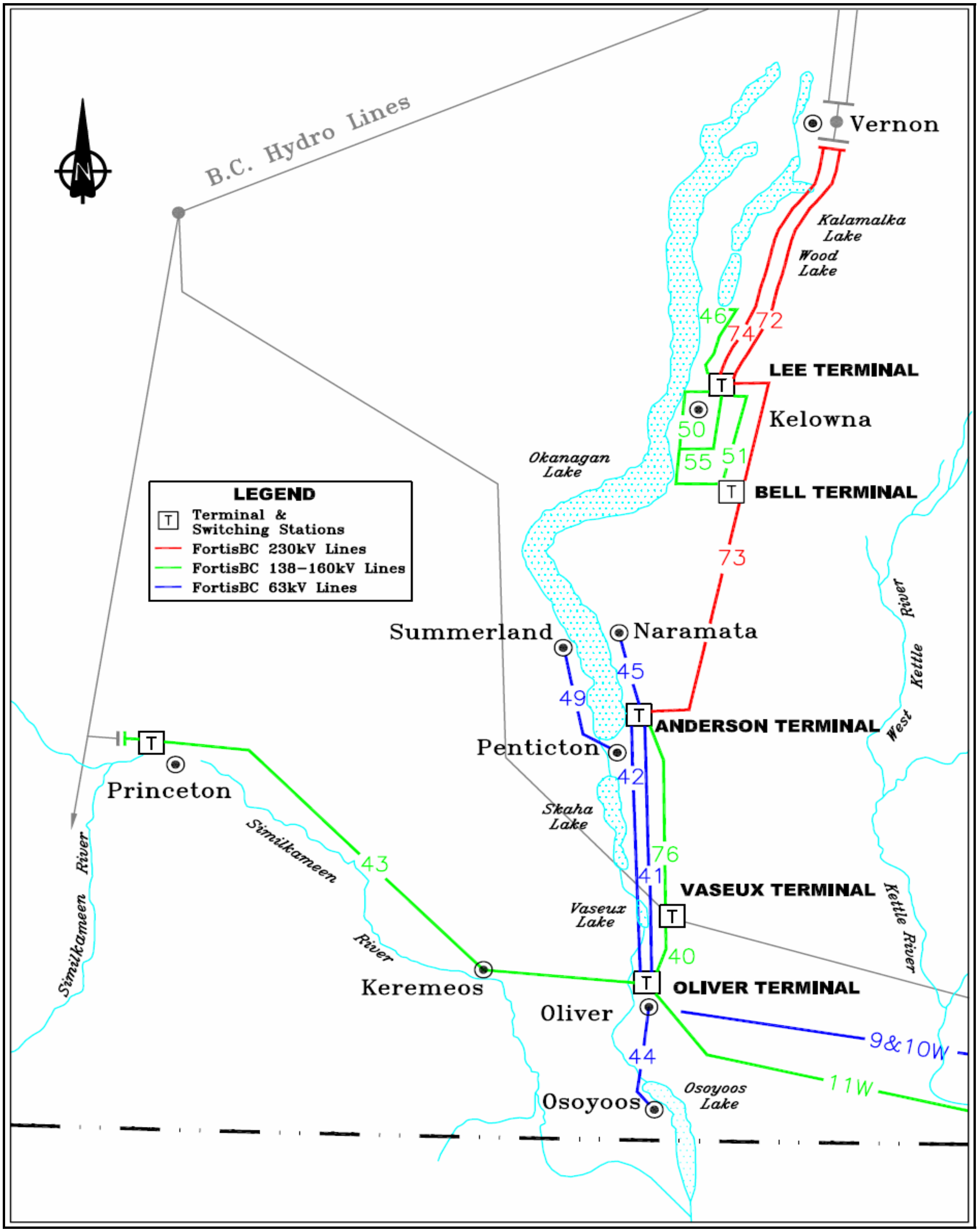
As the distribution network expands due to load growth, exposure to distribution faults increases, which increases the risk of a major transformer failure in the long term. This type of failure could lead to lengthy outages for several thousand customers in the area and could result in expensive replacement and repair over an extended period of time, leaving the power system network vulnerable in the intervening period. Distribution level faults are likely to continue to increase along with area load growth and will impact Transformer 1 until such time as the distribution load is removed from it.

Due to physical space constraints there is inadequate space for further expansion at the Oliver Terminal station site, precluding the development of this site to accept a 230 kV circuit from Vaseux Lake. Instead, the 230 kV, 161 kV and 138 kV portions will be reconstructed at the new Bentley Terminal station. This will allow the 161 kV portion of the Oliver Terminal station to be salvaged, providing adequate space to construct a new distribution substation to current standards as well as providing room for future distribution expansion.

3.2 DESCRIPTION OF THE OKANAGAN TRANSMISSION SYSTEM

This section describes the existing bulk supply system in the Okanagan region and in particular the facilities that will be modified as part of the OTR Project. A map of FortisBC’s existing Okanagan transmission facilities is provided in Figure 3-2 below.

Figure 3-2: Existing FortisBC Okanagan Transmission System



3.2.1 Existing FortisBC Okanagan Bulk Transmission Network

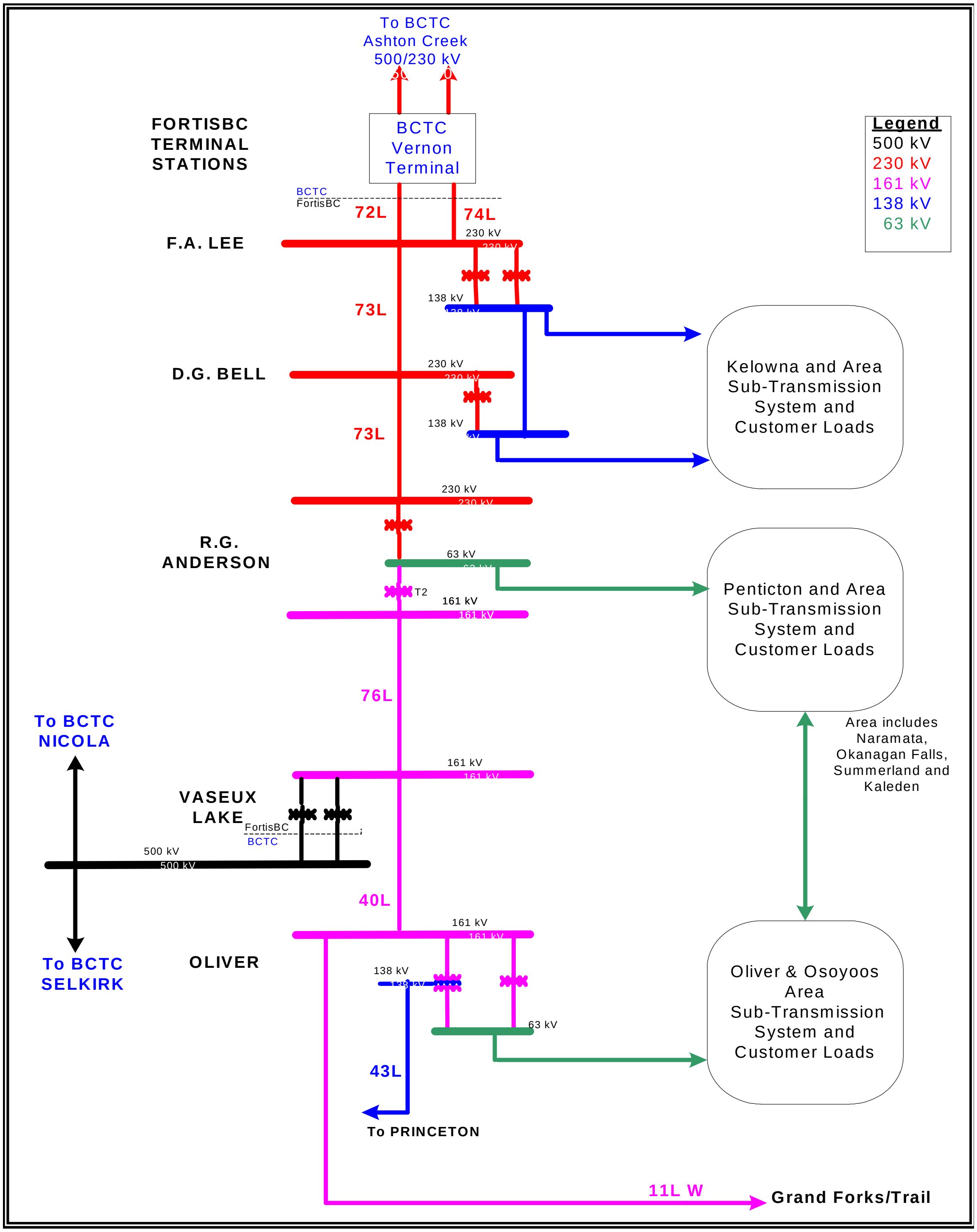
The FortisBC bulk supply system in the Okanagan is interconnected at BCTC's Vernon Terminal north of Kelowna via two 230 kV lines (72 Line and 74 Line) from the main interconnection point for Kelowna at FA Lee Terminal station. The Vernon Terminal itself interconnects with BCTC's Ashton Creek Substation north of Vernon via two 230 kV transmission lines (Lines 2L255 & Line 2L256).

From FA Lee, a single 230 kV line (73 Line) continues through DG Bell Terminal station south to the RG Anderson Terminal station, the main load supply for Penticton, where it connects with a 161 kV line (76 Line) from Vaseux Lake Terminal station via a 230/63/161 kV step-down-step-up transformation. The Vaseux Lake Terminal station provides a supply interconnection to the BCTC 500 kV transmission system (5L96 and 5L98) and is currently operating at 500/161 kV although designed for an upgrade to 500/230 kV.

Finally, Vaseux Lake Terminal station interconnects south to the Oliver Terminal station via a single 161 kV line (40 Line). Oliver Terminal station interconnects with the FortisBC Kootenay transmission system via 11W Line to the east and with Princeton via 43 Line to the west. There is a 138 kV transmission interconnection between FortisBC and BCTC at Princeton.

Figure 3-2-1 below is a schematic representation of the existing Okanagan transmission system.

Figure 3-2-1: FortisBC Transmission System 2007



3.2.2 FA Lee and DG Bell Terminal Stations

Together the FA Lee and DG Bell Terminal stations shown in Figures 3-2-2A and 3-2-2B supply the 138 kV sub-transmission network in the Kelowna area. There are two 100/133/168 MVA 230/138 kV transformers located at FA Lee Terminal station and one 120/160/200 MVA 230/138 kV transformer at DG Bell Terminal station. In normal operation the two stations operate in parallel and are interconnected via 230 kV and 138 kV transmission lines. There are four more 138 kV sub-transmission lines which distribute power to the seven distribution substations in the Kelowna area.

Figure 3-2-2A: FA Lee Terminal Station

Figure 3-2-2B: DG Bell Terminal Station

3.2.3 RG Anderson Terminal Station

The RG Anderson Terminal station shown in Figure 3-2-3A below is the main supply point for the Penticton area and is located in north-east Penticton.

The station is equipped with two transmission-class transformers:

- Transformer 1 is a 236/69 kV, 101/134/168 MVA transformer manufactured in 1977; and
- Transformer 2 is a 225/161/63 kV transformer, 101/134/168 MVA when operated on the 225 kV tap**,** 82/110/137.5 MVA when operated on the 161 kV tap, manufactured in 1981.

RG Anderson Transformer 1 is connected directly to 73 Line and provides a step-down for the 230 kV transmission network from the north. RG Anderson Transformer 2 is connected directly to 76 Line and provides a step-down for the 161 kV transmission network from the south. The two transformers share a common 63 kV bus. As shown in Figure 3-2-1, there is no direct connection between the 161 and 230 kV transmission systems at RG Anderson. To flow through the station, power must first be transformed to the lower 63 kV level. This is a significant bottleneck during peak load times.

The RG Anderson 63 kV bus supplies the Penticton area load via four radial operated 63 kV transmission lines. Of these, 59 Line feeds Transformer 3 (distribution transformer located at RG Anderson), 45 Line feeds the Westminster and Naramata substations, while 53 Line and 52 Line serve the areas of central Penticton, Kaleden, Okanagan Falls and Summerland and are interconnected with 42 Line from Oliver Terminal station.

A single line diagram of RG Anderson is found at page 24 of Appendix C.

Figure 3-2-3A: RG Anderson Terminal Station

RG Anderson Transformer 1 is presently de-rated to 110 MVA from its nameplate capacity of 168 MVA due to insulation limitations. Remedial work on Transformer 1 can be performed to restore the full 168 MVA rating. Transformer 1 could also be up-rated in future to 180 MVA by the addition of fans for cooling.

In addition, Transformer 1 and Transformer 2 were both relocated from other substations and do not match electrically. They have different nominal voltages, different tap ranges and different impedances which makes parallel operation impractical. A recent condition and design analysis for both transformers indicates that they can be refurbished to extend their life.

3.2.4 Vaseux Lake Terminal Station

Vaseux Lake Terminal station is a 500/230/161 kV dual transformer station located northeast of Oliver, and is shown in Figure 3-2-4 below.

The station is equipped with two transmission-class transformers:

- Vaseux Transformers 1 and 2 are 512.5/170/242 kV, 250 MVA transformers manufactured in 2005.

The station was constructed as part of the South Okanagan Supply Reinforcement Project (SOK Project) and energized in late 2005, connecting the south Okanagan to BCTC's 500 kV Nicola-Selkirk circuit (5L96 and 5L98). The SOK Project was the first stage in FortisBC's plans to address the area power supply constraints created by increased load demands and to improve system security and reliability by providing a second major source of supply to the Boundary, South Okanagan and Similkameen (in addition to the east-west 11 Line).

Figure 3-2-4: Vaseux Lake Terminal Station

The Vaseux Lake Terminal station has a partial ring bus configuration on both the high (500 kV) and low (161/230 kV) voltage bus sides and interconnects with the FortisBC transmission system via two 161 kV lines, 76 Line to RG Anderson Terminal station and 40 Line to Oliver Terminal station. Due to the absence of high and low voltage bus circuit breakers between the two transformers, the failure of one of the two transformers results in the loss of the second transformer and a complete loss of the station transformation.

The 500 kV portion of Vaseux Lake Terminal station is owned by BC Hydro and managed by BCTC. Single line diagrams of the BCTC and FortisBC portions are found in Appendix C at pages 27 and 28.

3.2.5 Oliver Terminal Station

The local transmission network in the Oliver area operates at three nominal voltage levels: 161 kV, 138 kV and 63 kV. The Oliver Terminal station is shown in Figure 3-2-5 below.

The station is equipped with two transmission-class transformers:

- Oliver Transformer 1 is a 161/63 kV, 45/65 MVA transformer manufactured in 1971; and
- Oliver Transformer 2 is a 161/138/63 kV, 61.5/82 MVA transformer manufactured in 1969

Oliver Terminal supplies 42 Line to OK Falls and Kaleden, 44 Line to Oliver and Osoyoos, and 66 Line to Osoyoos, all at 63 kV, and 43 Line which supplies the Similkameen region at 138 kV. 43 Line also interconnects to BCTC at Princeton.

There are two 13 kV distribution feeders supplied from the tertiary winding of Oliver Transformer 1, which is an obsolete practice that imparts additional risk to the transformer, as described in section 3.1.3.6. Distribution backup for these feeders is supplied from the Pine Street Substation in Oliver.

Figure 3-2-5: The Oliver Terminal Station

Oliver Transformer 2 is nearly 40 years old and has had historical issues with the presence of gas in the transformer oil and incidences of overheating.

3.3 PROJECT PRIORITY

Load growth in the Okanagan region and subsequent assessment of the reliability criteria and analysis of the implications to the transmission system initiated a review of some of the factors for the OTR Project that were addressed in FortisBC's 2005 SDP. To ensure FortisBC's ability to continue to serve customers in the central Okanagan and address the system reliability in the region, the OTR Project is required.

The OTR Project priority analysis is shown in Table 3-3 below.

Table 3-3: Priority Analysis

Category	OTR Project Evaluation
Safety (ability to improve safety by undertaking the project)	Safety risk is considered low.
Restoration Time (measure of potential reliability improvement)	The restoration time for the transmission system in the Okanagan area depends on the nature of the failure, and may also depend on the proximity of the failure to the nearest FortisBC Operations Centre. However, in the existing system configuration, for a major contingency (N-1, N-1-1, or N-2) it may not be possible to restore the entire system back to normal. Extended customer outages could result.

Category	OTR Project Evaluation
Thermal Capacity (% overload compared to equipment rating)	In the existing configuration, under normal operating conditions, a significant amount of load will remain undelivered as the rapidly developing load surpasses the overall transmission system capacity. The nameplate capacity of RG Anderson Transformer 2 has already been exceeded, and a recent study indicates that the normal loading capacity RG Anderson Transformer 1 needs also to be limited to 110 MVA instead of 168 MVA until necessary corrective actions are implemented.
System Effects of Failure (consequence to system of an element failing)	The consequences of single contingency events are increasing with load growth. By 2010/11, an outage of 76 Line during winter peak will result in voltage collapse in the Kelowna and Penticton regions, and the failure of either 72 Line or 74 Line during winter peak will result in load curtailment in the range of 40 to 50 MVA in the Kelowna to Penticton region. Presently more than 58,000 direct and indirect customers are connected to Kelowna (FA Lee and DG Bell) and a further 28,000 in the Penticton areas (RG Anderson).
Voltage Related (measure of power quality)	During normal conditions, the power flow in RG Anderson Transformer 2 now exceeds its nameplate rating during system peak. Continued operation beyond normal limits will result in degradation in supply quality, and result in voltage related issues. An N-1 event during the winter peak load periods by 2010/11 will lead to a voltage collapse and ultimate loss of load in the Kelowna—Penticton areas.

Category	OTR Project Evaluation
Public Impact (number of customers affected)	The population of the CORD and RDOS is approximately 250,000 most of whom are served by FortisBC's Okanagan Transmission System, and could reach 365,000 by the year 2030 as forecast by BC Statistics.

3.4 PROJECT REQUIREMENTS AND CONSEQUENTIAL BENEFITS

As described and discussed in the previous sections, a solution must to be designed to achieve the following:

1. Alleviate system capacity constraints under normal operating conditions (N-0) along with RG Anderson Transformer 2 overload issues through the planning horizon (2024);
2. Strengthen the North-South (Vernon-Oliver) transmission backbone by eliminating the existing power flow bottleneck at Penticton due to RG Anderson Transformer 2 and the 76 Line transmission path between Vaseux and Penticton;
3. Provide a high level of single contingency (N-1) supply security to the Kelowna-Penticton area for outages on 72 Line, 73 Line, 74 Line, 76 Line, or the proposed 75 Line; and
4. Introduce double contingency (N-1-1/N-2) security to the Kelowna-Penticton area for close to 100% of such events during 2010 and nearly 90% levels during year 2024.

Additional Consequential Benefits:

1. Provide separate transformer and bus protection zones for Vaseux Lake Transformer 1 and Transformer 2 to ensure that both transformers are not lost due to a single contingency failure;
2. Reduce system losses (see section 5.2);

3. Increase the area transformation capacity by commissioning the new Bentley Terminal station and rebuilding the Oliver Terminal station as a distribution substation;

4. Facilitate system maintenance and enhance sub-transmission reliability in the Penticton and Oliver areas by adding 63 kV bus coupler circuit breakers at RG Anderson and Oliver Terminal stations;

5. Improve overall reliability in the Oliver area by transferring the distribution load presently supplied by the Oliver Transformer 1 tertiary winding to a dedicated distribution transformer;

6. Optimize equipment usage within the system:

   a. RG Anderson Transformer 2 will be refurbished and relocated to the proposed Bentley Terminal station to provide the 230/63 kV transformation. A new transformer will be installed at RG Anderson to better match the existing Transformer 1.

   b. The redundant Oliver Transformer 1 may be reused for a future capacity/reliability upgrade of the Grand Forks Terminal station or retained as a spare;

   c. Oliver Terminal station will have adequate space for future distribution growth; and

7. Provide increased transmission capacity in the provincial grid. As discussed in the BCTC 2006 South Interior Bulk System Development Plan, the OTR Project, combined with transformer upgrades at BCTC's Selkirk Terminal, will also help address current short-term capacity shortfalls within the BCTC transmission system.

3.5 PROPOSED SOLUTION – THE OTR PROJECT

FortisBC's proposed solution comprises the following principal elements:

1. Replacing the existing single circuit 161 kV transmission line between Vaseux and Penticton (76 Line) with two new 230 kV circuits (75 Line and 76 Line)

between Vaseux Lake Terminal station and RG Anderson Terminal station at Penticton;

2. Conversion of Vaseux Lake Terminal station to 230 kV including adding circuit breakers to complete the 500 kV and 230 kV ring buses;
3. Replacing the existing single circuit 161 kV transmission line between Vaseux and Oliver (40 Line) by a single circuit 230 kV line between Vaseux Lake and Bentley Terminal stations;
4. New 230/161/138/63 kV Bentley Terminal station near Oliver;
5. Addition of 30 MVar capacitor banks at the FA Lee and DG Bell Terminal stations.
6. Conversion of Oliver Terminal station to a distribution station

Additionally, there will be associated changes such as those required to the FortisBC and BCTC Remedial Action Schemes.

These Project elements are described in detail in section 4.

3.6 FUTURE SYSTEM IMPROVEMENTS – POST OTR PROJECT

The proposed OTR Project will alleviate system constraints and increase single and double contingency system reliability. Subsequent system improvements identified in the 2005 SDP and 2007 SDP Update include the addition of 150 Mvar static var compensator (SVC) at DG Bell Terminal station, which will be the subject of a separate application.

In addition to the line and transformer constraints identified in this section, the unavailability of dynamic reactive compensation facilities in the Okanagan also results in power delivery constraints under various scenarios. In the case of double contingency, after fault clearing there is a significant voltage change on the system. When the transient is over, the transformer load tap changers at the terminal and distribution substations adjust to restore/raise system voltage, but this in turn can lead to more voltage drop and eventually a voltage collapse. Provision of dynamic reactive support, which is an instantaneous injection of reactive power provided by a SVC, assists in restoring the system voltage and avoiding a voltage collapse.

Construction and commissioning of the SVC in 2010/2011 is acceptable given that the OTR Project as proposed is expected to meet double contingency events in the Okanagan region for more than 99% of the time during the year until 2013.

Figure 3-6A and Figure 3-6B depict the effects on reliability criteria compared to forecast load, before and after the addition of SVCs. Without the SVC the system would have insufficient N-1 capacity in 2011; the addition of the SVC would extend N-1 capacity beyond the current planning horizon.

