Peace River Site C Hydro Project

Stage 2

Preliminary Clearing Considerations

Prepared for BC Hydro Site C Hydro Project by
Industrial Forestry Service Ltd.
June 2009

EXECUTIVE SUMMARY

This report describes an investigation into how vegetation would be cleared from lands that may become affected in the Peace River area, if the potential BC Hydro Site C dam received Crown approval to proceed. The proposed clearing considerations provide a forestry-focused baseline from which BC Hydro can continue to develop towards a fully integrated reservoir preparation plan should the project proceed to Stage 3. The reservoir preparation plan is intended to consider refined forestry attributes in conjunction with potential socio-economic impacts, heritage resources, air quality, wildlife, and aquatic habitat. This investigation was undertaken by professional foresters and engineers who are familiar with the operating conditions that exist in the Peace River country, the equipment that is most readily available for forestry and clearing operations and utilizing the best digital and inventory data available, without actually performing on-the-ground surveys.

If the Site C Hydro project were to proceed, lands impacted would include the reservoir, the dam site, re-alignments of Highway 29 and widening of a transmission line corridor. The total forested area that could potentially be affected by this project is approximately 5900 hectares (excluding highway 29 road-realignments). Using British Columbia government forest inventory files, all areas were sub-divided into operating units based upon terrain, clearing method and access. Approximately 550 operating units were identified and analyzed for total and merchantable coniferous and deciduous volumes, brush volume, tree clearing method, biomass removal method, means of access (for example: roads, ice bridges, temporary bridges, helicopter) and tree and brush disposal.

For the purposes of these baseline considerations, it was assumed that all vegetation (excluding stumps) would be removed from sites that could be affected, should the project proceed. The clearing methods proposed were selected with consideration for worker safety, operational feasibility, minimizing soil disturbance and preserving the integrity of the forest floor.

Information is provided for each operating unit with respect to area, volumes, geographic location, forest licensee operating area, land ownership and clearing method. The report also provides a detailed account of the different types of clearing methods used, and estimated

means and location of vegetation disposal. As well, the location of existing roads, proposed new roads and proposed bridges and ice-bridges were identified using contour mapping.

List of Acronyms

BCTS – British Columbia Timber Sales

Canfor – Canadian Forest Products Ltd.

dbh – diameter at breast height

GIS – Geographic Information Systems

ha - hectare

IFS – Industrial Forestry Service, Ltd.

LiDAR – Light Detection and Ranging

LP Canada – Louisiana Pacific Canada

MOFR- Ministry of Forests and Range

MS – Microsoft

m^3 – cubic metre

NCC – non-commercial cover

OGMA – Old Growth Management Area

OSB – Oriented Strand Board (in sheets similar to plywood)

PPA – Proposed Protected Area

TFL – Tree Farm License

TSA – Timber Supply Area

VDYP – Variable Density Yield Prediction

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1.0 Introduction

This report describes the procedures and assumptions used to develop considerations to clear vegetation from lands that would be affected by a proposed Peace River Site C Hydro Project. The report was completed for BC Hydro by foresters, forest technicians and forest engineers at the forestry consulting company of Industrial Forestry Service Ltd. (IFS) in Prince George B.C.

The potential Peace River Site C Hydro Project (the "Project") would generally affect the Peace River between the Peace Canyon Dam, near Hudson's Hope, B.C. and roughly seven kilometers southwest of Fort St. John, just downstream of where the Moberly River enters the Peace River. The Project footprint would include areas that may become affected by reservoir flooding, dam construction sites, Highway 29 relocations, and new overhead electric transmission lines from the project to the interconnection at Peace Canyon. A map of the general region follows (Figure 2.0a).

The intent of this assignment was to develop preliminary strategic baseline clearing and access considerations and suggest wood extraction methods that may be utilized should this Project proceed. The considerations are intended to be as efficient as possible from strictly a logging and land clearing perspective. If the Site C Hydro Project proceeds to the next stage of studies, the forestry-focused considerations discussed herein would contribute to the development of an integrated reservoir preparation plan. That plan would consider refined forestry attributes in conjunction with potential socio-economic impacts, heritage resources, air quality, wildlife, and aquatic habitat.

A site visit of the potential Project footprint was not carried out by the consultant. This assignment used available digital information, and local professional forestry and engineering knowledge of harvest/clearing methods to compile strategic clearing considerations. The information that was assembled was combined with professional expertise to estimate the volume of merchantable wood and waste wood that would be affected by the Project.