Figure 3-6A: Proposed System (Kelowna & Penticton) Capacity Vs Load (WITHOUT SVC)

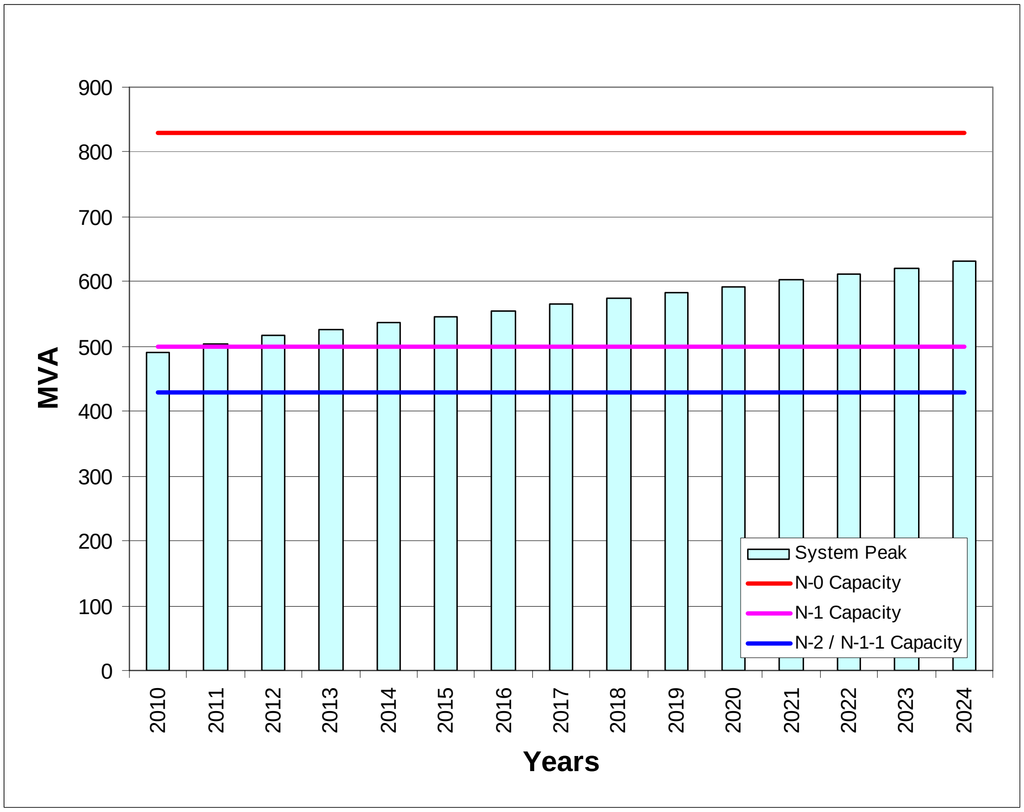


Figure 3-6B: Proposed System (Kelowna & Penticton) Capacity Vs Load (WITH SVC)

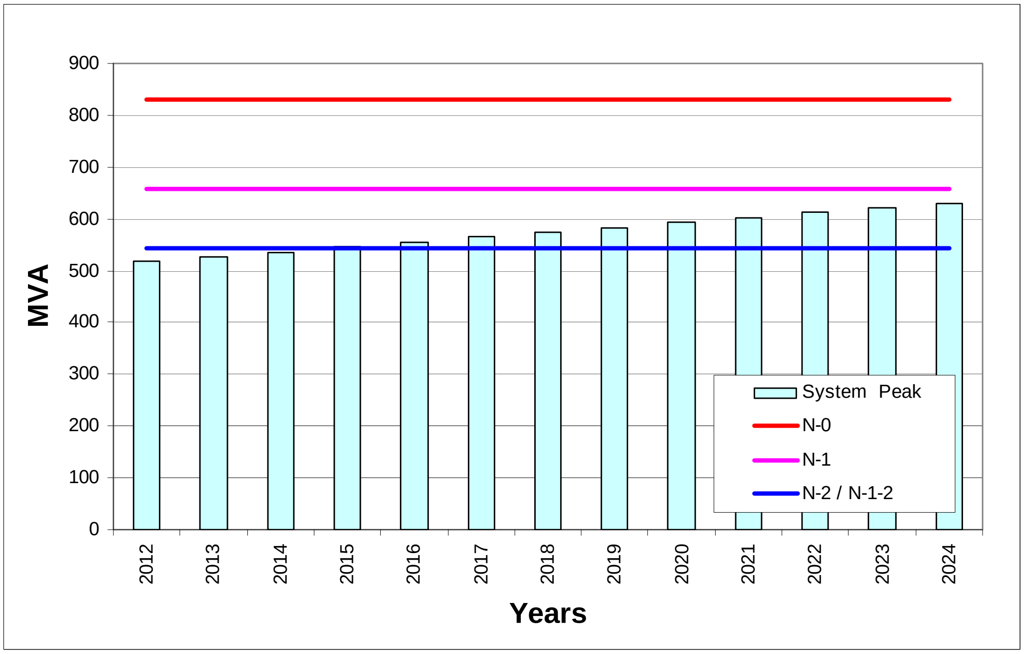
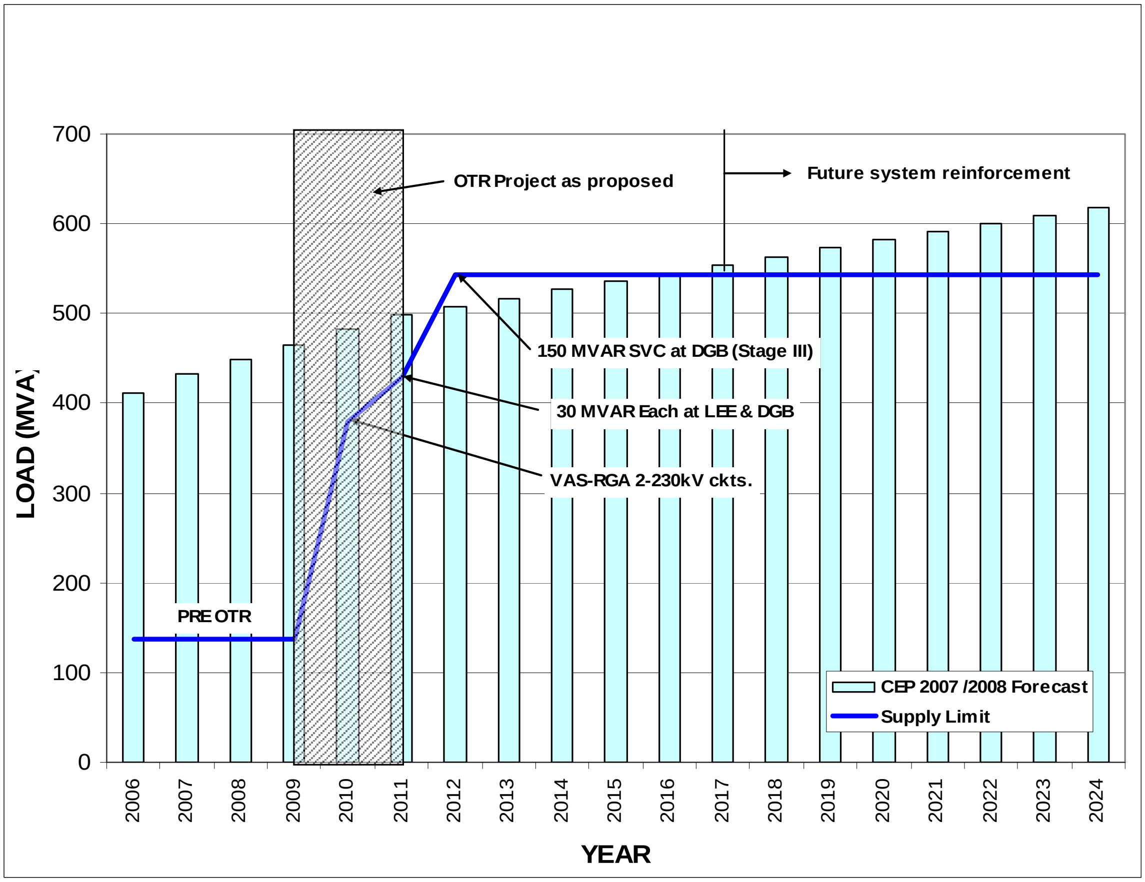


Figure 3-6C below illustrates the expected N-2/N-1-1 capacity over the planning horizon, once the additional improvements are completed.

Figure 3-6C: Future Kelowna and Penticton Winter Peak Load Supply Capability N-2 / N-1-1



3.6.1 Beyond the OTR Project and SVC

As the load in the Okanagan area continues to grow, the capacity margin provided by the OTR Project will be eroded over time. As shown by the figures in section 3.5, the OTR Project (combined with the future SVC installation) will provide adequate supply at the following reliability levels:

Table 3-6-1: Okanagan Area Capacity/Adequacy Timeline

Reliability Level	Year
N-0	2024+ (past planning horizon)
N-1	2024+ (past planning horizon)
N-2/N-1-1	2015 (100%) 2024 (90%)

It can be seen that the proposed project will provide sufficient capacity for normal and single-contingency operation well into the future. Coverage for N-2 contingencies would be adequate until 2015. Beyond that time system reinforcement would be required to ensure full compliance with the N-2 planning criteria for Kelowna.

FortisBC is currently in the initial planning stages for system reinforcement beyond the 10 - 15 year horizon. Alternatives being considered include both transmission (poles and wires) solutions and generation resource additions. There are many factors that will influence the decision regarding these future solutions of which include: environmental impacts, network efficiency (losses), reliability and economics.

It should be noted however, that these solutions will all depend on the presence of the 230 kV backbone that will be constructed as part of the OTR Project to transmit the required power; thus, they are not an alternative solution – rather they are an augment to the project. As well, due to the large number of studies that will be required, any of these solutions are at least 5 years away from full definition and 6 to 8 years away in terms of implementation.

Okanagan Transmission Reinforcement Project

(OTR Project)

Section 4:   Project Description

FortisBC Inc.

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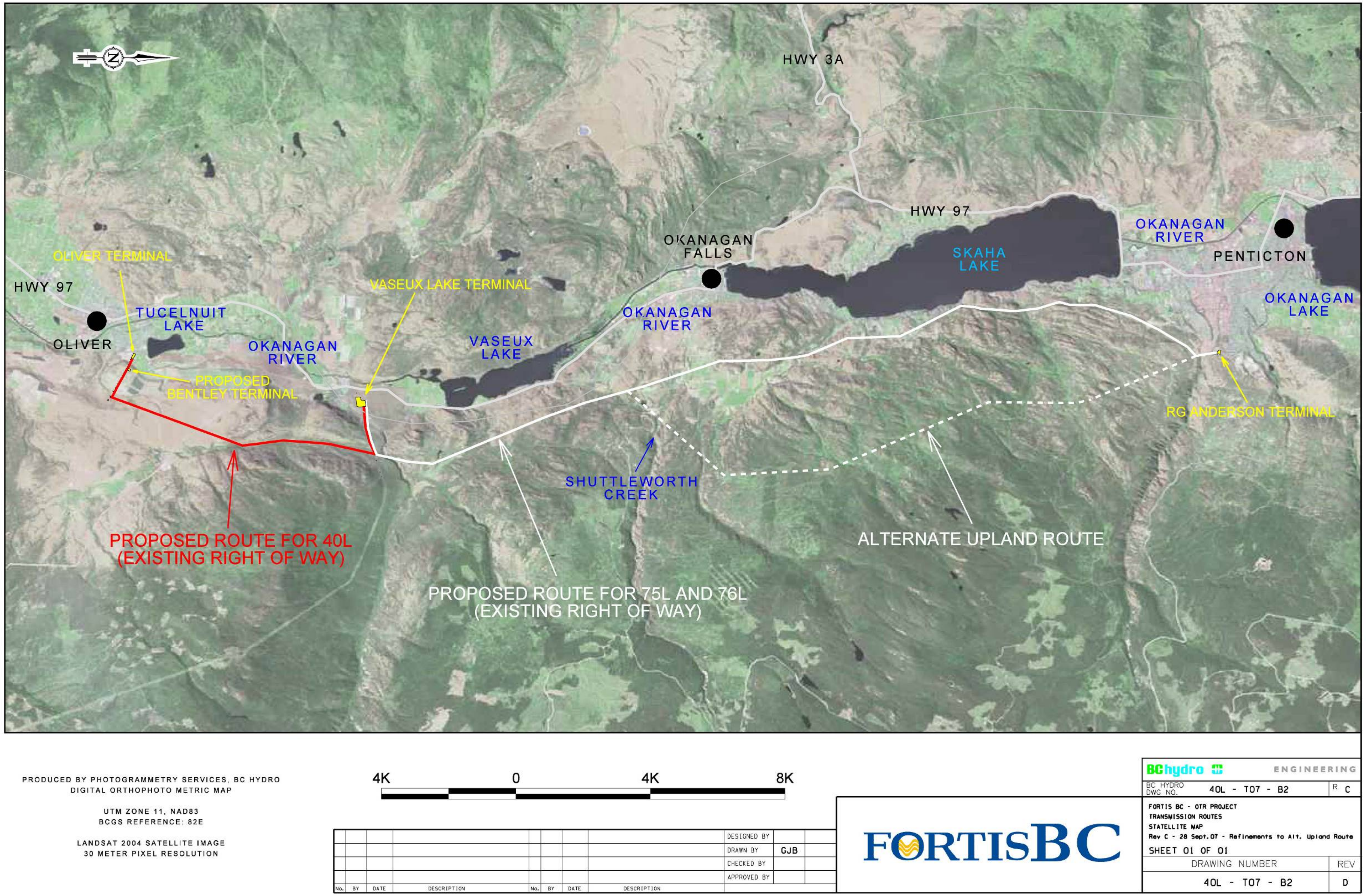
4.0 PROJECT DESCRIPTION

The proposed Okanagan Transmission Reinforcement Project will result in the completion of a 230 kV transmission backbone in the Okanagan by replacing the existing 161 kV transmission 40 Line between Vaseux Lake and Oliver and 76 Line between Vaseux Lake and Penticton with 230 kV lines and adding a second 230 kV line, 75 Line, between Vaseux Lake and Penticton. The Project includes modifications to the Oliver, Vaseux Lake, RG Anderson, FA Lee and DG Bell Terminal stations as well as the construction of the new Bentley Terminal station in Oliver.

This Application contemplates an in-service date of November 2010 based on the construction of new transmission infrastructure on the existing right-of-way. An Upland route was also considered in this application, and is shown geographically on Figure 4-0 below. If one of the alternative Upland line routes as outlined in section 4.2.3 is ordered by the BC Utilities Commission, the full in-service date for the OTR Project would be delayed by 24 months or more while the alternate route property rights and permits are acquired (assuming they can be). The delay and uncertainty associated with acquiring new rights-of-way would potentially increase exposure of the Okanagan area to blackouts due to increasing load growth and limited supply capacity.

Figure 4-0: OTR Project Satellite Map Overview



4.1 PROJECT OVERVIEW

The OTR Project's principal elements consist of; conversion of Vaseux Lake Terminal to 230 kV; 28 kilometres of two new 230 kV transmission lines (a double circuit) from the RG Anderson Terminal station to the Vaseux Lake Terminal station replacing an existing 161 kV line; upgrading 11 kilometres of 161 kV transmission line to 230 kV between the Bentley and Vaseux Lake Terminal stations; constructing the new Bentley Terminal station; installation of capacitor banks at the FA Lee and DG Bell Terminal stations and conversion of Oliver Terminal to a distribution substation.

The OTR Project transmission line will be constructed on the existing brownfield line corridor (established 1965) utilizing route Alternative 1A between Oliver and Penticton and is represented geographically in Figure 4-0 above.

The Bentley Terminal station will be constructed on Osoyoos Indian Band land approximately 300 metres from the existing Oliver Terminal station.

Figure 4-1 below shows a simplified diagram of the South Okanagan Transmission System with OTR Project elements identified.

The OTR Project elements are comprised of:

1. **Two new 230 kV lines between Vaseux Lake and RG Anderson Terminal Stations**

   The existing 28 kilometre 161 kV 76 Line, will be replaced with two 230 kV transmission lines (a double circuit) to provide needed supply capacity and improve single and double contingency reliability for the Penticton and Kelowna areas. The recommended line Alternative 1A, using single steel pole construction, will be used to fit the two lines within the existing right-of-way.

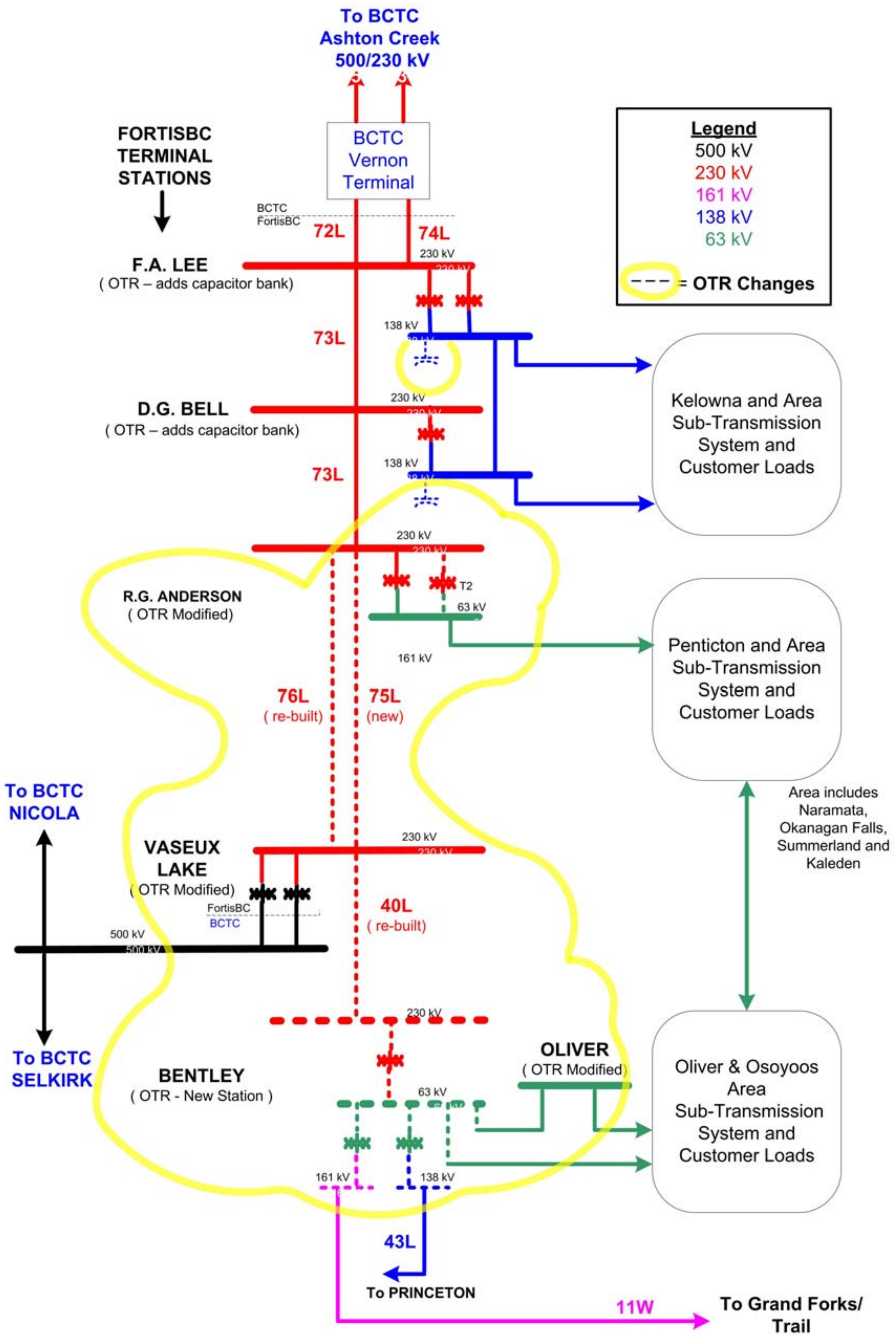
2. **New 230/161/138/60 kV Bentley Terminal Station**

   The new Bentley Terminal station is required for transmission voltage conversion and switching in the Oliver area. The existing Oliver Terminal station is not adequate as it has less than 20% of the required space for new transmission equipment and adjacent development does not allow expansion of the existing site. The new Bentley Terminal station will connect to the new 230 kV line as well as the existing 11W Line (161 kV supplied from Warfield), 43 Line (138 kV to Princeton) and area 63 kV sub-transmission lines.

3. 230 kV line between Vaseux Lake and Bentley Terminal Stations

The existing 11 kilometre 40 Line (161 kV) between Vaseux Lake and Bentley Terminal stations will be replaced with a 230 kV line to increase transmission capacity and to be compatible with the conversion to 230 kV at the Vaseux Lake Terminal station. Steel pole H-frame construction will be used to reduce the risk of line loss due to wildfire as has been experienced in events such as the Okanagan Mountain Park Wildfire of 2003.

Figure 4-1: Transmission System Post OTR Project



4. Upgrade of Existing Terminal Stations

Vaseux Lake Terminal Station

The Vaseux Lake Terminal station upgrades include re-connecting existing pre-equipped transformers and minor equipment change outs to accommodate the voltage change from 161 to 230 kV; adding two 230 kV circuit breakers for the new 230 kV line to Penticton with the addition of associated protection and control equipment to allow independent switching of the transformers; and providing a new 500 kV circuit breaker on the BCTC 500 kV side of the station, with protection and control changes to accommodate independent switching of the FortisBC transformers.

RG Anderson Terminal Station

The RG Anderson Terminal station upgrades include completing a 230 kV ring bus with three new 230 kV circuit breakers for the two new 230 kV lines from Vaseux Lake Terminal station with addition of associated protection and control equipment; and replacing Transformer 2 with a new transformer (Transformer 4) that is more electrically compatible to operate in parallel with the existing Transformer 1.

Oliver Terminal Station

The Oliver Terminal station upgrade includes converting the station from a 161/138/63 kV transmission and distribution terminal to a 63/13 kV distribution station. The aged distribution portion of the station will be replaced, and the rebuilt substation will then include room for future distribution expansion.

FA Lee Terminal Station

The FA Lee Terminal station upgrades include installing one 138 kV circuit breaker and a 30 Mvar capacitor bank for voltage support during transmission contingencies.

DG Bell Terminal Station

The DG Bell Terminal station upgrades include installing one 138 kV circuit breaker and a 30 Mvar capacitor bank for voltage support during transmission contingencies.

5. FortisBC and BCTC Remedial Action Schemes (RAS)

Due to the proposed stronger interconnection with the BCTC transmission system supplying the Okanagan, FortisBC funded the stability studies for the interconnection. The results of these studies indicate that minor modifications to the FortisBC and BCTC RAS are needed. The FortisBC and BCTC RAS maintain system stability by automatically adjusting the power system to respond to contingency events.

4.1.2 Summary of OTR Project Costs

A summary of OTR Project costs is provided in Table 4-1-2 below.

1 **Table 4-1-2: Summary of Project Costs (+20/-10% Escalated as spent dollars)**

	Components of the Project	2006/2007	2008	2009	2010	Total
		($000s)				
1	75/76 Lines Vaseux to RG Anderson - New 230 kV Construction on existing right-of-way (28 kilometres)		5,553	27,764	22,211	55,527
2	40 Line Vaseux to Bentley – New 230 kV Construction on existing right-of-way (11 kilometres)		455	2,275	1,820	4,550
3	63 and 138 kV Circuit Connections Oliver-Bentley (300 metres)		67	336	269	672
4	Bentley Terminal Station – New Construction		3,099	15,495	12,396	30,990
5	Oliver Terminal Station – Upgrade		569	2,844	2,275	5,687
6	RG Anderson Terminal Station – Upgrade		1,050	5,249	4,199	10,498
7	FA Lee Terminal Station – Capacitor Bank Addition		167	837	670	1,675
8	DG Bell Terminal Station – Capacitor Bank Addition		162	811	649	1,622
9	Vaseux Lake Terminal Station – 230 kV Upgrades		444	2,220	1,776	4,440
10	Vaseux Lake Terminal Station – 500 kV Upgrades		293	1,464	1,171	2,928
11	Planning and Preliminary Engineering	3,972	1,391			5,363
12	Project Management and Operations Support		381	1,903	1,523	3,807
13	**Subtotal**	**3,972**	**13,631**	**61,199**	**48,959**	**127,760**
14	Allowance for Funds used During Construction (AFUDC)		647	2,892	6,197	9,736
15	Removals and Salvage			1,174	2,738	3,912
16	**Total**	**3,972**	**14,278**	**65,264**	**57,894**	**141,408**

4.2 ENGINEERING DESIGN AND CAPACITY

The proposed OTR Project will increase Kelowna - Penticton load capacity under normal system conditions (N-0) by approximately 360 MVA and the capacity for single (N-1) and double (N-1-1, N-2) system contingency conditions by approximately 170 MVA and 260 MVA respectively. As outlined in section 3 - Project Justification, this capacity will provide for load growth within the planning timeframe and significantly improve reliability under single and double contingency conditions. The proposed OTR Project also provides a number of other benefits as described in section 3.4.

4.2.1 Transmission

Preliminary engineering for transmission line layout using digital elevation modeling of the routes was completed to support Project definition work, public consultation, and to evaluate structure types and configurations. Right-of-way access, geotechnical stability and vegetation analyses were conducted in early 2007 using orthographic photography, digital elevation modeling, and aerial and sample ground inspections to assess feasibility of the line route alternatives. The preliminary designs identify types of structures and right-of-way use that will be required. These designs will be refined as part of detailed design after OTR Project approval. (Please refer to Appendix E for mapping and Appendix C for additional engineering requirements for the transmission lines.)

Structure type and location were based on balanced objectives that would:

- Minimize disruption to current land use along the right-of-way;
- Minimize construction of new access roads and vegetation removal;
- Reduce electromagnetic fields, radio frequency interference and audible noise as much as practical;
- Minimize impacts on the aesthetic appearance of the right-of-way;
- Improve line reliability;
- Decrease fire hazard; and

- Be cost effective.

To meet these objectives the proposed OTR Project will locate the new structures next to existing structures within the right-of-way to provide the required line clearances. Galvanized steel poles will be used rather than lattice steel towers or wood poles for reliability purposes, to minimize wildfire damage risk, and to minimize impact on the right-of-way and property owners. Optimization of individual pole locations may occur during detailed line design and during consultation with property owners.

The fibre-optic cable currently mounted on the 76 Line and 40 Line structures will be re-located to these new structures.

The proposed Transmission Line Design is described below.

1. **Vaseux Lake Terminal Station to RG Anderson Terminal Station (double circuit: 75 Line/76 Line)**

   Using recommended line route Alternative 1A, the existing 28 kilometres of 76 Line (single circuit 161 kV transmission) will be reconstructed to a 230 kV transmission double circuit (75 Line and 76 Line) within the existing brownfield right-of-way, with these key aspects:

   - The existing right-of-way established in 1965 is on average 40 metres wide and runs east 1.7 kilometres from Vaseux Lake Terminal, then 26.3 kilometres north on the east side of Eagle Bluff, Vaseux Lake, Okanagan Falls and Skaha Lake to RG Anderson Terminal station on the east side of Penticton. The right-of-way crosses 2 kilometres of farm acreage in the Shuttleworth Creek area and about 0.8 kilometres of vineyards and 1.6 kilometres of the Heritage Hills residential area south of Penticton. The 100 existing 161 kV, 16 metre tall H-frame wood pole structures will be salvaged. Some temporary new access trails or upgrades to existing access trails will be required prior to construction. About 6 to 8 kilometres of the route is helicopter only access. Minimal hazard tree clearing will be required to prepare the right-of-way.

- The two new transmission lines will primarily be on single braced-post steel poles (double circuit construction) for normal length and straight spans, with steel davit arm or two steel poles for span turns or longer spans. The first 1.7 kilometres east of Vaseux Lake Terminal station will be two sets of single pole structures (partially pre-built as part of the SOK Project) before combining onto double circuit structures. The typical 30 metre high double circuit structures will be located near the centre of the existing brownfield right-of-way and generally stationed where the existing line structures are. The foundations for the poles will be direct buried, rock anchored reinforced concrete or shallow earth reinforced concrete bases, depending on ground conditions. The poles and conductors will have non-glare galvanized finishes to minimize visual impacts. The “Bunting” or 33 millimetre diameter Aluminum Conductor Steel Reinforced (ASCR) conductors will generally be aligned vertically to fit within the right-of-way and the phasing configured to minimize Electric Magnetic Field (EMF) at the right-of-way boundary.

Figure 4-2-1A below shows the existing FortisBC and BCTC transmission lines on the right-of-way to the east of the Vaseux Lake Terminal station.

Figure 4-2-1A: Eastern view of right-of-way above Vaseux Lake Terminal

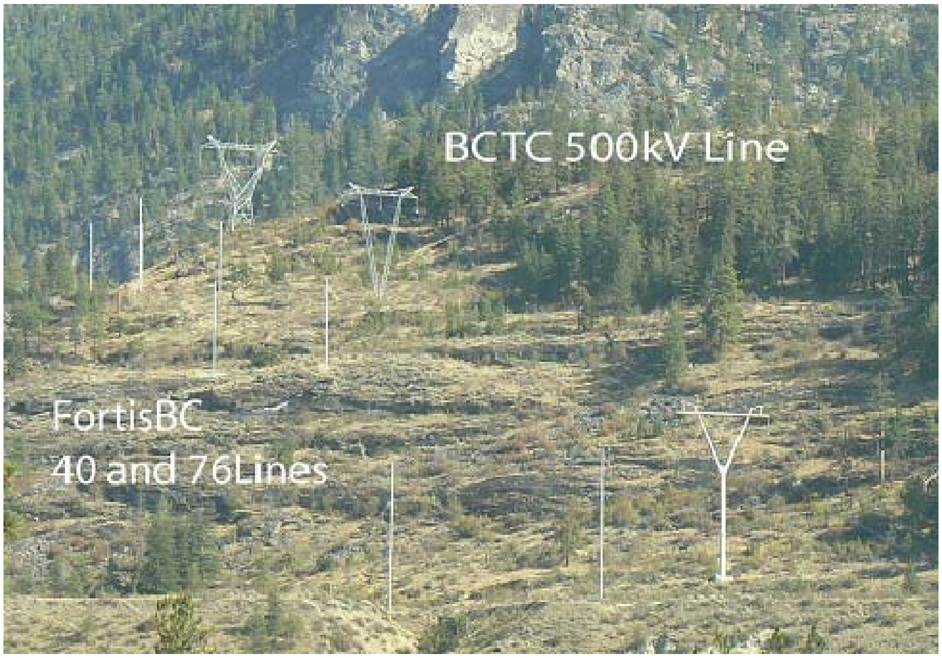


Figure 4-2-1B is a photograph of the existing H-Frame 161 kV structure on the existing 76 Line right-of-way in the McLean Creek area.

Figure 4-2-1B: Existing 76 Line - Allendale Lake Road

Figure 4-2-1C is a rendering of the proposed single pole double circuit 203 kV (75 Line/76 Line) on the existing brownfield right-of-way.

Figure 4-2-1C: Rendering of Double Circuit – Allendale Lake Road

Figure 4-2-1D is a photograph of the existing H-Frame 161 kV 76 Line located on the existing brownfield right-of-way in the Heritage Hills area.

Figure 4-2-1D: Existing 76 Line - Apple Road, Heritage Hills

Figure 4-2-1E is a rendering of the proposed double circuit 230 kV 75 Line/76 Line on the existing right-of-way.

Figure 4-2-1E: Rendering of Double Circuit – Apple Road, Heritage Hills

Figure 4-2-1F on the following page is a photograph of the existing H-Frame 161 kV 76 Line located on the existing right-of-way in the Heritage Hills area. Figure 4-2-1G, also on the following page, is a rendering of the proposed single pole double circuit 230 kV 75 Line/76 Line on the existing right-of-way.

Figure 4-2-1F: Existing 76 Line, Heritage Boulevard, Heritage Hills

Figure 4-2-1G: Rendering of Double Circuit, Heritage Boulevard, Heritage Hills

The construction activities will be timed to fit within seasonal and operational periods where environmental impacts are minimized and transmission equipment outages are possible. Activities will consist of the following:

- Minimal preparation along the right-of-way for access and vegetation clearing;
- Installation of pole foundations and anchors;
- Installation of steel poles coordinated with the removal of the old structures and transfer of the existing fibre-optic cable (combination of construction crane and helicopter lifts);
- Installation of conductors, overhead ground wires and any required buried ground wires near station entries;
- Right-of-way restoration including a temporary construction road for decommissioning; and
- Installation of new transmission entry structures at Vaseux Lake and RG Anderson stations to terminate the lines.

2. Vaseux Lake Terminal Station to Bentley Terminal Station in Oliver (40 Line)

The existing 40 Line (11 kilometres) will be reconstructed from single circuit 161 kV line to a single circuit 230 kV transmission line with these key aspects:

- The existing right-of-way established in 1965, is on average 40 metres wide and runs 1.7 kilometres east from Vaseux Lake Terminal, then south 9.3 kilometres on the east side of the Okanagan Valley through the Osoyoos Indian Band Lands to Oliver. The new line will use the existing right-of-way. Some new temporary access with minimal danger tree clearing will be required for the construction. The 45 existing 161 kV 16 metre high, H-frame wood pole structures will be salvaged.

Figure 4-2-1H and Figure 4-2-1I are photographs of existing H-Frame 161 kV 40 Line structures located on the existing right-of-way between Vaseux Lake Terminal station and Oliver Terminal station.

Figure 4-2-1H: Existing 40 Line – Manuel's Canyon – North of Oliver

Figure 4-2-1I: Existing 40 Line Osoyoos Indian Band Land NE of Oliver

- New 17 metre high galvanized steel pole H-frame construction will be used to reduce risk of extended line outages due to wildfire. During the detailed design and tendering work the use of wood poles on sections where fire risks are lower will be reviewed based on commodity prices for steel or wood poles. Structures will generally be stationed where the existing line structures are but offset about 3 metres east of the existing structures for line clearances. The pole bases will be either directly buried in earth or in blasted rock holes depending on ground conditions. The poles and conductors will have non-glare galvanized finishes to minimize visual impacts.
- The construction activities will be timed to fit within seasonal and operational periods where environmental impacts are minimized and transmission equipment outages are possible and will consist of the following activities:
    - Minimal preparation along the right-of-way for access and vegetation clearing;
    - Installation of steel poles coordinated with the removal of the old structures and transfer of the existing fibre-optic cable (combination of construction crane and helicopter lifts);
    - Installation of conductors, overhead ground wires and any required buried ground wires near station entries;
    - Right-of-way restoration including a temporary construction road for decommissioning; and
    - Installation of new transmission entry structure at Bentley station to terminate the 40 Line.

3. Bentley Terminal Station to Oliver Terminal Station Lines (66 Line, 68 Line, 69 Line, 43 Line, 11W Line)

The new Bentley Terminal station will be located about 300 metres east from the existing Oliver Terminal station. Five lines currently terminating at the Oliver

Terminal station will need to be re-terminated within the existing right-of-way between the terminal stations. Several existing structures will be replaced by new structures to facilitate the line changes.

4.2.2 Stations

Preliminary station engineering was completed to support Project definition work, public consultation and to evaluate different station configurations. The preliminary designs provide good indication of expected station layouts. These designs will be refined as part of detailed design after Project approval. (Refer to Appendix C for drawings and additional details with regard to the stations.)

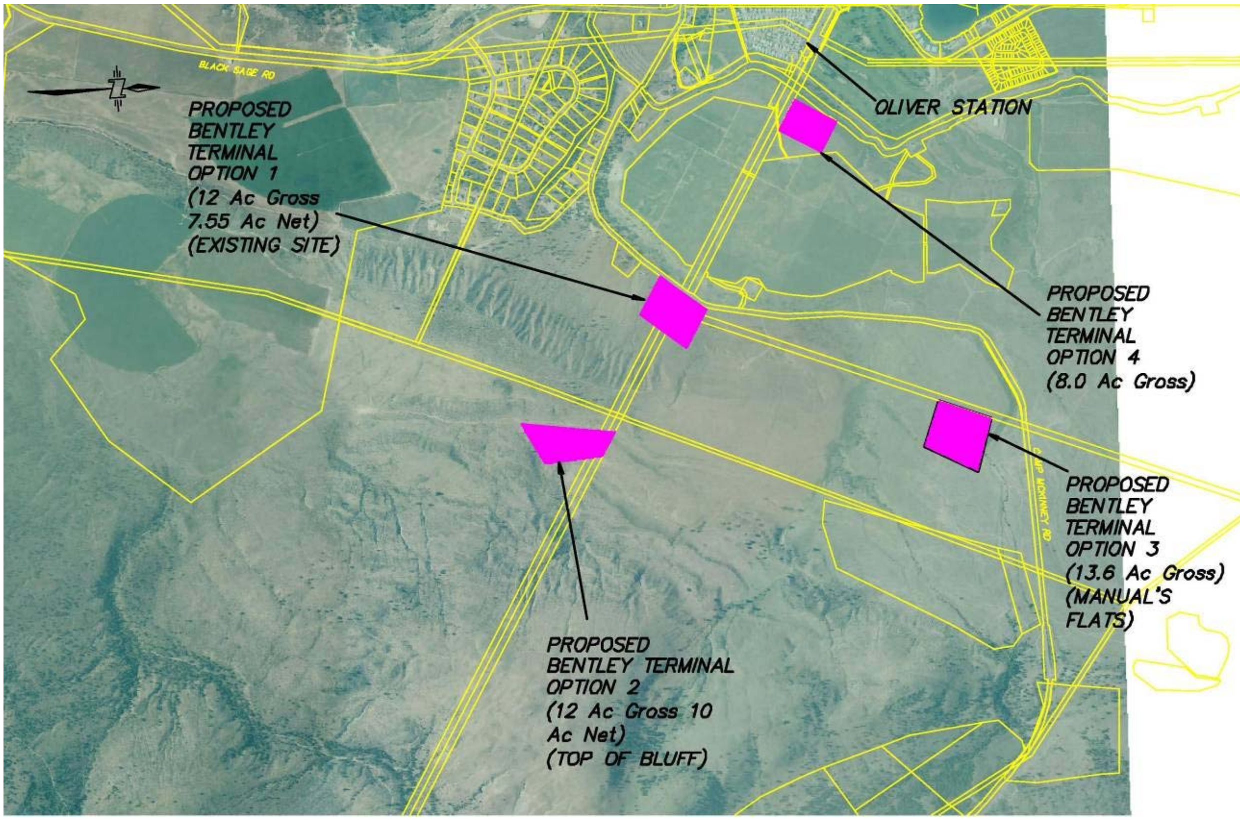
Design summaries for the OTR Project substations are provided below.

1. **New 230/161/138/63 kV Bentley Terminal Station:**

   As described in section 3.1.3.6, the existing Oliver Terminal station site is not large enough to accept the termination of the new 230 kV transmission lines, and a new station site is required. The new Bentley Terminal station will be located on Osoyoos Indian Band (OIB) land. The site for the station was identified after extensive consultation with the OIB on several potential sites adjacent to the existing transmission right-of-way. The site chosen was the most acceptable to the OIB and with acceptable environmental impact.

   Three site options were initially assessed for the terminal location. The first site (Site Option 1, Figure 4-2-1J) was the former switching station site along McKinney Road east of Oliver where the existing transmission lines cross the road. The station was decommissioned from service in the early 1990s as a result of upgrades at the Oliver Terminal.

4-2-1J: Bentley Terminal Station Site Options



Community input, size and technical constraints contributed to the selection of 2 additional sites (Site Options 2 and 3). Site Option 2 was discarded as it failed to meet engineering thresholds and was not cost effective. Site Option 3 was considered to be the most cost effective and met engineering and constructability criteria. However, the site was found to be unavailable because of future OIB development plans. The OIB then suggested Site Option 4 for consideration. FortisBC considered this Option acceptable after assessing cost, engineering and constructability.

FortisBC signed a Memorandum of Understanding (MOU) with the OIB on September 7, 2005 to enter into a lease and permit agreements for the Nk'Mip Substation site (approved under BCUC Order C-1-06), the Bentley Terminal station site, and a linear corridor between both stations for transmission and distribution line purposes. A copy of the MOU is contained in Appendix F.

A federal Order-in-Council approved the MOU resulting in lease and permit agreements for the Nk'Mip and the proposed Bentley Terminal site were completed in 2007.

Execution of the Bentley Terminal lease, also covered by the Order-in-Council, is in progress. Draft Environmental Assessment Reports, initial civil engineering, and site surveys have been filed with Indian and Northern Affairs Canada (INAC). The lease payment has been paid to INAC, in trust. Funds will be released to the Osoyoos Indian Band by INAC upon final lease sign off.

Figure 4-2-1K shows the new Bentley Terminal station site in relation to the existing Oliver Terminal station.

Figure 4-2-1K: Oliver Terminal Station and Proposed Bentley Terminal Site

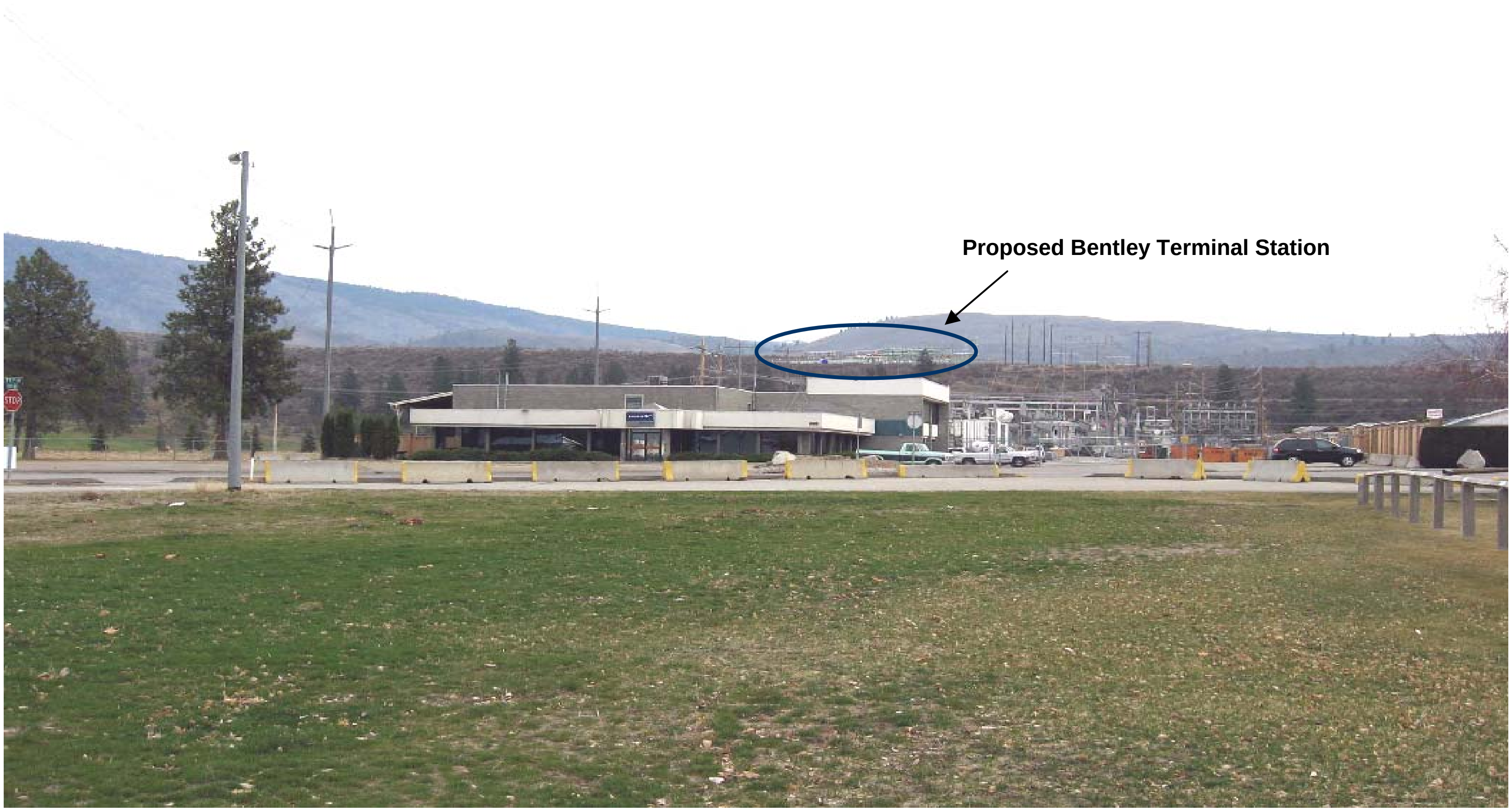
Major equipment for this multi-voltage (Bentley) transmission station will include:

- One 230 kV, one 161 kV and one 138 kV line circuit breakers;
- Six 63 kV circuit breakers to form a ring bus configuration on the 63 kV transmission side;

- 168 MVA 230/63 kV dual winding transformer with on-load tap changers relocated from RG Anderson Terminal station;
- New 150 MVA 161/63 kV transformer re-connectable to 138/63 kV with on-load tap changer;
- New 100 MVA 138/63 kV transformer with on-load tap changer; and
- Protection and control systems housed in a control building.

The station is designed to minimize visual impact by locating higher voltage equipment on the east side of the station and utilizing a compact bus design for the 63 kV portion of the station. The station site is also located partially in a natural depression on the bench land. To accommodate growth, space is provided for future 63 kV and 138 kV lines and a future conversion of the 161 kV line to Grand Forks/Warfield to 138 kV. A rendering of the future Bentley Terminal station viewed from the existing Oliver Terminal station site is provided in Figure 4-2-1L.

Figure 4-2-1L: Rendering of Bentley Terminal Station located above and east of the existing Oliver Terminal in the foreground



A rendering of the future Bentley Terminal station is also shown in Figure 4-2-1M.

Figure 4-2-1M: Rendering of Bentley Terminal Station looking west toward Oliver

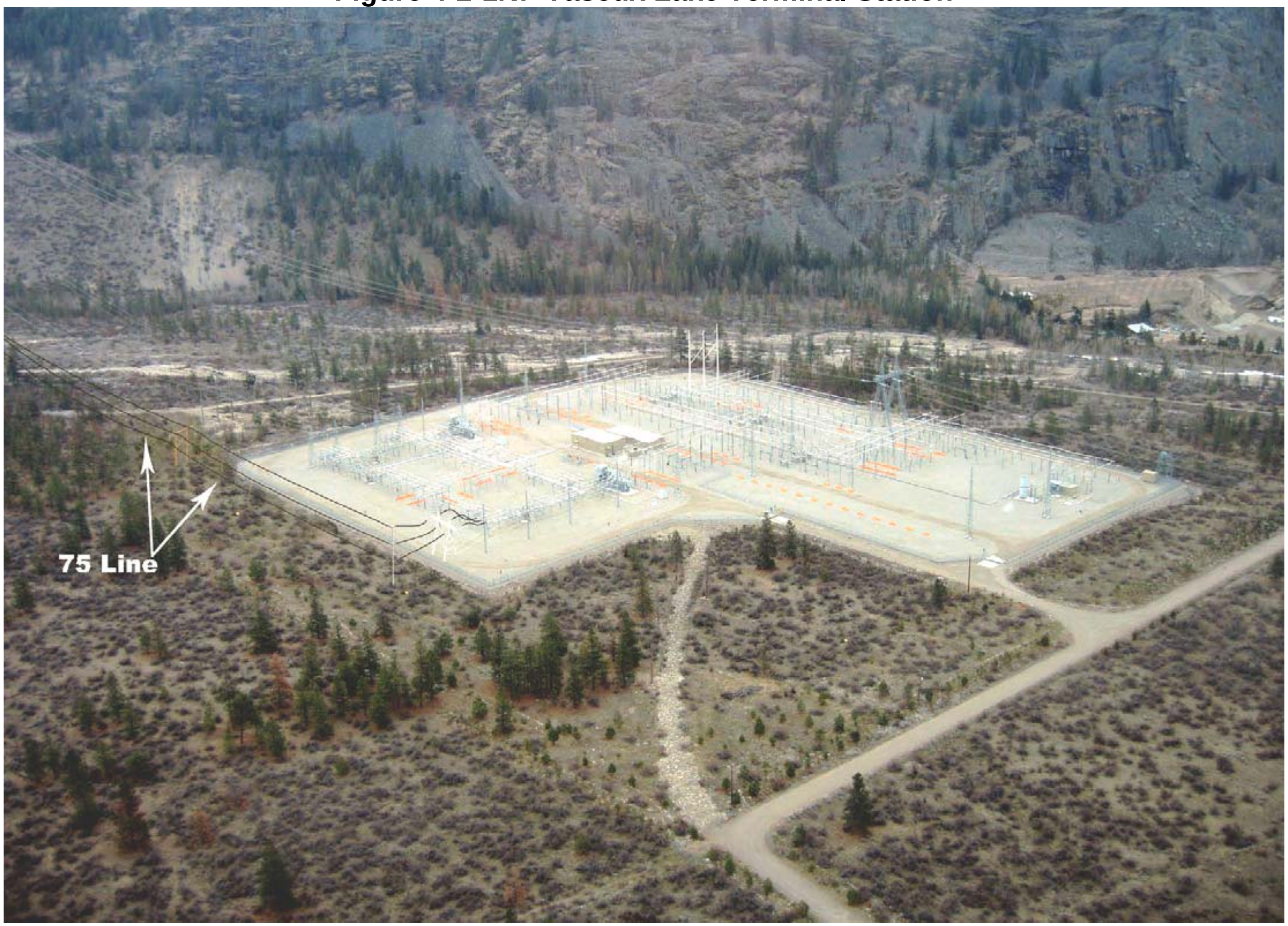
2. Vaseux Lake Terminal

The Vaseux Lake Terminal station (completed in 2005) was designed in anticipation of a future voltage conversion from 161 kV to 230 kV that could be accommodated by reconnecting existing pre-equipped transformers, along with minor equipment change outs. The modification for this Project will be within the foot-print of the existing station fence line. Major equipment for this transmission station will include:

- Addition of two 230 kV circuit breakers and associated protection and control equipment; and
- Addition of a new 500 kV circuit breaker with bus and protection and control changes. (Note: the 500 kV side of the station is managed by BCTC.)