2.0 Assignment Scope

The assignment scope was the development of harvesting and clearing considerations for the potential Site C Hydro footprint, with the assumption that all vegetated areas in the Project footprint would need to be cleared down to stump height. Harvest plan maps were created to identify and describe proposed clearing units, existing access routes, roads that may need upgrades, new access routes, heli-log areas, log landings and waste wood disposal locations. The assignment scope includes the potential reservoir, Highway #29 relocations, dam construction site and new transmission lines.

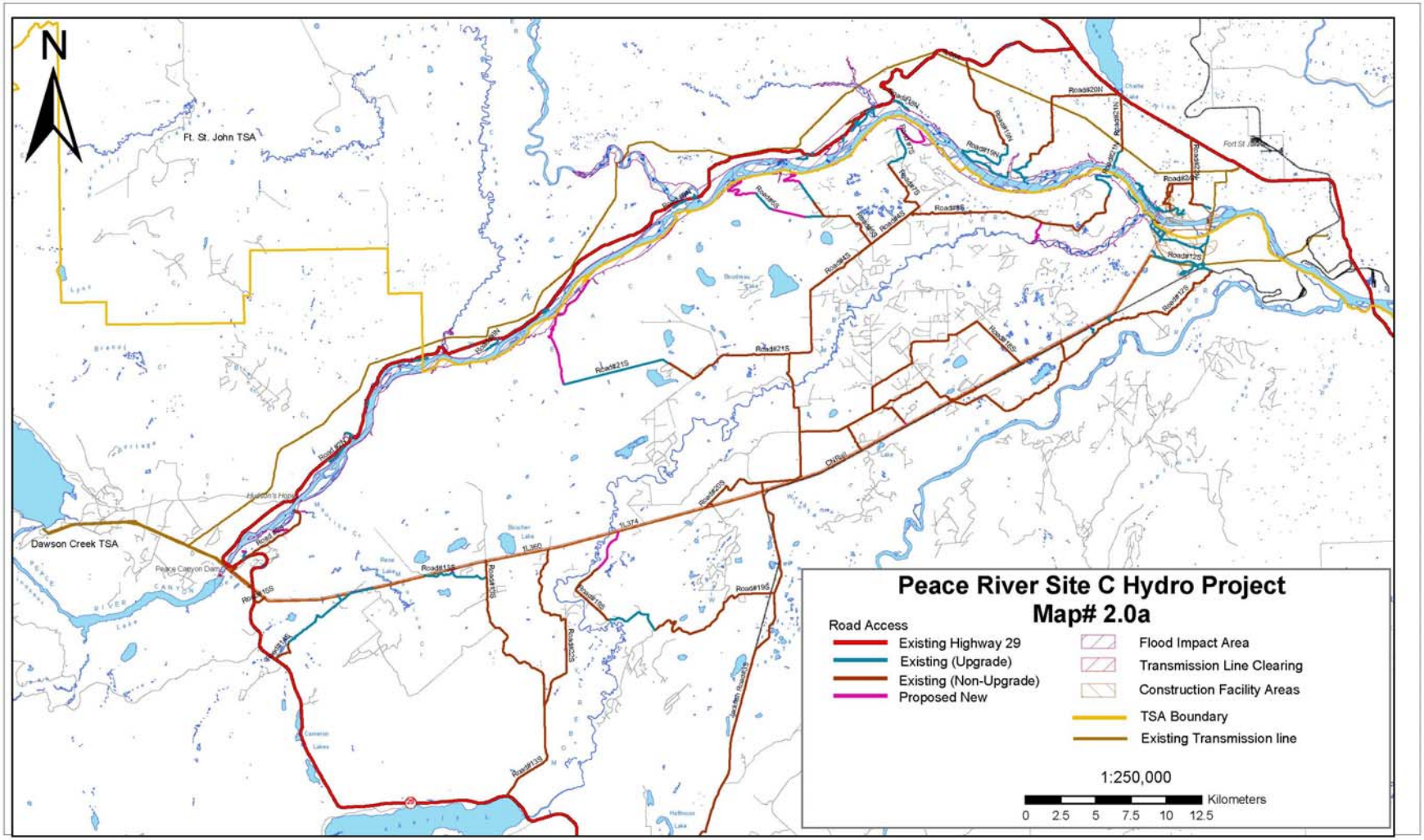

Figure 2.0a Potential Peace River Site C Hydro project footprint

3.0 Methodology

The development of strategic clearing considerations was largely an office undertaking that utilized forest inventory data, planimetric maps, topographic data and the experience of foresters, engineers and technicians familiar with operational harvest planning in the Peace River region of British Columbia. The information in this report was enhanced by comments made by a BC Hydro Professional Engineer and a BC Hydro Professional Forester, who completed aerial reconnaissance surveys of the project site in August 2008, October 2008, and February 2009. Impressions and comments from the overview flights were considered during the production of the draft strategic harvest plan maps submitted to BC Hydro for the potential Project area. This report also provides a description of the logic behind many of the merchantable and waste wood clearing assumptions.

3.1 Volume Estimations of Merchantable Wood and Waste Wood

In the development of clearing considerations, an accurate estimation of both merchantable and waste wood volumes was required.

Inventory volumes exist on the forest inventory files. These inventory volumes were updated using the Ministry of Forests and Range Variable Density Yield Prediction (VDYP) model version 6.6d. Coniferous stands were considered merchantable if they had greater than 100 cubic metres per hectare. Deciduous stands were considered merchantable if they had greater than 75 cubic metres per hectare. The total volume per hectare was then calculated for each forested stand.

It should be noted that the current MOFR stand volume models calculate the volume of the stem only. Branches and below ground biomass are not presently available. This information is scheduled for release sometime in 2009.

Non-merchantable wood volume was calculated as the difference between total volume and merchantable volume.

Estimates of wood volume in non-commercial brush areas do not exist on Ministry of Forests and Range forest inventory files. The volumes within these sites vary greatly. A professional

assessment of the amount of above-ground wood volume on these sites places the average at about 30 cubic metres per hectare. This volume was included in the assessment of volumes affected under the clearing footprint.

3.1.1 Existing and Proposed New Road Clearing Volumes

Wood volume that would be cleared on existing and proposed new access roads (other than Highway 29) was identified on the forest inventory files by buffering the centerline of each road. New proposed roads were buffered 12.5 metres on each side of the centerline to determine the wood volume in a 25 metre cleared right-of-way. Existing roads typically exist on the inventory files as single-line features. Although part of the right-of-way for these roads has already been cleared this is not recognized on the forest inventory files and additional upgrade would be required in many instances. To account for the additional clearing that may be required on existing roads, a clearing buffer of 5 metres was applied to each side of existing roads. Merchantable and gross wood volumes were calculated as per Section 3.1.

3.2 Missing and New Inventory Information

The development of a forest inventory specifically for the potential Project footprint was not part of this assignment. Instead, forest inventory files for the Site C area were acquired from other existing sources. These sources however, were not concerned with proposed changes in the Peace River shoreline; as a result, there are many apparent discrepancies when forest cover stand boundaries are overlaid with ownership lines and ortho-photos of the clearing area. In some areas, river islands have moved, shrunk or expanded from the time that the forest inventory was carried out. Other areas may now have clay banks as a result of landslides that did not previously exist. Farmers may have extended fields and river islands may have more or less vegetation as a result of changes to water levels since the time of forest cover inventory delineation. Where these changes were most obvious, the inventory line work was re-digitized to account for changes in the vegetation that were apparent as a result of visual inspection of the proposed flood site. Visual inspection was carried out through review of ortho-photos provided by BC Hydro and through review of Google Earth imagery acquired from the internet. The volumes and species for these areas were estimated using attribute information in similar adjacent vegetated areas.

3.3 Proposed Harvest Unit Delineation

The identification of proposed Harvest Units evolved over the course of completing this assignment. All clearing considerations were prepared with consideration for the principle of "safety-by-design" and incorporate techniques that minimize long-term environmental consequences. If the project were to proceed to the next stage, considerations for safety, environment, social-economic, heritage, etc.,, would be developed as part of an integrated reservoir preparation. Each proposed Harvest Unit was assigned an alpha-numeric value.

Proposed Harvest Units in the flood plain and around the dam construction site were delineated after consideration for many factors that will be discussed in this report. A total of 440 potential harvest units were created for the flood plain footprint. The potential dam site has a total of 54 potential harvest units. Delineating the harvest units within the transmission line was based on grouping forest stands (polygons) into operationally efficient units and with consideration for wood flow. The transmission line has 25 potential harvest units. The Highway 29 Realignment options were each considered as one stand-alone harvest unit.