1 The rendering in Figure 4-2-1N below shows the new 75 Line leaving the station at lower left-hand corner, on the
2 north side of the station.

Figure 4-2-1N: Vaseux Lake Terminal Station



3. RG Anderson Terminal Station

The RG Anderson Terminal station was built in east Penticton in the 1960s and most recently upgraded in 2004-05. The upgrade included preparations for completing the 230 kV bus ring on the high-voltage portion of the station and removing the existing 230 -161 kV split configuration. The modification for this Project will be within the foot-print of the existing station fence line. Major equipment for this terminal station will include:

- Installing three new 230 kV circuit breakers and addition of associated protection and control equipment;
- Replacing Transformer 2 with a new transformer (Transformer 4) more electrically compatible to operate in parallel with the existing Transformer 1 (the existing Transformer 2 will be re-located to the Bentley Terminal station); and
- Adding a 63 kV bus-tie circuit breaker to isolate sections without incurring outages for maintenance and to improve reliability.

4. Oliver Terminal Station

The Oliver Terminal station will be converted from a 161/138/63 kV transmission and distribution terminal to a 63 kV to 13 kV distribution station. Station changes will include:

- Removing the existing 161 kV equipment, including circuit breakers and two transformers for salvage;
- Re-building the aged distribution portion of the station to current 63/13 kV distribution station standards including a mobile transformer connection point; and
- Adding a 63 kV bus-tie circuit breaker to facilitate maintenance without load outages to isolate sections and to improve reliability.

5. **FA Lee and DG Bell Terminal Stations**

The modifications for this Project will be within the foot print of the existing stations' fence lines which are both located in Kelowna. FA Lee and DG Bell Terminal stations modifications include:

- Adding in each station one 138 kV circuit breaker and a 30 Mvar capacitor bank for voltage support during transmission contingencies.

4.3 ALTERNATIVE TRANSMISSION ROUTES

All transmission line upgrades and additions contained in the proposed OTR Project can be accomplished within the existing brownfield rights-of-way. Alternate routes or structure configurations that require new or wider rights-of-way may be difficult to acquire in all areas. Examples include lands around the lines in the Oliver – Vaseux Lake area, where a number of protected lands and nature preserves exist, as well as east of Skaha Lake which has been proposed as a wildlife management area dedicated to the unique ecology of the region.

4.3.1 Transmission Line Sections

1. **40 Line - Vaseux Lake to Bentley Terminal Station**

The preferred route for the 230 kV rebuild of 40 Line from Vaseux Lake south to the new Bentley Terminal station is the existing right-of-way. The 40 Line right-of-way is on Osoyoos Indian Band land for 4 kilometres east and north of Oliver Terminal station. No reasons to modify the route were identified during the planning stage or during the public consultation process.

2. **75 Line and 76 Line - Vaseux Lake Terminal to Shuttleworth Creek section**

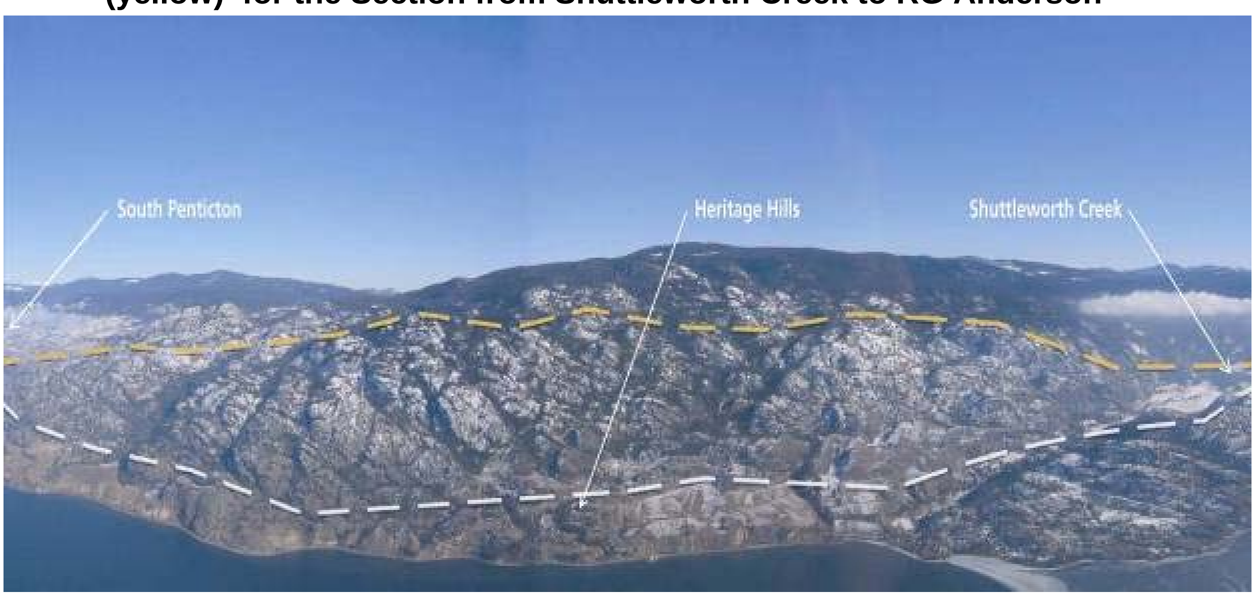
The preferred route for the two 230 kV transmission lines (75 Line and 76 Line) from Vaseux Lake north to the Shuttleworth Creek area is the existing right-of-way. The preferred line construction type is single steel pole carrying both lines, which will allow the two transmission lines to fit within the existing right-of-way with no requirement for widening. Like 40 Line, these lines also cross protected lands. No reasons to modify the route for this line section were identified during the planning stage or during stakeholder consultations.

3. 75 Line and 76 Line - Shuttleworth Creek to RG Anderson Terminal section

Property development has occurred or is planned along 4 to 5 kilometres of the line section running 18.5 kilometres from Shuttleworth Creek to RG Anderson Terminal station. Some residents in the areas of Shuttleworth Creek, and Heritage Hills, and in the Evergreen Drive neighborhood of Penticton raised concerns during the public consultation process about the transmission line staying in the right-of-way and have expressed the desire to see this section of the line corridor move east onto a new greenfield right-of-way uphill on Crown land.

For the 75 Line/76 Line section from south of Shuttleworth Creek to RG Anderson, two possible routes with three possible line configurations were identified and combined to create five alternatives that were evaluated. The Upland greenfield route was developed on the basis of minimizing cost and environmental impacts, where possible. The two route Alternatives are shown in Figure 4-3-1 below and mapped in Appendix E.

Figure 4-3-1A: Existing Brownfield Route (white) and Upland Greenfield Route (yellow) for the Section from Shuttleworth Creek to RG Anderson



Alternative Routes for 75 Line/76 Line between Shuttleworth Creek and RG Anderson Terminal

Alternative 1A (the preferred Alternative) and Alternative 1B would make use of the existing 18.5 kilometre right-of-way, and Alternatives 2A and 2B would be greenfield construction on 19.2 kilometres of new right-of-way on a higher elevation upland route. Alternative 3 would consist of splitting the two lines into lower height single circuit transmission lines, one running on the existing right-of-way and the other on the alternate Upland route. The Alternative 3 combination was identified to partially address concerns expressed by some local residents with respect to the additional height of structures for a double circuit, as this alternative would use lower height H-frame structures.

The five alternatives for the line section for the two circuits from Shuttleworth Creek to RG Anderson Terminal station, using combinations of the two feasible routes and structure types are shown in Figure 4-3-1B below and are summarized as follows:

Alternative 1A (Cross Section C) – Existing brownfield route 18.5 kilometres long with primarily a 30 metre high single steel pole two-circuit configuration located on the existing 40 metre wide right-of-way. This configuration has features that minimize right-of-way usage, and that reduce the aesthetic impacts and EMF aspects of the lines on the existing right-of-way with no greenfield environmental impacts.

Alternative 1B (Cross Section E) – Existing brownfield route 18.5 kilometres long with primarily a 30 metre high double circuit H-frame configuration located on the existing 40 metre wide right-of-way. This configuration has features that minimize construction costs but occupies more of the right-of-way, and has less mitigation of aesthetic and EMF aspects than Alternative 1A.

Alternative 2A (Cross Section C)– Upland greenfield route 19.2 kilometres long with primarily a 30 metre high single steel pole two circuit configuration, requiring a new 40 metre wide right-of-way through tenured Crown land. This configuration has features that minimize right-of-way usage, and reduces the aesthetic impact and EMF aspects of the lines on the required new right-of-way. The new right-of-way is estimated to have a footprint of approximately 77 hectares and a corresponding environmental impact.

Alternative 2B (Cross Section D) – Upland greenfield route 19.2 kilometres long with primarily a 19 metre high two single-circuit, H-frame, steel pole circuit configuration, requiring a new 51 to 60 metre wide right-of-way through tenured Crown land. This configuration reduces construction costs but requires wider right-of-way than Alternative 2A. The new right-of-way is estimated to have a footprint of approximately 105 hectares and a corresponding environmental impact.

Alternative 3 (Cross Section B)– Combination of existing brownfield route (18.5 kilometres) and Upland greenfield route (19.2 kilometres) with primarily a 19 metre high single-circuit steel pole H-frame configuration on each route. A new 40 metre wide right-of-way is required over Crown lands for the Upland route in addition to re-use of the existing right-of-way. This configuration offers higher system security due to diversity of the line routes and uses structures smaller than Alternatives 1A, 1B and 2A. The new right-of-way is estimated to have a footprint of approximately 77 hectares and a corresponding environmental impact.

FortisBC has conducted engineering at a planning level for Alternative 2A and Alternative 3 and at a preliminary level for Alternative 2B to define construction issues and costs. Alternative 2B is considered more viable on a cost and impact basis than Alternative 2A and Alternative 3 at this time. FortisBC has also completed the Environmental and Social Impacts Assessment for the Upland greenfield route and refined the route based on the field studies. Using this work FortisBC has prepared budget and schedule considerations for the Upland Alternatives for evaluation and comparison.

Figure 4-3-1B: Typical Right-of-way Cross Sections

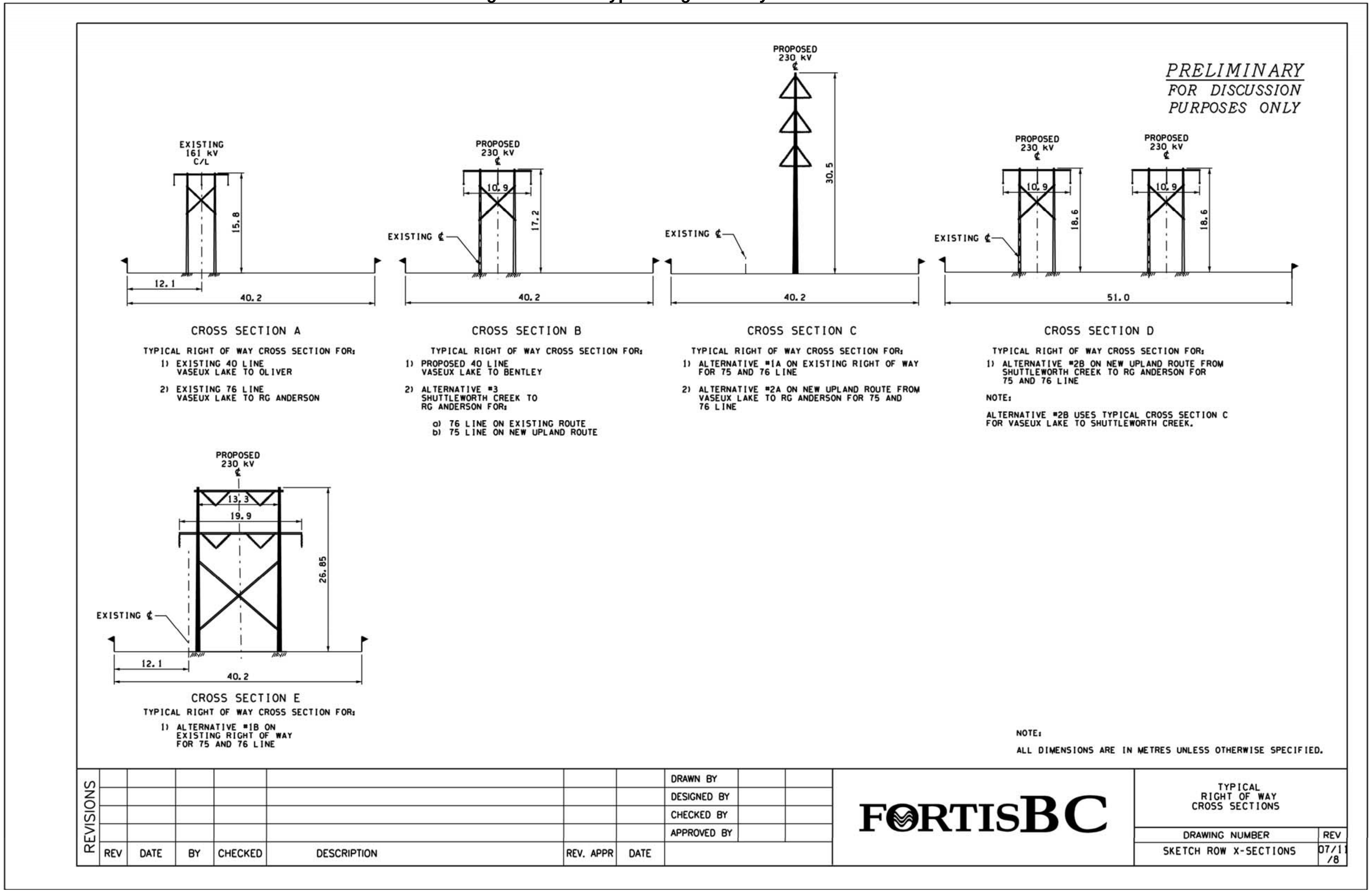


Table 4-3-1C below provides a comparison of the five alternatives for the line section from Shuttleworth Creek to RG Anderson using information from preliminary design, environmental and archaeological screening studies and public consultation.

Table 4-3-1C: Comparison of Transmission Line Alternative Features

Shuttleworth Creek to RG Anderson Transmission Line Alternative					
	Alternative 1A Existing Corridor – Single Pole Double Circuit	**Alternative 1B Existing Corridor – H-Frame structure Double Circuit**	**Alternative 2A Upland - Single Pole Double Circuit**	**Alternative 2B Upland-Two Single Circuits**	**Alternative 3 Two Single Circuits – One Existing, One Upland**
General Information					
Description	Existing line corridor with two circuits on single pole double circuit structures from Shuttleworth Creek at the 400 to 500 metre elevation north to RG Anderson Terminal station. Design with aesthetic poles and conductors and for minimum EMF.	Existing line corridor with two circuits on double circuit H-frame structures. From Shuttleworth Creek at the 400 to 500 metre elevation north to RG Anderson Terminal station.	Upland route with two circuits on single pole double circuit structures from south of Shuttleworth Creek diverting east, and up hill to the 1,000 to 1,200 metre elevation then north to RG Anderson Terminal station. Design using aesthetic poles and conductors and minimum EMF.	Upland route two single circuits each on H-frame structures routed south of Shuttleworth Creek diverting east, and up hill to the 1,000 to 1,200 metre elevation then north to RG Anderson Terminal station.	One line on Existing Route the second line on Upland Route Shuttleworth Creek to RG Anderson Terminal station. Each on H-frame structures.
Length of total route alternative and average width	18.5 kilometres of double circuit structures, average 40 metre wide right-of-way.		19.2 kilometres of double circuit structures, average 40 metre wide right-of-way.	19.2 kilometres of two single circuit structures, average 51 to 60 metre wide right-of-way.	18.5 and 19.2 kilometres of single circuit structures, average 40 metre wide right-of-way.

	Alternative 1A Existing Corridor – Single Pole Double Circuit	Alternative 1B Existing Corridor – H-Frame structure Double Circuit	Alternative 2A Upland - Single Pole Double Circuit	Alternative 2B Upland-Two Single Circuits	Alternative 3 Two Single Circuits – One Existing, One Upland
Environmental Issues on Alternative Sections (within a 500 metre buffer)					
Adjacent Lakes (No impact to lakes)	Vaseux Lake is 500 metres west separated by a height of land. Skaha Lake is within 100-500 metres for 6.0 kilometres of the route		Vaseux Lake is 500 metres west separated by a height of land. Skaha Lake is about 1,500 metres west for 6.0 kilometres of the route		
Wetland Features	Some wetland features requiring care in pole placement in some areas.		Some wetland features requiring care in pole placement in some areas. There is a unique wetland feature on the upland route due to vegetation types and a microclimate that is not normally found at that altitude.		
Wildlife Habitat	Quality habitat used by a variety of species adapted to the existing right-of-way and residual impacts. Crosses sheep wintering areas.		Quality habitat used by a variety of species in a pristine setting including at risk bird species such as the Williamson's Sapsucker as well as the California Big Horn Sheep and other large mammals. Residual access is a key concern as it may provide undesired public access into these pristine areas. Crosses sheep summer and fall foraging areas. For Alternative 3 the same issues above and for Alternative 1 apply.		

	Alternative 1A Existing Corridor – Single Pole Double Circuit	Alternative 1B Existing Corridor – H-Frame structure Double Circuit	Alternative 2A Upland - Single Pole Double Circuit	Alternative 2B Upland-Two Single Circuits	Alternative 3 Two Single Circuits – One Existing, One Upland
Socio-economic Issues					
Land Use	Utilizes existing linear corridor for 100% of the 18.5 kilometre route. Some development around 4 to 5 kilometres of the route. Crosses more agricultural and residential areas.	Same as Alternative 1A plus line structures occupy more of the right-of-way width.	19.2 kilometres of new corridor primarily on Crown land a minimum of 40 metres wide. Number of tenure holders in area. Natural forested area crosses trapping, backcountry guiding/ outfitting areas.	19.2 kilometres of new corridor primarily on Crown land a minimum of 51 to 60 metres wide. Number of tenure holders in area. Natural forested area crosses trapping, backcountry guiding/ outfitting areas.	19.2 kilometres of new corridor primarily on Crown land plus 18.5 kilometres of existing corridor average about 40 metres wide. Number of tenure holders in area. Natural forested area crosses trapping, backcountry guiding/ outfitting areas.
First Nations	Existing right-of-way.		Crosses Crown Land that has traditional use areas of the First Nations and a pending claim to some rights.		
Parks, Heritage and Other Identified Recreation Areas	Near area of recreational rock climbing which is a Proposed Protected Area		Crown Land area has guiding and other tenure holders. Proposed Wildlife Management Area and Resource Management Zone in the area.		
Regulatory Issues					
BC Ministry of Environment	Protection of Species At Risk		Protection of Species At Risk. Residual access into new wildlife habitat. Planned Wildlife Management Area.		
BC Ministry of Forests and Range	No significant concerns		Fire protection and minimize loss of timber		
Integrated Land Management Bureau	Right-of-way established including on Crown Land.		Requires acquisition of tenure on Crown Land. Proposed Upland Line route has conflicts with Land and Resource Management Plan for the region. ILMB has concerns with full First Nations input; grazing tenures and California Big Horn Sheep Management areas. These have potential Project Schedule impacts.		

	Alternative 1A Existing Corridor – Single Pole Double Circuit	Alternative 1B Existing Corridor – H-Frame structure Double Circuit	Alternative 2A Upland - Single Pole Double Circuit	Alternative 2B Upland-Two Single Circuits	Alternative 3 Two Single Circuits – One Existing, One Upland
Line Design, Construction, and Maintenance Issues					
Maintenance and Operations	Existing access to the route with approximately 2 kilometres of helicopter only access.		Proposed Wildlife Management Area expected to require deactivating of access roads leaving access by helicopter. Periods of valley cloud limit aerial access. Higher elevation has more exposure to lightning and icing.		Same as Alternative 1A and 2A. The route diversity may reduce risk of some double line outages.
Design/Construction	Tall (30 metres), compact width steel structures to fit double circuit in existing right-of-way. Least amount of helicopter construction expected. Existing fibre-optic cable can be re-located to new structures.	Tall (30 metres), steel structures to fit double circuit in existing right-of-way. Less foundation costs than Alt. 1A. Least amount of helicopter construction expected. Existing fibre-optic cable can be re-located to new structures.	Areas of difficult terrain and access, longer spans, with fewer but bigger steel pole structures compared to Alternative 1A. Need to address residual access: Portions require helicopter construction. New fibre-optic cable installation required.	Areas of difficult terrain, longer spans. More common 19 metre tall steel H-frame pole construction for two single circuits. Need to address residual access: Portions require helicopter construction. New fibre-optic cable installation required.	Areas of difficult terrain, longer spans. More common 19 metre tall steel H-frame pole construction for two single circuits. Need to address residual access: Portions require helicopter construction. Existing fibre-optic cable can be re-located to new structures.

4.3.2 Financial Analysis

As discussed in section 3 the OTR Project required in-service date is 2010. Both Alternatives 1A and 1B can meet this in-service date objective. Alternatives 2A, 2B and 3 would not meet the objective as they would have an in-service date of 2012 or later.

For cost comparison purposes only, an in-service date of 2012 has been used in Table 4-3-2A below. Table 4-3-2A provides the cost and NPV analysis comparing the OTR Project using Alternatives 1A and 1B on the existing brownfield right-of-way and the Upland route Alternatives 2A, 2B and 3 requiring a new greenfield right-of-way.

Estimates provided for Alternatives 2A and 3 are at the +35 / -20% planning level, while the estimates for Alternatives 1A, 1B and 2B are at the +20 / -10% a preliminary design level. Estimate detail can be found in Appendix G.

Table 4-3-2A: Route Alternatives (2012) - Cost & NPV Analysis

Alternative	1A	1B	2A	2B	3
	($000s)				
TOTAL CAPITAL COST	147,977	135,584	167,883	153,391	159,852
Net Present Value of Revenue Requirements	60,106	53,335	68,698	60,778	64,312
One-Time Equivalent Rate Impact	1.97%	1.75%	2.26%	2.00%	2.11%

Table 4-3-2B below provides a cost and NPV analysis comparing the preferred route Alternative 1A with Alternative 1B which also uses the existing brownfield right-of-way. Both of these Alternatives have an in-service date of 2010 and both estimates are at the +20 / -10% preliminary design level. Estimate detail can be found in Appendix G.

Table 4-3-2B: Route Alternatives 1A & 1B 2010 in-service Cost & NPV Analysis

Alternative	1A	1B	2A	2B	3
	($000s)				
TOTAL CAPITAL COST	141,408	129,915	No costs are presented for these Alternatives due to time frame associated with acquiring a new right-of-way for the upland route.		
Net Present Value of Revenue Requirements	69,421	61,840			
One-Time Equivalent Rate Impact	2.28%	2.03%			

Alternative 1B is estimated to have the lowest cost regardless of whether the in-service date is 2010 or 2012. FortisBC submits, however, that it is not the most cost-effective alternative when consideration is given to other non-financial project attributes such those discussed in section 4.3.3 below.

4.3.3 Non-Financial Comparison

A non-financial comparison of the five alternatives was prepared using criteria for evaluation that are generally consistent with those put forth with previous projects. The rankings were prepared in accordance with previous BCUC instructions with criteria ranking being 1 to 5 with 1 being the lowest and 5 being the highest rank. Where possible for each criteria one alternative is ranked best and one the poorest. Where issues remain with all alternatives or where there are no meaningful differences between alternatives the rankings may be the same, or there may not be a best or poorest ranked alternative. The following criteria and definitions were used:

Definitions

1. **Reliability** - a measure of availability of electrical supply from the new transmission facilities. Also considers potential for exposure to damage and resulting service outages due to external hazards. For example, some line routes have higher exposure to wildfire, lightning and winter icing and are more difficult to access and repair, extending outage durations.

2. **Operations and Safety**

   a. **Operations** - considers accessibility and operability of the facilities by FortisBC employees and contractors working on system repairs or performing routine maintenance. An example is the degree of difficulty of access to transmission structures with heavy equipment.

   b. **Safety** - considers exposure to injury for persons working on or near line facilities including the general public, FortisBC employees, and contractors. Considerations include limits of approach to energized equipment and safe clearance for vehicles and service equipment. All facilities must be designed and maintained to the applicable safety standards.

3. **Public Health** - applies to known health and environmental issues posed by the transmission facilities, which may include but not be limited to, accidental release of controlled materials, oil spills, and any other such events. FortisBC designs, constructs and operates these facilities to ensure that probability of such events is mitigated. Health Canada has not determined that electric and magnetic fields, at levels associated with typical transmission lines, pose any hazard to public health. As some stakeholders have expressed concern, EMF has been considered separately (see item 10 below).

4. **Risk of Delay** - considers the risk of significant delay to the final in-service date of the proposed facilities. Delays can stem from regulatory process, permitting, zoning applications and procurement schedules.

5. **First Nations** - considers the effect of the Project on the cultural values, economic well being and quality of life of First Nations citizens.

6. **Environmental** - considers potential effects on the natural habitats of both aquatic and land dwelling plants and animals including rare and endangered species.

7. **Parks and Recreation** - considers the potential impact of the Project on the capability of the parks and recreation areas to continue to provide a quality experience for existing and future users.

8. **Aesthetics** - considers visual effects of the proposed facilities that may be observed by residents and visitors in the Project area.

9. **Property Values** - considers the potential effects of the proposed Project on the market value of real estate in the Project area.

10. **Electric and Magnetic Fields**– considers Project compliance with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) reference levels for public exposure. All alternatives will be compliant with the reference levels. FortisBC has ranked the potential for EMF exposure based on proximity and frequency of passage expected on or immediately adjacent to the right-of-way.

11. **Effects during Construction** - considers the temporary disruption to residents, property owners and services near the Project area. Disruptions may include service interruptions, land use, traffic detours and delays, noise and dust.

Table 4-3-3D: Non Financial Comparison of Route Alternatives

(1 = lowest ranking: 5 = highest ranking)

	Criterion	Weighting Factors	Alternative 1A Existing Corridor – Single Pole Double Circuit		Alternative 1B Existing Corridor – H-Frame structure Double Circuit		Alternative 2A Upland - Single Pole Double Circuit		Alternative 2B Upland-Two Single Circuits		Alternative 3 Two Single Circuits – One Existing, One Upland	
			Rank	Weighted Rank	Rank	Weighted Rank	Rank	Weighted Rank	Rank	Weighted Rank	Rank	Weighted Rank
1	**Reliability**	**15**	4	60	4	60	2	30	3	45	5	75
2	**Operations and Safety**	**15**	3	45	3	45	1	15	3	45	4	60
3	**Public Health**	**10**	5	50	5	50	5	50	5	50	5	50
4	**Risk of Delay**	**15**	5	75	5	75	1	15	1	15	2	30
5	**First Nations**	**10**	4	40	4	40	2	20	2	20	2	20
6	**Environmental**	**10**	5	50	4	40	3	30	2	20	1	10
7	**Parks and Recreation**	**5**	4	20	4	20	4	20	4	20	2	10
8	**Aesthetics**	**5**	2	10	1	5	4	20	3	15	2	10
9	**Property Values**	**5**	5	25	5	25	5	25	5	25	5	25
10	**EMF**	**5**	4	20	3	15	5	25	5	25	3	15
11	**Effects during Construction**	**5**	1	5	1	5	3	15	3	15	1	5
12	**Totals**	**100**		**400**		**380**		**265**		**295**		**310**

4.3.4 Ranking Summary

In terms of non-financial criteria, Alternative 1A ranks highest overall, more so for the following criteria: Risk of Delay, First Nations and Environmental. It ranks lower in criteria where the route may impact existing developments near the line. It ranks higher than some of the Alternatives with respect to Reliability, Operations and Safety.

1. **Reliability** - The upland route alternatives have less expected reliability due to additional exposure to lightning strikes, wildfire, and winter ice impacting the lines due to the higher elevation of the route. The difficult higher elevation access also would mean that outage repairs would take longer. During winter months "valley cloud" would make aerial access to upland routes difficult at the 1,000 metre level. Alternative 3 ranks higher in reliability as the two separate routes provide path diversity for two-thirds of the distance from the Vaseux Lake Terminal station to RG Anderson Terminal station resulting in fewer events that would lead to double line outages.

2. **Operations and Safety** - The alternatives with the upland routes raise a number of operational and safety issues relating to line maintenance as well as emergency response time in the event of line damage requiring heavy or specialty equipment due to the limited or aerial access of the upland route. Due to the constraints imposed by the proposed Wildlife Management Area there will be minimal road access for maintenance purposes requiring more line access by helicopter. The alternatives with taller two circuit structures are more challenging to maintain. All Alternatives would be designed to current safety standards so there is little differentiation for public risk.

3. **Public Health** – All the line alternatives will be designed and operated to current standards and there is no scientific basis to distinguish between the alternatives based upon public health considerations.

4. **Risk of Delay** - Alternatives requiring new Crown Land rights-of-way increase the risks associated with Project delay due to the extended period for land

rights acquisition and regulatory approvals the outcomes of which are uncertain. Alternatives with new right-of-way construction will cause delays of 24 months or longer. The risk of Kelowna and Penticton area contingency power outage events would increase with each year of load growth. Alternative 3 might allow construction along the existing right-of-way while the securing new upland right-of-way partially reducing delay risks and costs.

5. **First Nations** - The upland alternate routes cross Crown Land that has traditional use areas of the First Nations and a pending claim to some land rights. Further consultation would be required to identify potential impacts. The existing right-of-way has several documented archeological sites nearby and construction planning has to include procedures to avoid disturbance of these sites. This is considered lesser impact than the Upland route.

6. **Environmental Factors** - The existing route has the smallest environmental footprint as it re-uses right-of-way that is already considered disturbed land and its re-use would be in keeping with Okanagan Shuswap Land Resource Management Plan Objectives and strategies. The alternatives using a new upland route will reduce some quality habitat used by a variety of species in a pristine setting including at risk bird species such as the Williamson's Sapsucker as well as the California Big Horn Sheep and other large mammals. Residual access after construction or for maintenance is a key concern as it may provide undesired public access into these pristine areas. Alternative 3 ranks the lowest due to its presence in both the existing and upland areas.

7. **Parks and Recreation** - The existing right-of-way is near to, but does not impact the climbing cliffs at Skaha Bluffs. The upland alternate routes cross areas where some guiding tenures are in place on the Crown Land. Alternative 3 is ranked lowest due to its presence in both the existing and upland areas.

8. **Aesthetics** – Approximately 2 kilometres of the existing right-of-way runs adjacent to nearby development resulting in a lower rank for Alternative 1A and 1B due to the taller poles and additional conductors. There would be some

mitigation by using non-glare conductors and aesthetic style poles for Alternative 1A versus 1B. The upland Alternatives 2A, 2B, and 3 may increase visibility of the right-of-way in some areas as it would climb uphill east of Shuttleworth Creek. Alternative 2A ranks the highest as it moves away from developed areas and has the smaller width right-of-way. Alternative 3 ranks the lowest by maintaining a presence in the developed areas of the existing right-of-way in addition to impacting the upland area.

9. **Property Values** - FortisBC does not consider any of the route alternatives to have a negative impact on area property market values, and as a result ranks all of the alternatives the same. Property values should not be considered in the final analysis of the route. For Alternative 1A and Alternative 1B the short and long term impact on property values due to the taller poles and additional conductors are difficult to assess in absolute terms. In the VITR Decision the Commission concluded that the VITR would not have a significant impact on average property values over the long term, and that any impact over the short term should be afforded little weight, because the proposal involved the use and upgrade of an existing right of way and transmission line.

This conclusion was reached in part due to the fact the VITR did not involve the addition of a transmission line where there currently was no line, and in consideration that the line was in place when the owners purchased their properties and thus had realized any benefit at the time of purchase. FortisBC contends that both of these factors are in place with the preferred OTR Project route alternative within the existing right-of-way.

FortisBC does not consider any perceived increase in value to properties near the existing right-of-way due to a move to a greenfield route to be germane to the decision as there is no benefit to either the Project or ratepayers in providing a potential advantage to a small group of landowners, especially when viewed in the wider Project prospective. FortisBC also submits that there is no general principle of universal application supporting a claim that the proposed OTR Project would have a negative impact on the value of any property in the vicinity of this Project. The assessment is further supported by the Interwest Property Services Upland Route Analysis, which can be found in Appendix K.

10. **Electric and Magnetic Fields (EMF)** - All route line designs will meet the ICNIRP reference levels for public exposures. Magnetic fields for Alternatives 1A and 2A are predicted to reduce from the current existing levels. The compact double circuit lines considered for Alternative 1A and Alternative 2A will have the lowest magnetic fields due to cancellation effects of the configuration and the electric field will be less than the existing line due to structure height and location. Alternative 1B, due to it occupying more width of the right-of-way, ranks lower than Alternative 1A. Alternative 2A and Alternative 2B line routes, with no existing development near them, were also ranked higher due to less frequent human proximity.

11. **Effects During Construction** – Alternatives 1A, 1B and 3 using the existing right-of-way will have somewhat higher construction impact effects due to proximity of development along several kilometres of the route. No customer outages are expected to be needed for construction for any route alternatives. There will be helicopter and equipment activity in the area for all alternatives, more so for the upland routes. For all alternatives there would be work in the existing right-of-way to salvage the existing line conductors and poles.

4.3.5 Routing Conclusion

Selection of route and line configuration is a balance of numerous, often competing, considerations. Of the potential alternatives considered, Alternative 1A has the least environmental impact, minimizes visual impacts and has low cost and minimal delay risks due to the land rights already being in place. While Alternative 1B is the lowest cost and overall least cost option on the existing right-of-way, FortisBC does not believe that it is the most cost-effective alternative when consideration is given to the other OTR Project characteristics.

FortisBC does not consider any alternative with an in-service date beyond 2010 to be preferable as it does not adequately address the project need due to the large amount of load that is placed at risk based on the historical record of one to two blackouts per year in the Kelowna area.

In evaluating these route alternatives, the decision on whether to use an existing established transmission corridor versus a greenfield corridor has been discussed in recent BCUC proceedings. FortisBC considers that the concept of a *"common utility corridor*" and *"established transmission corridor"* are synonymous when looking at the objective of minimizing the impact of the OTR Project.

The Commission has previously stated in the Naramata Decision that it is *"reluctant to establish a new utility corridor when an existing and well established corridor can be utilized."* The OTR Project can be fully constructed on existing transmission corridors, at a lower cost, and with lower environmental impact, without the need to impact a greenfield area.

Alternatives 2A, 2B and 3 require securing tenure for some 20 kilometres of new right-of-way on Crown land for the Upland route. Discussions regarding the Upland route have been held with the Integrated Land Management Bureau (ILMB), Nature Trust of BC, First Nations and other stakeholders. Those discussions have identified several associated uncertainties in obtaining license of occupation for the new Upland right-of-way that can impact costs and schedule for the OTR Project using one of those Alternatives. The issues with the Upland greenfield route include:

- the uncertainty of ILMB tenure approval due to conflict with area environmental objectives and strategies which includes a proposed Wildlife Management Area and with other resource plans outlined in the Okanagan Shuswap Land Resource Management Plan (LRMP);
- the extent, including cost, of environmental mitigation needed to obtain right-of-way approval in view of the LRMP objectives and strategies is uncertain;
- the expressed First Nations interests in the area;

- the potential compensation or mitigation for existing tenure holders in the affected Crown land including grazing, trapping and guiding; and
- the requirement to negotiate new a right-of-way across the Nature Trust of BC property where the line leaves the existing corridor and goes upland.

To reduce the uncertainty significantly for the Upland route would require FortisBC to commit to proceeding with that route and to conduct a complete application process with the ILMB. The application process including impact reviews, and additional consultation will involve some elements of negotiations to obtain approvals and therefore has uncertainty of timing and outcomes. The ILMB advises that in applications with issues such as this, it would not be unexpected for the process to take 24 months or longer to complete and may not result in a right-of-way approval. The design and construction of the line would take about 24 to 30 months to complete after securing a right-of-way.

If one of these Upland Alternatives is pursued then appropriate allowances need to be reassessed for the uncertainty noted earlier for both budget and schedule.

Alternative 1B with the double circuit H-frame construction has lower construction cost than Alternative 1A but has a greater visual impact and uses more width of the existing right-of-way. Also, Alternative 1B, although well within ICNRP guidelines, does not minimize EMF at the edge of the right-of-way as effectively as Alternative 1A.

The Commission has previously concluded a distinction between the most cost-effective and least-cost alternative considers all project scope elements that are relevant (VIGP Decision, page 77). Given that the aesthetic and EMF impact differences between Alternatives 1A and 1B are present over 19 kilometres of the existing transmission corridor FortisBC submits that Alternative 1A represents the most cost-effective solution. This situation and conclusion are both similar to those discussed when considering the overhead segments of VITR, with the exception of steel versus wood H-frame structures. In that case, the Commission determined that, *“the disadvantages of the wood H-frame Alternative outweigh the cost advantage.*” (VITR Decision, page 105)

The relevant disadvantages were cited as, *"requirements for a wider corridor, higher EMF values, different visual impacts (more poles), increased construction impacts on residents, and additional definition-phase costs due to public consultation and additional environmental assessment requirements."*

FortisBC, after review of the various considerations, submits that Alternative 1A with a 2010 in-service date meets the needs of the project while offering a reasonable and appropriate balance among environmental issues and social issues such as land use, regulatory/permitting issues, design, construction, maintenance, and operational issues and cost. In consideration of these factors, Alternative 1A is the preferred route regardless of the in-service date.

4.4 RELATED FACILITIES - THIRD PARTY

An agreement in principle is in place with BCTC to upgrade, at FortisBC cost, the BCTC Vaseux 500 kV Terminal station to separate the high voltage switching for the FortisBC 500/230 kV transformers. BCTC has completed studies needed to update Remedial Action Schemes as the new 230 kV lines will increase the strength of the network meshing of the FortisBC and BCTC transmission systems.

The estimated cost for the modifications to the Vaseux Lake 500 kV station is $2.93 million.

Shaw Business Systems share a FortisBC fibre-optic cable between Penticton and Okanagan Falls that is under-built on 76 Line. Cable relocation to the new transmission line poles is required and cable outages will be needed when the 76 Line is replaced. The scheduling and cost implications are based on Shaw/FortisBC agreements.

The estimated cost to FortisBC for relocating the fibre-optic cable as a result of the system upgrade is $375,000.

4.5 PUBLIC WORKS / INFRASTRUCTURE

The OTR Project does not impact any public works or existing infrastructure other than the shared Shaw/FortisBC cable noted in section 4.4 above. Overhead lines will also span but not directly impact common crossings of several roads and one natural gas pipeline.

4.6 ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT

The health and safety interests of the public, employees and contractors include community and environmental values and will be integrated into the planning, tendering and audit protocols for the Project. FortisBC construction safety and risk mitigation standards will be applied in detail to the corridor, and the requirements will be detailed in final construction and environmental management plans.

The transmission line route and corridor planning included an Environmental and Social Impact Assessment (ESIA) to identify environmental sensitivities, landowner impacts and potential stakeholder issues. The ESIA is attached as Appendix I.

Design and construction work will proceed according to the terms of construction and environmental management plans to ensure compliance with regulations and stakeholder expectations. Detailed construction, traffic and fire safety plans will be prepared by construction contractors to manage and monitor risks.

Route selection priorities were, schedule, cost, environmental impacts and suitability for construction. Corridor refinement was guided by efforts to minimize impacts to wildlife, vegetation communities, watersheds and public use areas. The ESIA identifies current environmental conditions and sensitive issues and will facilitate development of an Environmental Management Plan to be completed in February 2008. The assessment was referred to other interested agencies and stakeholders in November 2007.

FortisBC also commissioned an archaeological assessment for the spring and summer of 2007. Guided by a general archaeological overview screening assessment, the detailed impact assessment found a low risk of encountering items or sites of archaeological significance. The field assessments confirming the screening assessment were conducted in the Spring of 2007 and are appended to the ESIA report.

The final detailed construction and environmental management plans for the purpose of tendering the Project will include specific prescriptions, procedures and requirements to mitigate potential construction impacts, including:

- Constraints to activities within riparian interface areas and engineered stream crossings to minimize erosion;
- Constraints to timing of activities during critical life cycle periods for wildlife such as California Bighorn Sheep;
- Controlled access to construction sites and subsequent decommissioning to permanent low-maintenance access;
- Project transmission structure design and siting within the right-of-way to minimize visual landscape impacts;
- Habitat enhancement where appropriate, including wildlife trees and browse, riparian modifications and improvements and re-vegetation including indigenous species at some locations;
- Control of invasive species particularly noxious weeds during construction and followed by post construction monitoring; and
- Application of construction methods to minimize impact to sensitive vegetation communities such as the shrub-steppe grasslands.

No significant environmental or community effects were identified by FortisBC for the majority of the recommended Project Alternative 1A. There are public concerns with respect to visual impact for the larger transmission lines versus the existing line on several kilometres of the existing transmission corridor north of Shuttleworth Creek. FortisBC will, as part of the design and construction process, attempt to minimize those effects by optimizing the transmission line design within the corridor. Construction and environmental plans may also be modified with input from the provincial Ministries during construction as conditions warrant.

4.7 ELECTRIC AND MAGNETIC FIELDS

FortisBC's position with respect to Electric and Magnetic Fields is consistent with that of Health Canada as set out in the document "Electric and Magnetic Fields at Extremely

Low Frequencies" (which can be found on their website: http://www.hc-sc.gc.ca/iyh-vsv/alt_formats/cmcd-dcmc/pdf/emflow_e.pdf). Health Canada states that *"Typical exposures present no known health risks…the scientific evidence is not strong enough to conclude that typical exposures causes health problems"*. Although Health Canada does not consider exposures to EMF from electrical devices and power lines to present any known health risks, FortisBC is aware of concerns by some of its customers. In all locations along the transmission line, the magnetic field (MF) levels associated with this Project will be significantly lower than ICNIRP's reference levels for public exposure, which are supported by the WHO. The MF levels are also predicted to be lower than current existing levels. This reduction in the MF occurs because of the increased height, compact transmission pole design, and higher operating voltage of the new and upgraded lines. The results of the typical MF calculations for 40 Line from Vaseux Lake to Bentley and for 75 Line and 76 Line from Vaseux Lake to RG Anderson showing the before and after-construction MF levels are plotted in Figures 4-6A and 4-6B respectively. For 75 Line and 76 Lines the fields are shown for the recommended Alternative 1A. The highest MF levels would occur when other transmission system components are out of service during peak loads putting higher than normal loads on the transmission line. The average MF levels are more representative of the typical or normal loading levels on the lines. Note that the transmission lines and hence the calculated MF and profiles are not centered on the right-of-way in some of the configurations.

Figure 4-6A: 40 Line – Magnetic Field Vs Distance from Centre of Right-of-Way

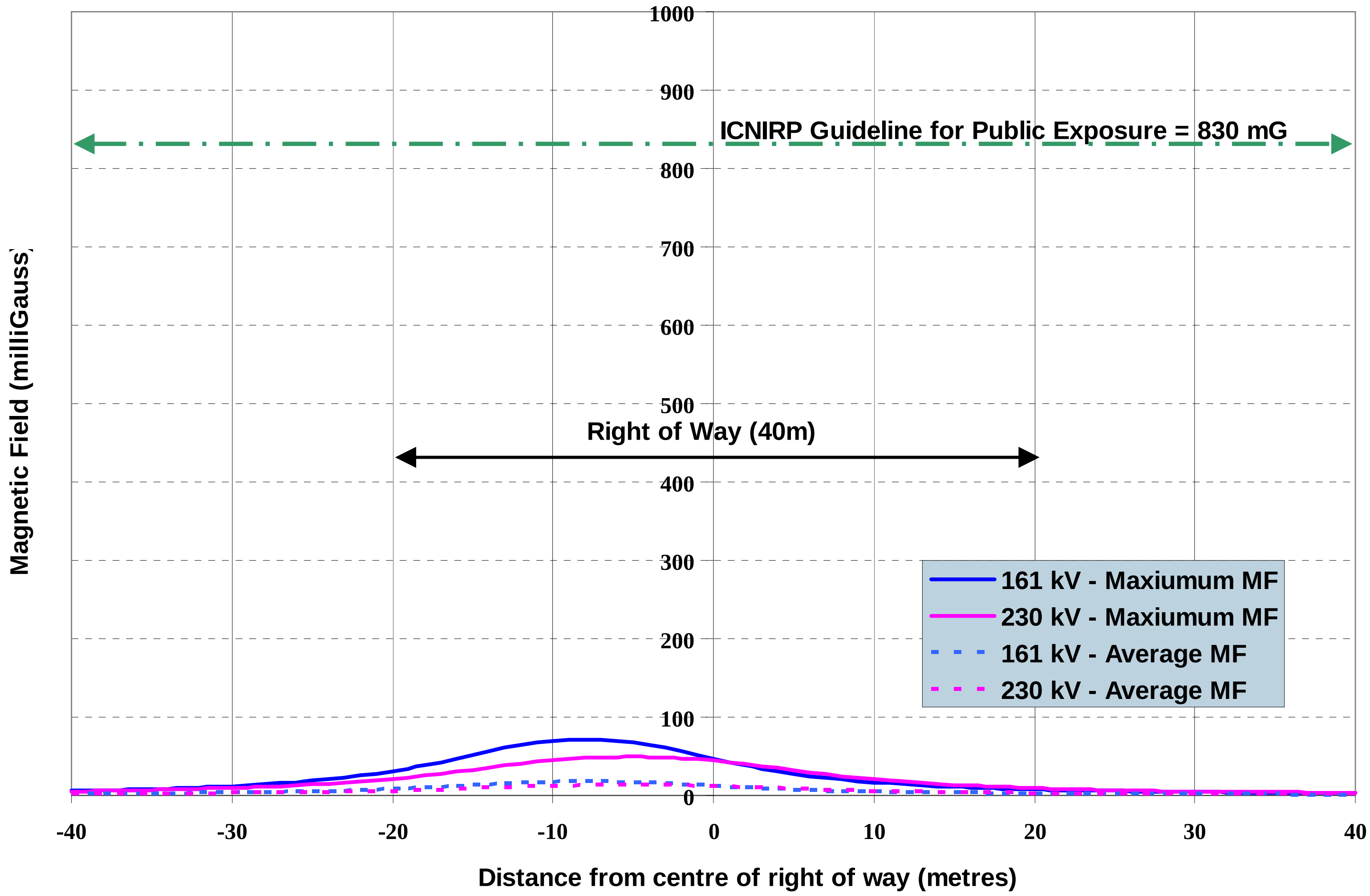
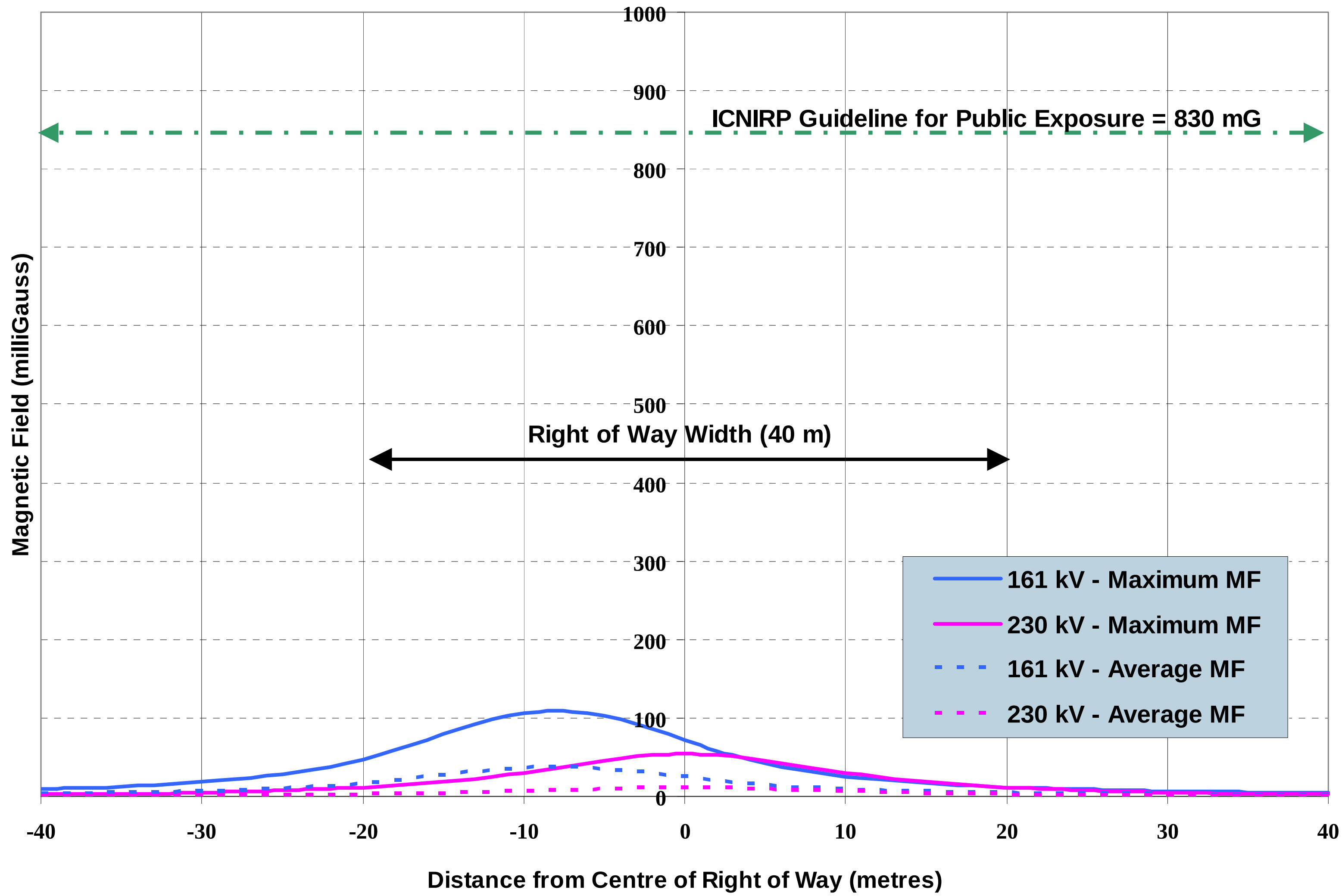


Figure 4-6B: 75 Line and 76 Line Magnetic Field Vs Distance from Centre of Right-of-Way



The Electric Field (EF) calculations for the Project are also well below ICNIRP's reference levels for public exposure. The new lines would differ little from those from the existing transmission lines despite the increased operating voltage due to the proposed line structure heights and location within the right-of-way. The EF is related to the operating voltage of the transmission line and does not vary as much as the MF which is proportional to the line loads. Table 4-6 summarizes the calculated EF before and after construction of the lines.

Table 4-6: Electric Field (EF), kV/m

Configuration	Maximum EF on Right-of-Way	EF at edge of Right-of-Way	ICNIRP Guideline
40 Line and 76 Line at 161 kV (Existing)	1.70	1.05	4.17
40 Line at 230 kV (Post OTR)	2.15	1.30	4.17
75 Line and 76 Line at 230 kV (Post OTR)	1.64	0.20	4.17

Okanagan Transmission Reinforcement Project

(OTR Project)

Section 5: Project Cost and Schedule

FortisBC Inc.

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5.0 PROJECT COST AND SCHEDULE

5.1 Project Capital Cost Summary

The OTR Project is estimated at $141.4 million. The cost and timing of major project elements is summarized in Table 5-1 below, and provided in more detail in Appendix G.

Table 5-1: OTR Project Capital Cost Summary

	2007	2008	2009	2010	Total
			($ 000s)		
Double Circuit 230kV Vaseux to Penticton (75/76 Line)		5,553	27,764	22,211	55,527
Single Circuit 230kV Vaseux to Bentley (40 Line)		455	2,275	1,820	4,550
63 & 138kV Circuits Bentley to Oliver		67	336	269	672
New Bentley Terminal		3,099	15,495	12,396	30,990
Oliver Substation Upgrade		569	2,844	2,275	5,687
RG Anderson Terminal Upgrade		1,050	5,249	4,199	10,498
Lee Terminal 138kV Capacitor Upgrade		167	837	670	1,675
Bell Terminal 138kV Capacitor Upgrade		162	811	649	1,622
Vaseux 230kV Terminal Upgrade		444	2,220	1,776	4,440
Vaseux 500kV Terminal Upgrade		293	1,464	1,171	2,928
Planning & Preliminary Engineering	3,972	1,391			5,363
Project Management, Engineering & Operations Support		381	1,903	1,523	3,807
Sub Total	3,972	13,631	61,199	48,959	127,760
AFUDC		647	2,892	6,197	9,736
Removals & Salvage			1,174	2,738	3,912
TOTAL	3,972	14,278	65,264	57,894	141,408

5.2 Operation and Maintenance Costs

Operation and Maintenance (O&M) costs associated with the substation and line infrastructure additions, replacements and changes which are part of the OTR Project are expected to increase, on average approximately $24,000 per year through the planning horizon of FortisBC's System Development Plan (SDP) through to 2024.

This average annual increase is largely due to the addition of the Bentley Terminal and infrastructure additions in the FA Lee, DG Bell and RG Anderson Terminals. Scheduled maintenance at terminals and substations occur, on average, every five years with Bentley Terminal maintenance cycles scheduled for 2016 and 2021.

Oliver Terminal Station O&M costs are expected to decrease as a result of the removal of aging infrastructure and downsizing to a distribution substation. Oliver Terminal maintenance cycles are scheduled for 2012, 2017 and 2022.

Annual O&M costs associated with 40 Line and 76 Line will be reduced through the planning horizon of FortisBC's SDP as a result of replacing an aged wood pole transmission line constructed in the mid 1960s with new steel infrastructure. The condition assessment program begins in year 20 for all new lines and scheduled inspections and maintenance occur every 8 years thereafter, with the first cycle scheduled for 2018, which will be comprised primarily of inspections.

5.3 SYSTEM LOSS REDUCTION

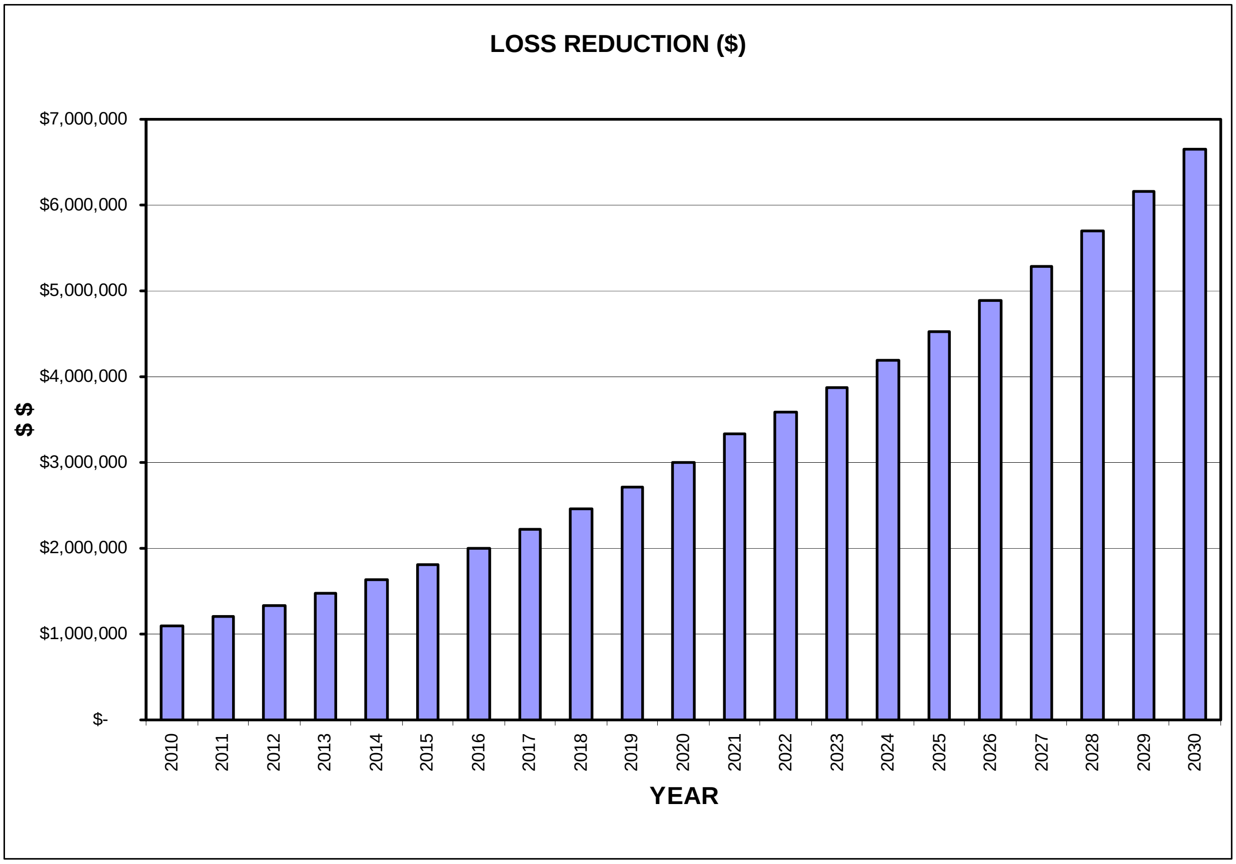
The proposed OTR Project will reduce system losses, as indicated in Figure 5-3 below. The primary elements of the OTR Project that results in System Loss reductions may be broadly identified as follows:

1. Voltage Conversion from 161 kV to 230 kV Level (Penticton-Oliver Zone) **- results in lower current flow to achieve the same power flow.**
2. Additional Transmission Line Circuits (Vaseux-Penticton Zone) – **load is shared between two lines and thus current is halved compared to a single line.**
3. Addition of Reactive Compensation (Capacitors in FA Lee and DG Bell) - **reduction in current flows needed to supply reactive load.**

Since resistance losses are proportional to the square of the current, reducing the current by half will result in a decrease in losses by a factor of four.

For calculating the system loss, the existing (pre OTR Project) and proposed (post OTR Project) network configuration was compared for year 2010 peak system losses. Then, depending on the system load duration curve and system growth, approximate system losses were calculated for future years. The differential system loss constitutes the differential savings in system losses.

Figure 5-3: System Loss Reduction



1 ## 5.4 REVENUE REQUIREMENT AND RATE IMPACT

2 The following assumptions have been made in the cost analysis provided below:

3 - Discount Rate: 10.0%
4 - General Inflation Rate: See Appendix G - BC Hydro Projected
5 Inflation Rates dated September 2007
6 - Depreciation Rate: 3.0% on depreciable assets
7 - CCA Rate: 8.0%
8 - Combined Income Tax Rate:

Year	2007	2008	2009	2010	2011 & beyond
Rate	31.50%	31.00%	30.00%	28.50%	27.00%

Table 5-4 below provides the financial summary along with expenditure impacts to 2015 for the OTR Project using the preferred route Alternative 1A utilizing the existing right-of-way.

Table 5.4: Preferred Alternative 1A - Financial Summary

	EXPENDITURE / IMPACTS	2007	2008	2009	2010	2015
		($000s)				
1	Cumulative Capital Expenditure	3,972	18,250	83,514	141,408	141,408
2a	Reduction in Annual System Losses	0	0	0	0	0
2b	Annual Operating Expense	0	0	0	0	(1,104)
2c	Financing and Income Tax	0	0	0	0	321
2d	Total Revenue Requirement	0	0	0	0	12,210
3	Maximum Annual Incremental Rate Impact Over Previous Year	3.48%				
4	Net Present Value of Revenue Requirement	69,421				
5	One-Time Equivalent Rate Impact	2.28%				

Detailed OTR Project costs and revenue requirements analysis may be found in Appendix G and Appendix H respectively.

5.5 PROJECT SCHEDULE

Investigative and conceptual feasibility work on this project began in October 2005 and preliminary engineering developmental work began in 2006. Some of the final engineering design for the major OTR Project components is currently underway so that orders for major equipment components will be placed as lead time dictates. Upon disposition of the Application by the Commission and other agencies with requirements as outlined in section 7, the OTR Project will enter the design and construction phase. The OTR Project is slated for completion in the fourth quarter of 2010. The OTR Project schedule is as follows:

Project Approval	Third Quarter 2008
Engineering for long lead equipment/materials	Third Quarter 2008
Right-of-way preparation begins	Third Quarter 2008
Bentley Terminal station construction	2009/10
New transmission line construction	2009/10
Vaseux Lake Terminal station changes	2009/10
Oliver Terminal station changes	2010
RG Anderson Terminal station changes	2010
Energize new 230 kV lines and new and modified stations	Fourth Quarter 2010
DG Bell and FA Lee Capacitor Bank modifications	Fourth Quarter 2010

The phases of the OTR Project are shown in greater detail in the Gantt chart included in Appendix G, Cost Estimates and Project Schedule.

5.6 RISKS TO OTR PROJECT COMPLETION

FortisBC has assessed the risks to completing the OTR Project by the required in-service date of 2010. Circumstances that could delay the OTR Project or increase costs include:

- Changes to the preferred Vaseux Lake to RG Anderson transmission route would increase overall project costs and delay the in-service date to 2012 or beyond. Scheduled in-service delay would be necessary to allow further First Nations and stakeholder consultation requirements as part of an application for a new right-of-way. Further consultation and agreement in principle is required from several key stakeholders including First Nations prior to the Integrated Land Management Bureau (ILMB) entertaining the application. Part of the delay would be due to the estimated time needed for process and referrals that the ILMB would take prior to issuing FortisBC a License of Occupation. There is also the risk that the ILMB would not be prepared to grant FortisBC a new right-of-way as FortisBC already has a right-of-way (established in 1965) that currently meets the needs of the OTR Project.

In addition, the Upland route traverses an area identified in the Okanagan Shuswap Land Resource Management Plan as a proposed Wildlife Management Area. This proposal is currently being reviewed by the Ministry of Environment for execution in the near future. OTR Project cost increases would result from increased public, stakeholder and First Nations consultation, land compensation, environmental mitigation, engineering and construction costs. This is further supported by the Interwest Property Services Upland Route Analysis, which can be found in Appendix K.

- Unforeseen environmental or archaeological discoveries during the construction phase. The risk of such occurrences is considered to be low, based on the results of the environmental and archaeological assessments. This is especially true of the existing right-of-way. Early stage public, agency and stakeholder consultation has served to identify and address potential issues prior to making final planning decisions.

- Narrow construction work windows for environmental impact mitigation and for transmission equipment outages leading to delays and increased costs. Extensive effort in the planning and scheduling of work will be used to reduce that risk along with the provision of schedule buffers to mitigate impacts.

- Shortage of qualified contractors and/or equipment and materials due to active regional and world markets. To mitigate where possible, the contracting and procurement strategy will provide flexible bundling of work packages to attract the best suited and available contractors at the time of tendering. The current industry forecasts for material and equipment delivery times will be used in schedule planning. Contractors and equipment manufacturing slots will be secured as early as possible. Industry cost inflation forecasts have been used in setting the inflation estimate for the project but current market volatility is still of concern.

5.7 CONTINGENCY PLAN FOR OTR PROJECT DELAYS

There are two scenarios that require contingency plans to be in place. These situations may occur even with all transmission system elements in service (N-0) as the area load continues to grow and exceeds the capacity of one or more components before project completion.

Scenario 1 - The total Kelowna-Penticton area peak load exceeds system capacity under normal operating conditions

In this situation the only solution is to reduce the load supplied by the overloaded system elements. This can be done in a limited manner by the following:

- Offload RG Anderson Transformer 2 onto 63 kV network via Oliver– by supplying some Penticton area load via 42 Line from Oliver, capacity can be freed up at RG Anderson Terminal. The amount of load that can be transferred is limited as 42 Line is only a 63 kV sub-transmission line and there are capacity limitations at Oliver.
- Load curtailment, if necessary – this could entail voltage reduction and/or rotating customer outages

Scenario 2 - Overloading of Penticton RG Anderson Transformer 2 during peak conditions

This situation can result when the FortisBC load is near peak and the prevailing system load flow is from Vaseux Lake towards Kelowna. This latter condition is beyond FortisBC's control and is driven by the provincial transmission grid flows at the time. In this case the options are similar:

- Offload RG Anderson Transformer 2 onto 63 kV network via Oliver - by supplying some Penticton area load via 42 Line as described above, it may be possible to reduce the overloading of Transformer 2.
- Open the 76 Line – 73 Line path between Vaseux Lake and Vernon – this breaks the South Okanagan system into two radially supplied systems which may allow more even distribution of load between RG Anderson

Transformer 1 and Transformer 2. The disadvantage is that it places the system in an N-1 contingency state leaving the area exposed to major outages if a second event occurs. This solution violates FortisBC planning criteria.

- Load curtailment, if necessary – this could entail voltage reduction and/or rotating customer outages.

These scenarios will continue to remain a risk throughout the project schedule and until the OTR Project is completed in 2010.

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Section 6: Power Supply Options

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6.0 OTHER SUPPLY OPTIONS CONSIDERED

FortisBC identified several potential solutions in addition to the preferred option, to resolve current and future supply deficiencies in the Okanagan area. With the exception of the “Do Nothing” scenario, each of the options briefly described below would meet the capacity and reliability requirements of the OTR Project however they were rejected for environmental, permitting, social, technical and cost considerations. Also, none of these options would meet the required 2010 in-service date for the OTR Project and all have a higher degree of cost and schedule risk.

6.1 DO-NOTHING

Maintaining the status quo (Do-Nothing) is not considered a viable alternative. Without improvements, the existing system will violate FortisBC planning criteria for a number of operating scenarios:

- Normal scenario (N-0) – at peak times during normal system operations (i.e. with all elements in service) RG Anderson Transformer 2 will be overloaded. This overload will continue to grow as the system load increases over time and will reduce the expected lifespan of the transformer. The only way to mitigate this overload is to open the transmission path between Vaseux Lake and Vernon Terminal stations, thus placing the system in a forced N-1 state. This would violate both FortisBC and utility industry transmission planning criteria and will reduce overall system reliability.

- Single-contingency scenario (N-1) – there will be insufficient available transmission capacity to meet the Kelowna and Penticton area load if certain critical elements are lost. This deficit will continue to grow as the system load increases. This violates both FortisBC and utility industry transmission planning criteria.

- Double-contingency scenario (N-1-1 / N-2) – there is insufficient available transmission capacity to meet the Kelowna-area load if both 230 kV lines from Vernon Terminal (or Ashton Creek) are lost. This load is already exposed for 82% of the year. The exposure will increase to almost 100% by 2015. This violates the N-1-1 planning criterion previously approved by the Commission for the Kelowna area.

6.2 REJECTED OPTION 1: EAST-WEST TRANSMISSION REINFORCEMENT

The East-West Solution requires approximately 170 kilometres of 230 kV transmission line along a new greenfield right-of-way from Warfield Terminal to RG Anderson Terminal along with associated station upgrades. A similar option was investigated in 2002, involving the upgrading of the existing Trail to Penticton 11 Line from 161 kV to 230 kV operations, and was rejected in favor of the Vaseux Terminal solution.

The East-West Transmission option was re-assessed as a potential solution in the OTR Project. While this option meets loading and voltage criterion for all recognized normal and single contingencies without system instabilities, it is inferior in its ability to withstand two-element simultaneous transmission outages (N-2) without customer exposure to load loss when compared to the OTR Project proposed solution given that the Vaseux Lake Terminal is in service. The East-West solution would also have comparatively higher line losses, and is less desirable from an environmental, permitting, social and cost perspective.

The primary elements that would be required with an East-West solution are:

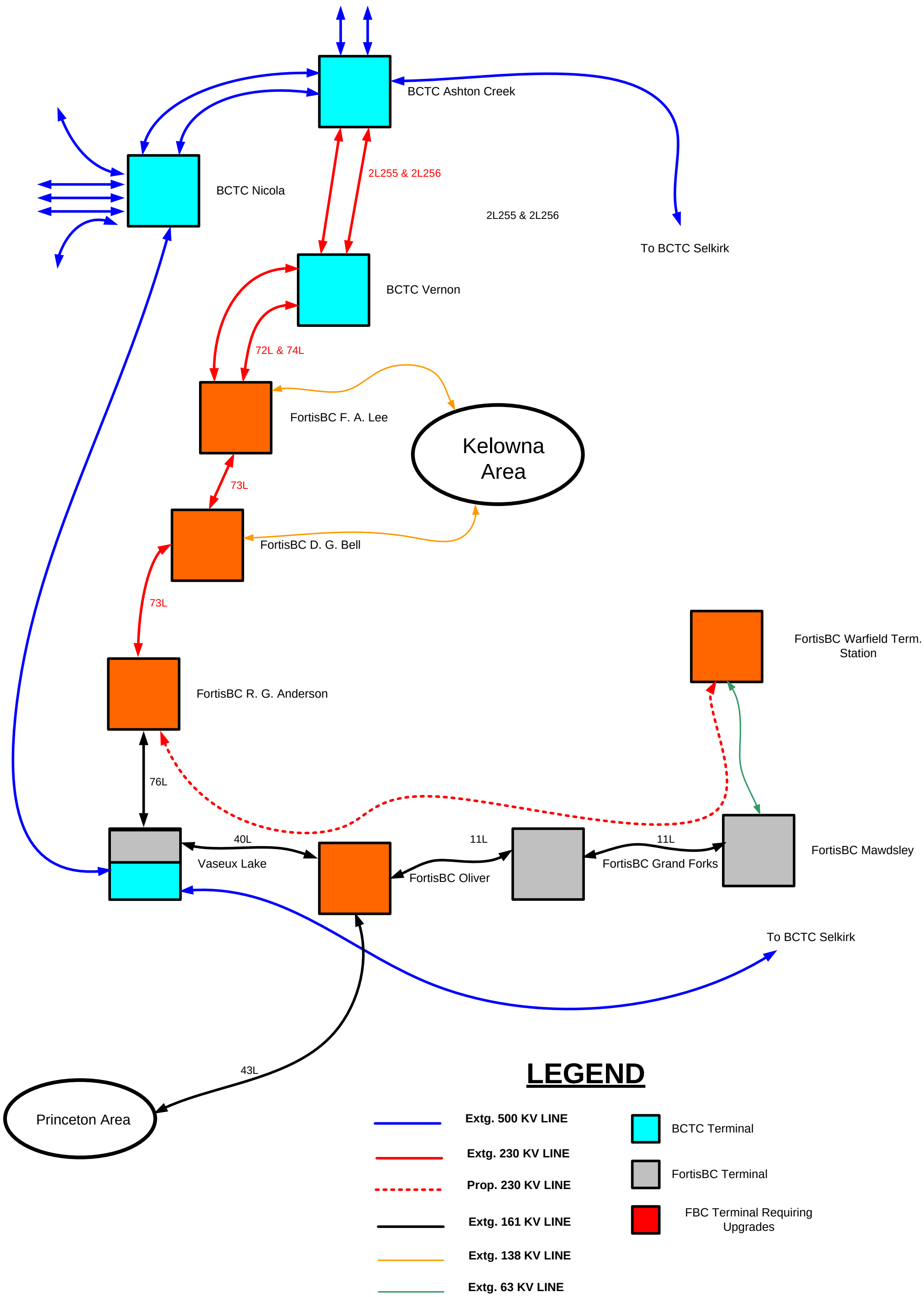
- An approximately 170 kilometre single circuit 230 kV line from Warfield Terminal station in Trail to RG Anderson in Penticton, on a new greenfield right-of-way;
- New end-to-end fibre optic communication from Warfield to RG Anderson;
- Necessary line and transformer terminations along with installation of 230 kV breakers to allow meshed operation of the transmission line at both Warfield and RG Anderson;

- Transformer replacement at RG Anderson;
- Replacement of Oliver Transformer 1 with a dedicated distribution transformer and rehabilitation of Oliver Transformer 2; and
- New Capacitor installation may be required at FA Lee and DG Bell Terminal stations (subject to study).

The estimated cost of constructing this option at $498 million would be significantly higher than the OTR Project proposed solution, and, as mentioned above would have comparatively higher line losses, and be less desirable from an environmental, permitting, social perspective.

The eventual system configuration under this option is shown in Figure 6-2 on the following page:

Figure 6-2: East-West Transmission Reinforcement Option



Note: Only Relevant Transmission Lines are shown

6.3 REJECTED OPTION 2: NORTH-SOUTH TRANSMISSION REINFORCEMENT

This option addresses the reinforcement of the Okanagan supply by providing a third 230 kV circuit to Kelowna from BCTC's Ashton Creek Substation. This would necessitate approximately 95 kilometres of 230 kV circuit between Ashton Creek and FA Lee Terminal station to secure supply into the South Okanagan, and a second 60 kilometre 230 kV circuit between FA Lee and RG Anderson. Based on technical viability and economic merits, this option is considered inferior to both the OTR Project Proposed solution and East-West Transmission option, and was thus studied to only preliminary detail.

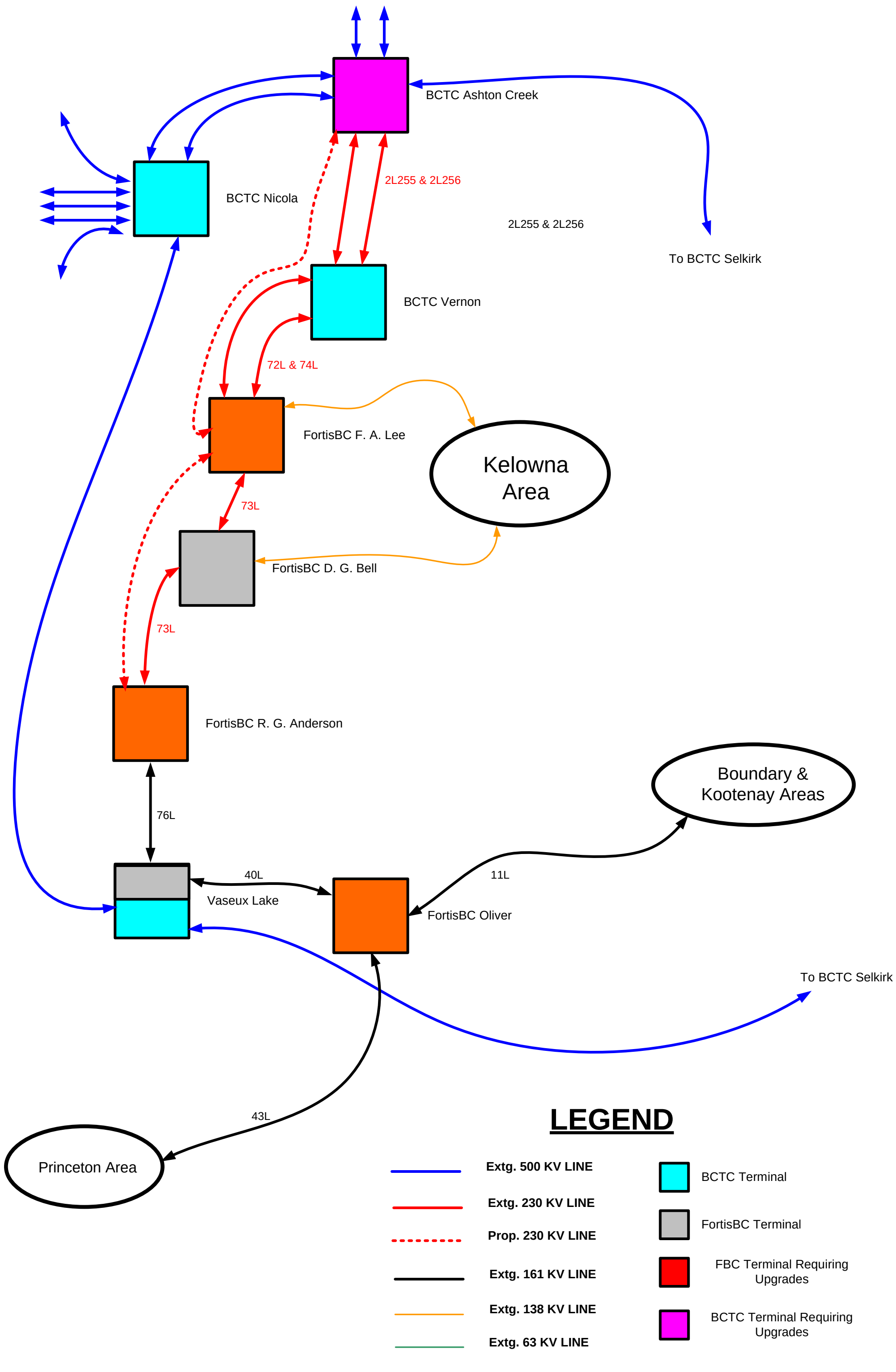
The primary elements of a North—South transmission line reinforcement would be:

1. Approximately 95 kilometers of single circuit 230 kV line from Ashton Creek substation to FA Lee Terminal station, on a new greenfield right-of-way;
2. Necessary line terminations at the BCTC Ashton Creek substation along with installation of 230 kV breakers;
3. Necessary line terminations at FA Lee Terminal station along with installation of 230 kV breakers;
4. Approximately 60 kilometres of single circuit 230 kV line from FA Lee Terminal station to RG Anderson Terminal station adjacent to the existing right-of-way;
5. Necessary line terminations at RG Anderson along with installation of 230 kV breakers;
6. Transformer replacement at RG Anderson Terminal station;
7. Replacement of Oliver Transformer 1 with a dedicated distribution transformer and rehabilitation of Oliver Transformer 2; and
8. New end-to-end fibre optic communication from Ashton Creek substation to FA Lee Terminal station.

The cost of constructing this option at $484 million would be significantly higher than the OTR Project Proposed Solution.

1 The eventual system configuration under this option is shown in Figure 6-3 below:

Figure 6-3: North-South Transmission Reinforcement Option



Note: Only Relevant Transmission Lines are shown

6.4 REJECTED OPTION 3: WESTBANK 230 kV BCTC INTER-TIE

This option proposes to interconnect FortisBC's DG Bell Terminal station to the BCTC substation at Nicola by a 94 kilometre new 230 kV line through BCTC's Westbank substation. This option would reduce the exposure of Kelowna to a significant load loss due to the outage of 72 Line and 74 Line or BCTC's 2L255 and 2L256 lines. Additional system upgrades would still be necessary to alleviate the overloading of RG Anderson Transformer 2 during the 2010 winter peak under normal system operation.

A portion of the new 230 kV circuit would be a submarine cable across Okanagan Lake from Westbank to Kelowna, at a significant cost. Operationally, line losses to the South Okanagan would be greater than under the OTR Project Proposed solution, because the transmission path from Vaseux Lake is a comparatively low impedance path to the South Okanagan area, as compared to the path from Nicola substation in the west, proposed in this option.

The primary elements of a 230 kV Inter-tie to BCTC at Westbank would be:

1. Approximately 80 kilometers of single circuit 230 kV line from BCTC's Nicola substation to BCTC's Westbank substation on a new right-of-way;
2. Necessary line and transformer terminations at Nicola and Westbank, along with installation of 230 kV breakers;
3. Approximately 14 kilometers of single circuit 230 kV line from Westbank to DG Bell on new right-of-way. This transmission line would include portions of overhead, underground and submarine construction, which may be a single or double circuit configuration;
4. Necessary line terminations at DG Bell along with installation of 230 kV breakers;
5. New capacitor installation may be required DG Bell (subject to study);
6. Transformer replacement at RG Anderson;
7. Replacement of Oliver Terminal Transformer 1 with a dedicated distribution transformer and rehabilitation of Oliver Transformer 2; and

8. New end-to-end fibre optic communication from Nicola substation to DG Bell Terminal station.

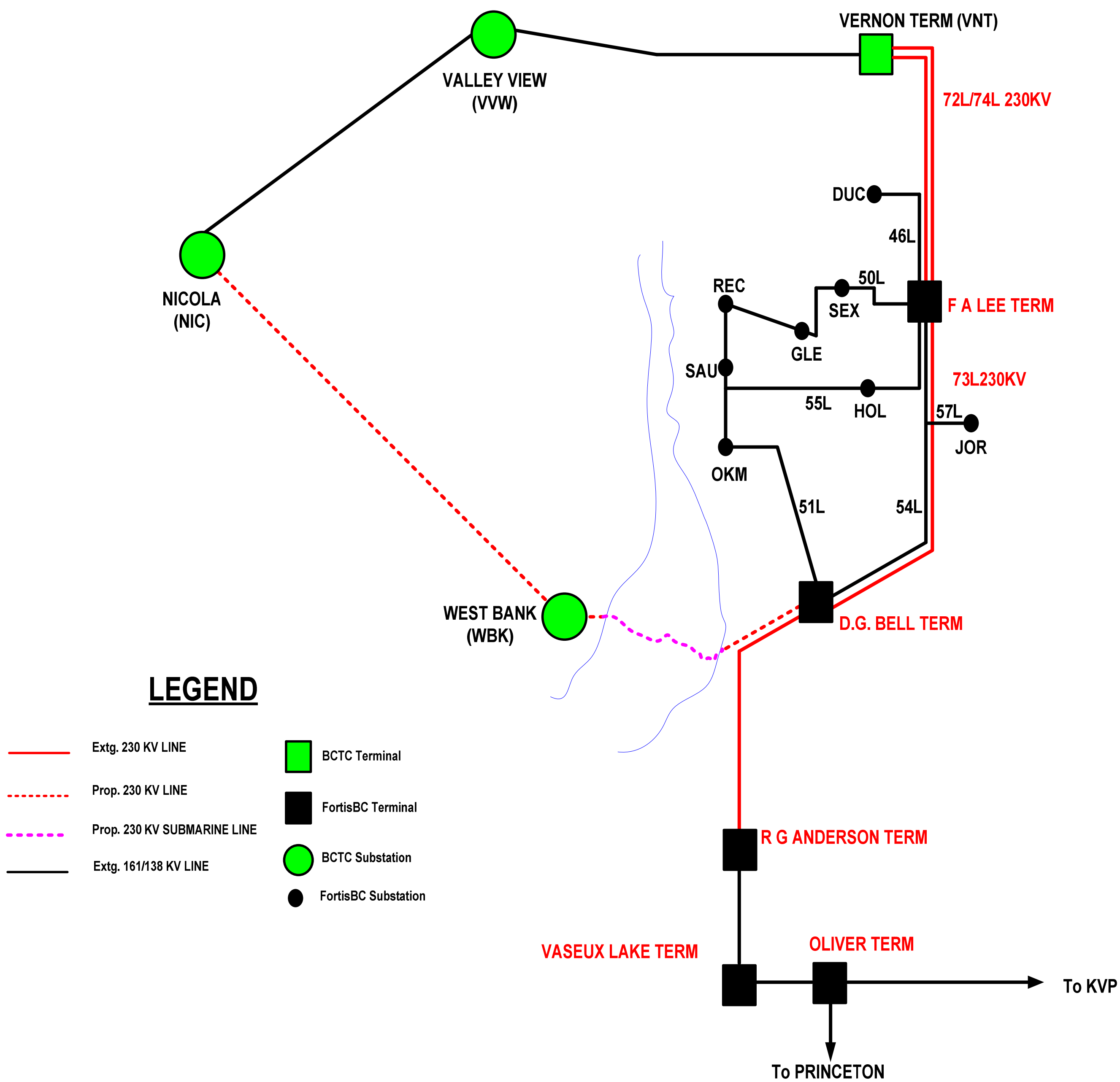
Though this option will be able to provide load back-up benefits to the BCTC Westbank substation, it is not considered to be a viable alternative to the OTR Project proposed solution, since it raises the following construction and operational challenges:

1. Technical challenges of submarine construction portion;
2. Expected high maintenance costs due to mandatory underwater routine inspection requirements;
3. In case of a fault, repair will be difficult and time consuming, possibly stressing the FortisBC network for extended time period, especially during peak load periods;
4. Laying of double circuit submarine cables may be technically preferable to a single circuit submarine cable but is not financially viable; and
5. Permitting may be more difficult and time consuming as a result of federal permitting for the submarine segment.

This option was not considered beyond preliminary analysis due to its technical inferiority, operational and maintenance challenges and high cost at $434 million.

The eventual system configuration under this option is shown in Figure 6-4 on the following page:

Figure 6-4: Westbank 230 kV Inter-Tie Option



6.5 REJECTED OPTION 4: LOCAL GAS FIRED GENERATION IN KELOWNA AREA

Local generation options considered for Option 4 include: natural gas, coal, diesel, wind and biomass. Size, reliability, environmental and public concerns and technical constraints virtually eliminate all but gas fired generation as a possible option for this project.

A gas fired generation option in the Kelowna area could meet the capacity (200 - 400 MW) and reliability requirements for the area. This resource option was considered in the SOK Project study as a means of delaying the capital cost of the transmission project. The rationale was to reduce the system peak loading below the existing transmission capacity.

The basic requirement for this option would be:

1. Installation of a peaking plant, 200 MW simple cycle gas combustion turbine (expandable to 400 MW, convertable to combined cycle, future);
2. Installation of gas pipelines;
3. Switch yards for connection of the generator(s) into the system ;
4. Provide 230 kV Line taps for the Gas Generating Plant switchyard into 73 Line;
5. Capacity enhancement of 76 Line (transmission);
6. 230 kV transformer replacement at RG Anderson;
7. Replacement of Oliver Transformer 1 with a dedicated distribution transformer and rehabilitation of Oliver Transformer 2; and
8. New end-to-end fibre optic communication to the new generator.

This option is not preferred due to the cost of $606 million, schedule impacts, technical constraints, and the associated public consultation and permitting.

6.6 COST ANALYSIS

A cost analysis detailing capital costs, Net Present Value (NPV) and rate impact of the four rejected supply options along with the OTR Project Proposed Solution can be found below in Table 6-6. Rejected option estimates are conceptual and for comparison purposes only. The OTR Project Proposed Solution estimate is at a preliminary design level.

Table 6-6: Rejected Supply Options Cost and NPV Analysis

					Schedule			
		2007	2008	2009	2010	2011	2012	2013
				($,000)				
Option 1: East - West								
Annual Project Costs				60,226	128,884	137,906	122,966	
AFUDC				1,807	7,480	15,484	23,310	
Total				62,033	136,364	153,390	146,276	
GRAND TOTAL	**498,000**							
NPV	**255,000**							
Rate Impact	**8.39%**							
Option 2: North - South								
Annual Project Costs				58,503	125,197	133,961	119,449	
AFUDC				1,755	7,266	15,041	22,643	
Total				60,259	132,464	149,002	142,092	
GRAND TOTAL	**484,000**							
NPV	**247,000**							
Rate Impact	**8.13%**							
Option 3: Westbank								
Annual Project Costs				52,426	112,191	120,044	107,040	
AFUDC				1,573	6,511	13,478	20,291	
Total				53,998	118,702	133,523	127,330	
GRAND TOTAL	**434,000**							
NPV	**220,000**							
Rate Impact	**7.21%**							
Option 4 Gas Generation								
Annual Project Costs				45,939	73,732	157,787	168,832	90,325
AFUDC				1,378	4,968	11,914	21,712	29,487
Total				47,317	78,701	169,701	190,545	119,812
GRAND TOTAL	**606,000**							
NPV	**285,000**							
Rate Impact	**9.37%**							
OTR Preferred Option								
Annual Project Costs		3,972	13,631	62,372	51,697			
AFUDC			647	2,892	6,197			
Total		3,972	14,278	65,264	57,894			
GRAND TOTAL	**141,408**							
NPV	**70,867**							
Rate Impact	**2.33%**							

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Section 7: Other Applications and Approvals

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7.0 OTHER APPLICATIONS AND APPROVALS

Applications, approvals and notifications required by external agencies for the OTR Project Proposed Solution for construction and operation are described below and summarized in Table 7-0.

New construction related to the OTR Project Proposed Solution is located entirely within existing rights-of-way and FortisBC's property with the exception of the proposed Bentley Terminal station in Oliver. The proposed station site is on Osoyoos Indian Band land and is subject to lease agreement approval by Osoyoos Indian Band and Indian and Northern Affairs Canada in accordance with the subject Memorandum of Understanding. In preparation for the lease approval from Indian and Northern Affairs Canada and Environment Canada the following submissions will be made as part of the Canadian Environmental Assessment Act (CEAA) screening:

- **Environmental Impact Assessment** (see Appendix I) cataloguing potential environmental impacts to flora and fauna and proposed mitigation;
- **Archaeological Impact Assessment** (see Appendix I) showing that the project will not degrade valuable historical and/or First Nations sites.

In addition to the federal approvals for the project components on federal lands, other approvals are required, and include:

- **Ministry of Environment** -- Permits sought by application include: notification for works in and about streams (if work within watercourses cannot be avoided) and occupation rights for minor gravel extraction;
- **Department of Fisheries and Oceans Canada (DFO)** -- Project Information Notification/Requirement as a minimum and potentially a Harmful Alteration, Disruption or Destruction of Fish Habitat (HADD) approval if there are significant impacts within the riparian zone of a watercourse (30 metres from top of bank);

- **Canadian Environmental Assessment Act Screening** -- CEAA screening is triggered where a federal approval is required, for example HADD approval, or Navigable Waters Authorization;
- **Ministry of Tourism and Sports, Arts-Archaeology Branch** -- Provides leadership, legislative requirements, management, protection and conservation of heritage resources of the Province of British Columbia. Permitting for the archaeological sampling work was issued by this agency;
- **Regional District** -- The proposed project spans the Regional District of Okanagan-Similkameen (RDOS) and development and building permits may be required for work at the existing Vaseux Terminal station;
- **Integrated Land Management Bureau** -- If route Alternatives 2A, 2B or 3 become the selected route alternative between Shuttleworth Creek and RG Anderson Terminal station, a more extensive approval process will be required involving the ILMB as the upland route involves Crown Land. This process is estimated to take 24 months or longer as the following factors should be considered prior to submitting an application:
    - A written consent would be required from all grazing leases prior to submission;
    - Input would be sought from the Ministry of Environment as the route is within the Derenzy Bighorn Sheep Habitat Resource Management Zone of the Okanagan Shuswap Land Resource Management Plan;
    - The proposal would be discussed further with First Nations concerned; and
    - Further consultation would be required with impacted tenure holders (water licences, traplines, recreation permits, guiding and outfitting, etc.) and key stakeholders along the upland route.

Table 7-0: Permits and Approvals Required for the Okanagan Transmission Reinforcement Project

Agency	Department or Branch	Legislative Mandate of Agency	Anticipated Notification or Approval	Trigger & Location
I. Federal Agencies				
Indian and Northern Affairs Canada	Pacific and Yukon Region Environment Vancouver	*Indian Act* *Canadian Environmental Assessment Act*	1 - CEAA screening	1 – Requirement for lease on federal land (Bentley Terminal Station site – Osoyoos Indian Band Reserve).
	Pacific and Yukon Region: Lands Vancouver	*Indian Act*	1 - Federal land lease. 2 - Salvage permit	1 – Requirement for lease on federal land (Bentley Terminal Station site – Osoyoos Indian Band Reserve). 2 – Requirement if clearing required on reserve land (Bentley Terminal Station site and 40 Line right-of-way on Osoyoos Indian Band land.
Environment Canada	Canadian Wildlife Service Vancouver	*Canadian Environmental Protection Act* *Species At Risk Act* *Canadian Environmental Assessment Act*	1 - CEAA screening 2 - SARA permits	1 - Requirement for lease on federal land (Bentley Terminal Station site – Osoyoos Indian Band Reserve). 2 – Requirement (if necessary) for handling, research or removal of residence.

Agency	Department or Branch	Legislative Mandate of Agency	Anticipated Notification or Approval	Trigger & Location
	Environmental Protection Service	*Canadian Environmental Protection Act* *Clean Air Act* *Clean Water Act* *Transportation of Dangerous Goods Act* *Environmental Management Act (applies once waste leaves federal property)*	1 – Spill reporting 2 – Hazardous Waste Storage permit (not likely)	1 - Notification in the event that a polluting substance escapes or is spilled on federal land (Osoyoos Indian Band Reserve) or provincial land. 2 - Requirement for storage, of hazardous wastes on federal or provincial land.
	Canadian Wildlife Service Land Management Vancouver	*Canadian Environmental Protection Act* *Species At Risk Act*	1 – CEAA screening 2 - Soil and Vegetation removal/alteration permit	1 & 2 – Soil and Vegetation removal associated with new pole holes, right of way preparations, and disturbance in the National Wildlife Area. (Federal land)
	National Parks Service Archaeology Branch Calgary	*Archaeological Heritage Policy Framework*	AIA Review (under CEAA screening)	Federal Lands: OIB and National Wildlife Area
Department of Fisheries and Oceans Canada	Kamloops	*Fisheries Act* *Navigable Waters Act*	1 - Notification (project information requirement) or; 2 - HADD approval (HADD: Harmful Alteration, Damage or Disruption to fisheries habitat).	1 - Notification is necessary where potential for HADD exists, otherwise courtesy. Uses CEAA referral process and notification is expected as a minimum for the crossing of Vaseux Creek. 2 - Disturbance to riparian zone and/or streambed (generally within 30 metres) of most watercourses that are tributary to fish bearing bodies of water triggers HADD.
Natural Resources Canada	Explosives Regulatory Division	*Canada Explosives Act*	Magazine licence	For storage of explosives.

Agency	Department or Branch	Legislative Mandate of Agency	Anticipated Notification or Approval	Trigger & Location
Transport Canada		*Transportation of Dangerous Goods Act*	TDG certificates of training for shipments of dangerous goods, TDG labels, placards and specified means of containment.	TDG Act and Regulations regulate transportation of dangerous goods by air and land. Dangerous goods include products such as fuel in jerry cans, solvent based paints, etc.
	Navigable Waters	*Navigable Waters Protection Act*	CEAA screening	Screening only if HADD triggered or if impact to navigation on water.
	Aerodrome Safety	*Standards Obstruction Marking*	Notification	Determination by Transport Canada if facilities/structures are in, or close to a fly zone, and require marking.
Health Canada	Human Resources Development Canada	*Hazardous Products Act, WHMIS*	Employee training & certification	Handling and exposure to all controlled products (WHMIS list)
II. Provincial Agencies				
Chair of the SAR (Species at Risk) recovery teams	Penticton	*Species at Risk Act Wildlife Act*	Notification, consultation and review of the ESIA (Voluntary).	Species at Risk (SAR) consultation. Recovery teams mandated under federal law to develop and assist in the implementation of recovery plans for SAR.
Ministry of Agriculture, and Lands	Pesticide Management	*Weed Control Act*	Mandatory noxious Weed control	Occupier of land has duty to control noxious weeds growing or located on land and premises

Agency	Department or Branch	Legislative Mandate of Agency	Anticipated Notification or Approval	Trigger & Location
Ministry of Environment	Water Branch	*Water Act*, Sections 8/ 9	Notification or Approval for works in and about streams and watercourses	Same triggers as the DFO/HADD process (riparian zone and/or watercourse impacts generally within 30 metres of the watercourse)
	Environmental Protection	*Environmental Management Act* *Spill Reporting Regulation* *Hazardous Waste Regulation* *Wildlife Act*	1 - Spill/Env. Emergency notification. 2 - Approval for storage, transportation and disposal of specified quantities of hazardous wastes.	1 & 2 - regulations specify type and quantity triggers
	Pesticide Management/Pesticide Wise	*Integrated Pest Management Act*	1 - Pesticide Applicator Licence 2 - Permit to apply to a watercourse	1 - Vegetation control with herbicides by commercial third party contractors. 2 - Permit to apply pesticides within 30 metres of a watercourse.
	Environmental Stewardship	*Environmental Management Act* *Wildlife Act*	ESIA review	- Upper route crown land application will trigger ESIA screening through referral process. Lower route is courtesy review only. - SAR 'residence' impacts (as identified in the Wildlife Act) could trigger ESIA screening.
	BC Parks	*Parks Act*	1 - ESIA review required for sections for Park. 2 - Park Use Permit 3 - Approval for Statutory Right-of-way Aerial Crossing of Vaseux Creek.	1 - Require review of mitigation plans in Vaseux Protected Area. 2 - Park Use permit required if temporary access off right of way for construction 3 - Approval for Statutory right of way Aerial Crossing of Vaseux Creek as part of reduction of right-of-way in rest of protected area.

Agency	Department or Branch	Legislative Mandate of Agency	Anticipated Notification or Approval	Trigger & Location
Ministry of Energy and Mines	Permitting Branch	*Mines Act*	Temporary Gravel Extraction Permit	If gravel extraction conducted on new site for the project only. Existing gravel operations will have their own permits in place.
Ministry of Public Safety and Solicitor General	Office of the Fire Commissioner	*BC Fire Code*	Approval or permit for fuel storage or dispensing	Fuel and Chemicals (over 45 gal.) must conform to CSA standards and NFPA 30 (2.3.2.3). Double Wall or dyking. Remote sites for heli fuel exempted.
Ministry of Tourism, Sports and the Arts	Archaeology Branch	*Heritage Conservation Act*	1 - Heritage Investigation Permit 2 - Site Alteration Permit	1 - Required for any AIA on provincial or private lands to do shovel tests and investigations. Permit not required on federal lands. Investigation permit obtained May, 2007 for AIA. 2 - May not be required as no additional heritage excavation anticipated.
Ministry of Forests		*Forest Act, Forest and Range Practices Act*	1 - Licence to Cut on Crown Lands 2 - Timber marks	1 - Timber removal and salvage on Crown Land. 2 - Removal of trees from private and Crown Land.
	Protections Branch		Burning permits	
Interior Health Authority		*Health Act*	Approvals re: sewage disposal field and waste and notification in the event of a spill	If installation of septic fields at any facility. (Does not apply to Osoyoos Indian Band - Bentley Terminal Station site).

Agency	Department or Branch	Legislative Mandate of Agency	Anticipated Notification or Approval	Trigger & Location
Ministry of Transportation	Okanagan –Shuswap District	*Transportation Act* *Transportation of Dangerous Goods Regulation*	1 - Permit for Access to a Controlled Access Highway 2 - Aerial Crossing Permit 3 - TDG certificates of training, TDG labels, placards 4 - Reporting dangerous goods spills	1 - New access to a MOT controlled road. 2 - More information required. 3 - TDG Regulation usually administered by MOT for road transport. 4 - Dangerous goods spills by road transport must be reported to this provincial authority.
III. Municipal Agencies				
Regional District of Okanagan Similkameen (RDOS)	Penticton Head Office		1 - Environmentally Sensitive Development Permit (ESDP) 2 – Height Variance permits 3 - Building Permits. 4 - Road crossing permits.	1 - Potential environmental approvals linked to Development permits in sensitive zones (ESDP) at Vaseux Lake Terminal Station. Development permits may be triggered by new buildings or site expansions. Case by case basis. Requires ESIA screening and approval if in an ESDP area (i.e. Vaseux Lake Terminal Station). 2 - Height Variance permits for selected structures in the stations (i.e. lightening spires). Needs interpretation for application in consultation with RDOS. 3 - New building construction within RDOS jurisdiction 4 - Permits for crossing RDOS managed roads.

Agency	Department or Branch	Legislative Mandate of Agency	Anticipated Notification or Approval	Trigger & Location
City of Penticton			Development Permit for RG Anderson. Building Permit	Permit is not required based on preliminary design. Construction within fence line and control building does not have to be expanded - permit may be required if design changes.
IV. Companies				
BC Transmission Corporation		*Transmission Act - BC Utilities Commission*	Change to BCTC to FortisBC interconnection	Vaseux Lake Terminal Station modifications
Terasen Gas Inc.			Pipeline Crossing Permit	
Telus			Utility Crossing Permit	
Weyerhaeuser			Road Use Permit	
Private Landowners			Access and Construction Rights	If access is needed to the right-of-way
Private Landowners			Vegetation Management Expansion	
Forest Management/Timber Licence Holders			Agreement with timber rights to holders provides compensation for and removal of timber.	For timber rights identified for the crown lands under consideration on the Upper route alternatives.

Okanagan Transmission Reinforcement Project

(OTR Project)

Section 8: Public Consultation

FortisBC Inc.

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8.0 PUBLIC AND FIRST NATIONS CONSULTATION

8.1 INTRODUCTION

FortisBC undertook a comprehensive approach to public consultation for the OTR Project to ensure that all interested stakeholders and First Nations had the opportunity to review the Project plan and provide feedback prior to FortisBC filing the CPCN Application. FortisBC's main goal for public consultation was to create a dialogue with interested parties by explaining the need for the Project, presenting FortisBC's preferred Project proposal and ensuring that interested parties were aware that FortisBC must consider environmental impacts, constructability and rate impacts that would result from the Project as part of the decision making process.

As part of the public consultation, FortisBC had informal and formal meetings with various levels of government, business organizations, other stakeholders and First Nations.

An overview of FortisBC's public consultation activities for the OTR Project is provided below and the complete Public Consultation Report is available in Appendix J.

8.2 OTR PROJECT PRE-CONSULTATION

Prior to the public consultation for the OTR Project, research was undertaken to identify communications objectives, impacted parties and key issues.

8.2.1 Communications Objectives

FortisBC identified a number of communications objectives as part of the public consultation for the OTR Project. Messaging was structured to ensure that the following was communicated:

a. The OTR Project is required to meet the growing electricity requirements of Okanagan communities;

b. FortisBC has an obligation to manage the costs of the OTR Project to ensure that a cost effective solution is proposed, recognizing that the Project impacts rates for all customers across FortisBC's service area;

c. FortisBC is committed to an open dialogue with stakeholders including area residents and First Nations. FortisBC is open to suggestions to improve the Project plan and is committed to responding to questions and concerns;

d. FortisBC must balance social, economic and environmental impacts with constructability and Project costs; and

e. There are benefits and risks associated with the Project.

8.2.2 Identification of Stakeholder and First Nations Groups

To ensure that FortisBC engaged appropriate stakeholders, the OTR Project team developed a list of groups to be included in public consultation efforts. As the public consultation proceeded, the list was expanded to include newly identified stakeholders as follows.

a. Landowners along the existing Oliver-to-Penticton transmission line corridor;

b. Residents of the Oliver, Okanagan Falls and south Penticton areas;

c. Municipalities;

  i. Town of Oliver;
  ii. City of Penticton;
  iii. District of Summerland; and
  iv. City of Kelowna.

d. Regional Districts;

  i. Regional District of Okanagan-Similkameen; and
  ii. Regional District of Central Okanagan.

e. Environmental Organizations;

  i. South Okanagan Similkameen Invasive Plant Society;

ii. South Okanagan Similkameen Conservation Program;

iii. The Nature Trust of British Columbia; and

iv. BC Wildlife Federation.

f. Business Organizations;

i. Penticton Chamber of Commerce; and

ii. Kelowna Chamber of Commerce.

g. Provincial Government;

i. Ministry of Environment, regional officials;

ii. Integrated Land Management Bureau; and

iii. BC Parks Department.

h. Federal Government;

i. Canadian Wildlife Service

i. First Nations;

i. Osoyoos Indian Band;

ii. Penticton Indian Band; and

iii. Okanagan Nation Alliance.

8.2.3 Issues Definition

Prior to the stakeholder engagement the OTR Project team attempted to identify key issues that might arise and to summarize information relevant to these issues. These summaries were continually updated throughout the public consultation process.

The key issues included:

a. Transmission line and station aesthetics;

b. Environmental impacts;

c. Customer rate impacts;

d. Line locations (preferred route and alternate route);

e. Property values and visual impacts;

f. Context of the “public need” for more electricity;

g. First Nations aspects;

h. Regional growth implications; and

i. Electric and Magnetic Fields.

8.3 PUBLIC OPEN HOUSES

As part of the public consultation for the OTR Project, public open houses were held in Oliver, Okanagan Falls and Penticton from 4 pm to 8 pm on March 6, 7 and 8, 2007 and on May 22, 23 and 24, 2007. During all open houses, local area residents had the opportunity to review a series of poster boards and were provided with handouts detailing the OTR Project.

The objectives of the open houses were defined as follows:

a. Describe and discuss the need for the OTR Project;

b. Discuss the elements required to expand transmission line capacity;

c. Present the OTR Project plan, along with FortisBC’s preferred transmission line route;

d. In the first series of open houses in March 2007, seek public input on the initial OTR Project design; and

e. In the second series of open houses in May 2007, present FortisBC’s preferred option and an alternate route in the east Skaha Lake area and associated benefits and risks of each option.

Over 50 display and orthographic photo boards and four different brochures were available at the first series of open houses. Attendees were encouraged to complete questionnaires expressing their opinions, concerns and suggestions for the OTR Project. Over 30 display boards, 32 orthographic photo boards and four updated brochures were available at the second series of open houses. Attendees were again encouraged to complete questionnaires to provide feedback and to present any outstanding concerns they might have about the OTR Project.

FortisBC and BC Hydro engineering, technical, environmental and public consultation experts were available at both series' of open houses to respond to questions and explain various aspects of the OTR Project.

8.3.1 Public Open House Notification

Residents in Oliver, Okanagan Falls and southeast Penticton were notified of the open houses through direct mail letters, hand delivered invitations and newspaper advertisements. The Public Consultation Report and outreach materials are provided in Appendix J. A web page on FortisBC's public website was created and contact centre staff received OTR Project information to respond to inquiries. Table 8-3-1 below identifies the schedule of public notification:

Table 8-3-1 – Schedule of Public Notification

Date	Notification	Target	Outreach
February 19	Personal letter of invitation to Open House Series 1	All landowners 500 metres to the west and 1,000 metres to the east of the existing transmission line along existing Oliver-to Penticton transmission line corridor	297 letters
February 19 – 23	Printed invitation to Open House Series 1	Defined areas including all of Oliver, Okanagan Falls and southeast Penticton	7,359 invitations
February 21 – March 4	Newspaper ads for Open House Series 1	Penticton, Okanagan Falls and Oliver newspapers	
April 11	Follow-up letter included a general update and the next steps FortisBC will take in preparation for Open House Series 2	All landowners along existing Oliver-to Penticton transmission line corridor and all Open House Series 1 registered attendees	451 letters

Date	Notification	Target	Outreach
May 7	Personal letter of invitation to Open House Series 2	All landowners along existing Oliver-to Penticton transmission line corridor, all Open House Series 1 registered attendees and individuals who requested information	508 letters
May 8 - 14	Printed invitation to Open House Series 2	Defined areas including all of Oliver, Okanagan Falls and southeast Penticton	7,359 invitations
May 9 - 20	Newspaper ads for Open House Series 2	Penticton, Okanagan Falls and Oliver newspapers	
June 20	Follow-up letter included a synopsis of the open houses, a general description of the OTR project proposal	Expanded list of landowners along existing Oliver-to Penticton transmission line corridor and previous open house attendees and leaseholders along the higher elevation alternate route. Series 1 and 2 registered attendees.	524 letters
September 19, 2007	Delay letter included notification of postponement of BCUC submission due to the need for further analysis (engineering & environmental analysis)	List of landowners along existing Oliver-to Penticton transmission line corridor and previous open house attendees and leaseholders along the higher elevation alternate route. Series 1 and 2 registered attendees.	519 letters

8.3.2 Public Open House Communications Materials

During the consultation process, FortisBC's goal was to be transparent with descriptions of the OTR Project, its impacts and public necessity. During the open houses, attendees had the opportunity to review a series of poster boards and handouts detailing the OTR Project. Attendees had an opportunity to ask questions of the OTR Project team and were supplied with a questionnaire to complete prior to their departure. Communication materials included the following:

a. Discussion Guide Brochure - General overview;

b. Backgrounder: Environment - Detailed overview of environmental considerations;

c. Backgrounder: Public Need - Detailed overview of the growth in the Okanagan including the projected 30-year growth and increase in building permits;

d. Display Boards - Key information on the OTR Project and FortisBC; and

e. Questionnaire - All open house attendees were given a questionnaire when they registered at the door. Attendees were encouraged to complete the questionnaires prior to leaving.

Copies of the communication materials have been provided in Appendix J.

8.3.3 Public Open House Feedback

A total of 110 people participated in the first series of open houses with over 79% responding to the questionnaire. Participants were asked to respond to questions relating to the OTR Project, the open house information and general questions pertaining to where they lived in relation to the OTR Project and how long they had lived in the Okanagan. Responses varied depending on the geographic location of the open house. In all areas participants appeared to understand and agree with the need for the OTR Project. However, as the open houses progressed northward towards Penticton where the existing transmission lines run through newer subdivisions, participants expressed more concerns about the routing of the transmission lines. The general comments received were divided into four categories: Project Need; Routing; Visual Impacts and Environmental and Social Impacts.

a. **Project Need** – Open House attendees generally acknowledged the region was growing and that the Project was necessary to meet future reliable power needs.

b. **Routing** - a number of participants expressed the desire to have the line moved away from their properties and onto Crown land. In contrast, a number felt that the line should stay within the existing right-of-way to reduce environmental impacts of clearing a new right-of-way and potential land acquisition.

c. **Visual Impacts** - there were concerns expressed about visual impacts and the appearance of the new line. Many expressed the desire to have more visual screening of substations and the opportunity to see how the height of poles and lines would impact their views.

d. **Environmental and Safety Impacts** - participants recognized that protecting the environment was a key Project objective and some requested that FortisBC protect wildlife sensitive areas. Some participants raised concerns about increased EMF.

A total of 128 people attended the second series of open houses with 79% completing questionnaires. An increased number of residents from the Heritage Hills area attended the open houses in Okanagan Falls and Penticton – many of whom expressed their desire to have the transmission line relocated to a higher elevation route. In the questionnaire attendees were asked to respond to questions about the preferred option on the existing right-of-way, the open house information and general questions relating to where they lived in relation to the line and how long they had lived in the Okanagan.

Responses varied depending on the geographic location. In Oliver, attendance was very low. In Okanagan Falls and Penticton there were increases in attendance with the majority of attendees being residents from Heritage Hills. The general comments received fell into four categories: Project Need; Routing; Visual Impacts and Environmental and Social Impacts.

a. **Project Need** - the majority of participants again recognized that the Project is necessary to meet the needs of a growing region. Increased concern was expressed regarding the route of the proposed transmission line on the existing right-of-way through populated areas.

b. **Routing** - there was strong support for a higher elevation route east of the Heritage Hills subdivision. In contrast, some participants expressed the desire to see the transmission line remain in the right-of-way the entire distance between Oliver and Penticton for environmental and economic reasons.

c. **Visual Impacts** - the comments from participants focused on potential effects on property values. There were also concerns expressed about impacts to views.

d. **Environmental and Social Impacts** - comments from participants included concern about environmental impacts of an alternate higher elevation route. Many felt that the existing right-of-way is the most environmentally preferred option. Some participants felt that EMF was a concern.

8.4 PUBLIC FEEDBACK OUTSIDE OF THE OPEN HOUSES

FortisBC responded to approximately 40 e-mails and phone calls in the interval between and subsequent to the open houses. The majority of the communications involved concerns about the transmission line location in the Heritage Hills area and the desire to have the line moved to a higher elevation route, along with concerns about property values, and potential health impacts of the transmission line.

In March 2007, FortisBC had two on-site meetings with landowners in Heritage Hills to discuss the potential impacts of the upgraded transmission line and possible mitigation measures.

Three petitions opposing the preferred route option over the existing right-of-way were received from the Citizens of Okanagan Falls Against High Voltage Overhead Lines (COFAHVOL) which was subsequently renamed South Okanagan for Alternative Route (SOFAR) and is referred to in this document as COFAHVOL/SOFAR. A March 28, 2007 petition contained 101 signatures supporting the following statement: “Opposition to the planned FortisBC Okanagan Transmission Reinforcement Project over the existing right-of-way.” A May 10, 2007 petition contained 103 signatures and a July 30, 2007 petition had 83 signatures supporting the same statement above.

FortisBC met with individuals from this group on July 23, 2007 to discuss the group’s desire to move the transmission line to the Upland route or place the lines underground. FortisBC also discussed possible mitigation strategies should the line remain on the existing right-of-way. At the meeting COFAHVOL/SOFAR presented a letter acknowledging the need for the OTR Project and their willingness to partially offset some of the additional costs of moving the line.

A petition was also received from the Council for Strata Plan K268 representing 16 landowners in the Golden Hills Strata opposed to the Upland route option for the transmission line. The petition dated August 10, 2007 stated that the Upland route option would have irreversible, lasting negative impacts on the watershed for the area. They stated that they support the existing right-of-way as it has less environmental impacts.

8.5 CONSULTATION WITH KEY GOVERNMENT AND COMMUNITY STAKEHOLDERS

Initial public outreach for the OTR Project began in fall 2006. FortisBC gave the following key stakeholders a high level overview of its plans to expand the transmission system in the South Okanagan:

a. City of Penticton;
b. The Nature Trust of BC;
c. Ministry of Environment;
d. Regional District of the Okanagan Similkameen;
e. Town of Oliver; and
f. BC Parks.

Personal invitations to attend the open houses were sent to representatives from the District of Summerland, The Nature Trust of BC, the Town of Oliver, the cities of Kelowna and Penticton, the South Okanagan Cattleman’s Association, and the Regional District of the Okanagan Similkameen.

Subsequent to the first open houses, as a potential higher elevation transmission line option for the East Skaha Lake area was being considered, FortisBC had discussions with The Nature Trust of BC, the South Okanagan and Similkameen Invasive Plant Society (SOSIPS) and the Canadian Wildlife Service about the preferred and alternate routes. These organizations stated their view that there would be fewer environmental impacts by proceeding with the OTR Project along the existing transmission line corridor.

Informal consultations were held with a number of other individuals, including lease and tenure holders who would be impacted by the higher elevation route.

Subsequent to the second series of open houses, formal meetings and presentations to review the Project and to describe FortisBC's preferred option were made to the following:

a. City of Kelowna City Council;
b. City of Penticton City Council;
c. Town of Oliver City Council;
d. District of Summerland;
e. South Okanagan Similkameen Conservation Program;
f. Regional District of Okanagan-Similkameen;
g. Regional District of Central Okanagan;
h. Kelowna Chamber of Commerce;
i. Penticton Chamber of Commerce; and
j. Integrated Land Management Bureau.

In an effort to solicit feedback, FortisBC sent a letter and the Environmental and Social Impact Assessment (ESIA) in draft from for the OTR Project to the following environmental stakeholders on September 19, 2007:

a. South Okanagan-Similkameen Conservation Program;
b. BC Ministry of Environment - Environmental Stewardship Division;
c. BC Ministry of Environment - Ecosystems Section;
d. BC Parks;
e. Environment Canada - Ecosystem Conservation;
f. Indian and Northern Affairs - Environment and Natural Resources;
g. En'owkin Centre;
h. Land Conservancy of BC;

i. Okanagan Similkameen Conservation Alliance; and

j. The Nature Trust of British Columbia.

The letter requested the organizations provide written feedback prior to October 31, 2007. FortisBC received letters from The South Okanagan-Similkameen Invasive Plant Society, the Ministry of Environment – Environmental Stewardship Division and the Nature Trust of BC.

8.6 CONSULTATION WITH FIRST NATIONS

When initial public outreach for the OTR Project began in fall 2006, FortisBC made high level overview presentations of its plans to expand the transmission system in the South Okanagan to the Okanagan Nation Alliance. FortisBC sought to clarify the appropriate entity for First Nations discussions on the OTR Project. It was agreed that the Okanagan Nations Alliance’s preference was that FortisBC deal directly with the Osoyoos Indian Band and the Penticton Indian Band. FortisBC subsequently met with both the Penticton and Osoyoos Indian Bands.

Informal meetings with the Osoyoos and Penticton Indian Bands were held in February 2007 to seek initial feedback on the aesthetic, environmental and economic aspects of the Project. Meetings were also held in April 2007 to update the Indian Bands on the OTR Project, and to obtain input on the alternate Upland route.

Formal presentations outlining the OTR Project were made to the Chiefs and councils of the Osoyoos and Penticton Indian Bands in May 2007. The Osoyoos Indian Band had questions related to the structure types and whether the transmission line on reserve land would require an expansion of the right-of-way. The Penticton Indian Band expressed concerns about the alternate route option. They also had questions about employment opportunities for local residents during construction.

On October 19, 2007, FortisBC met with the Okanagan Nations Alliance to update them on the consultation process with the Osoyoos and Penticton Indian Bands and requested they review and provide comments on the letters received from the Indian Bands.

8.7 RESPONSE TO PUBLIC FEEDBACK

Throughout FortisBC's consultation process, feedback was received through a variety of channels including the following:

i. Open House discussions with the OTR Project team;

ii. Completed open house questionnaires;

iii. Correspondence with landowners, community, business and environmental groups, government and First Nations; and

iv. Meetings with landowners, community, business and environmental groups, government and First Nations.

The primary issue expressed throughout the consultation process was the route selection for the transmission line in the East Skaha Lake area. Route selection was the key element in issues that were brought up throughout the consultation process including visual/aesthetic, health and environmental impacts, as well as the impacts to future development along the line corridor.

At the first series of open houses a number of residents in Oliver and Penticton expressed concerns about the use of the existing right-of-way to expand transmission capacity. Based on this feedback, the OTR Project team evaluated higher elevation transmission line routes around the East Skaha Lake area. Based on this evaluation, a viable alternate route was included as a discussion point for the second public outreach and second series of open houses.

After the second series of open houses, feedback was received from residents of Heritage Hills, the City of Penticton and the Regional District of the Okanagan Similkameen in support of the alternate route. Based on this feedback the alternate route was included in the CPCN Application as a viable technical alternative.

Following the second series of open houses, FortisBC also received feedback from Council for Strata Plan K268, the Penticton and Osoyoos Indian Bands and a number of environmental stakeholders whose preference was for FortisBC to remain on the existing right-of-way for the upgraded transmission lines in east Skaha Lake. This feedback was considered in FortisBC's selection of the existing right-of-way as the OTR Project Proposed Solution.

FortisBC received feedback from three environmental organizations in October 2007. The recommendations and feedback received has been addressed in the ESIA or will be in the Environmental Management Plan. All environmental feedback received was considered in FortisBC selection of the OTR Project Proposed Solution. FortisBC received considerable feedback throughout the consultation process for the OTR Project. All feedback was considered, along with social, environmental, technical and cost implications, in determining the OTR Project Proposed Solution.

Pursuant to the public consultation activities described above FortisBC received correspondence from various parties, stakeholders and First Nations. Copies of correspondence can be found in Appendix A. A summary of feedback can be found in Table 8-7 below and is discussed further the Public Consultation Report attached as Appendix J.

Table 8-7: Matrix of Support for Project Components

Stakeholder and First Nations	Expressed Support of the Project Need	Expressed Support for use of Existing ROW	Expressed Supports for moving line to Upland Route	Expressed Support for Lowest Cost Solution	No Position to Support Either Routre	Other Comments
City of Penticton	✓		✓			Requests FortisBC to consider relocation of the transmission line in order to minimize any impact on future developable lands.
City of Kelowna	✓	✓				Supports the distribution of costs.
Kelowna Chamber of Commerce	✓					Provides a viable long term solution while balancing environmental, social and economic impacts.
Penticton Chamber of Commerce	✓	✓				Would also support an alternate route if one can be secured in a timely and cost effective manner.
Regional District of Central Okanagan	✓					Supports the project in principle.
Regional District Okanagan Similkameen	✓		✓			Urges FortisBC to relocate the line, thus avoiding developed areas.
District of Summerland	✓	✓		✓		Supports lowest cost solution and environmental impact
Penticton Indian Band		✓				Supports the upgraded transmission line remaining on the existing ROW. Concerns are with respect to disturbance of surrounding landscape.
Osoyoos Indian Band		✓				Speaks only of the transmission line north of Okanagan Falls.
Okanagan Nation Alliance		✓				Support is subject to OTR upgrades being performed on the existing right of way.
Town of Oliver	✓			✓		Supports lowest cost to the user.
Coalition of Okanagan Falls Against High Voltage Power lines (COFAHVOL)	✓		✓			Willingness to offset a portion of additional costs associated with relocating the transmission line by use of a surcharge.
Integrated land Management Bureau	**N/A**	✓				Encourages FortisBC to pursue all options to use the existing ROW prior to proceeding with an application for a new one.
BC Ministry of Environment	**N/A**	✓				An upgrade along the existing corridor would have the least environmental impact.
The Natures Trust	**N/A**	✓				Cannot support the new upland route across conservation holdings.
BC Ministry of Forests and Range Fire Protection Branch	**N/A**				✓	Supportive of FortisBC's approach of using only steel structures for the project, thus minimizing fire hazard and risk.
South Okanagan Similkameen Invasive Plant Society	**N/A**				✓	The society is not in a position to support one route over another.