3.4 Proposed Harvest Unit Considerations

The focus of this assignment was to consider the potential logistics of cutting down all woody vegetation in the potential Project footprint to stump height (i.e. 30cm or less) and removing this vegetative material from the site. Merchantable wood would be transported to the nearest forest industry processing centre. Non-commercial waste wood would be burned on site, or removed from the site to designated areas suitable for incineration or disposal. All of these activities would be carried out using clearing systems that considered operational feasibility (soils, slopes, access, and vegetation), minimized detrimental soil disturbance caused by mechanical equipment, preserved the integrity of the forest floor within 15 metres of watercourses or the top of bank, and minimized potential sediment production and transport to watercourses from clearing polygons and access structures. Other issues, such as land ownership, timber type and geographic location also played a role in identification of proposed Harvest Units throughout the potential clearing footprint.

Cutting larger trees would be accomplished either by hand falling with a chain saw or mechanical falling with a feller-buncher. The choice is based primarily upon terrain and access; with more difficult terrain, poor ground access and sensitive sites being restricted to hand falling. Cutting smaller woody vegetation and smaller trees (saplings) would be done either by hand or mechanically operated brush saws.

Collection of merchantable and waste wood into piles would involve use of skidders, rake-equipped crawler tractors, excavators and some hand piling.

Transportation of logs and waste wood to an initial processing or sorting site may involve helicopter transportation by cable-sling or grapple, skidder transportation, truck transportation of collection bins or logging trucks. Once merchantable trees have been removed from the site to the roadside or designated landing, the trees would be de-limbed and sized according to the log specifications defined by regional manufacturing facilities. Logs would then be sorted and transported to these facilities by logging truck. It was assumed the remaining waste wood would be incinerated.

3.5 Protected Areas and Old Growth Management Area Considerations

Old Growth Management Areas (OGMAs) have been identified within the potential Project footprint by the Ministry of Forests and Range. Appendix A describes the area and volume within the Project footprint that would be affected by OGMAs and provides a map (Figure A-1a) that shows the location of OGMAs in the Project footprint.

There were no protected areas legally established within the potential Project footprint at the time of this report. Part of the Peace River - Boudreau Proposed Protected Area (PPA) exists within the Project footprint. The Peace River - Boudreau PPA is located southwest of the City of Fort St. John. It incorporates a major portion of the southerly bank of the Peace River Valley, Boudreau Lake, the lower Moberly River Valley and the islands at the confluences of Maurice Creek and Moberly River with the Peace River. At this time, the area has not been established as a protected area through Order-In-Council. Appendix A describes the area and volume within the Project footprint that would be affected by the

proposed protected area and provides a map (Figure A-1b) that shows the location of the Peace River - Boudreau PPA relative to the Project footprint.

4.0 Proposed Harvest Unit Clearing

The following sections describe the various proposed harvesting and clearing stages in further detail.

To prevent the spread of noxious weeds all equipment brought to the Project should be cleaned to remove all weed seeds prior to the commencement of any clearing activities and again between separate project areas. It is recommended that a noxious weed control and monitoring program be developed by BC Hydro and applied and actively monitored throughout the construction period up to flooding. Guidance from the Northwest Invasive Plant Council is recommended to establish the control and monitoring programs[1].

4.1 Vegetation Clearing

Several different harvesting and clearing methods would need to be used in the clearing process. These include:

- hand-falling, feller-buncher (i.e., mechanical falling),
- hand and mechanical brushing,
- hand and mechanical raking/piling,
- helicopter removal of vegetation and logs, skidder transportation of trees (cable, grapple and crawler),
- processing, sorting and loading of commercial logs,
- trucking of commercial logs to manufacturing facilities,
- incineration of waste vegetation[2],
- trucking waste wood to incineration facilities.

[1] ***Website –*** (Invasive Plant Council of BC, 2006)
[2] BC Hydro clearing contractors may choose to burn debris piles on-site rather than transporting them to landings or incineration sites. This decision to burn piles on-site would be subject to smoke regulations and the results of future environmental studies.

4.1.1 Hand Falling

Hand falling in British Columbia is typically falling timber and slashing brush with a chain saw in terrain that is inaccessible to heavy equipment or considered too difficult for machinery, like a feller-buncher, to safely operate (i.e. slopes greater than 35%), or in areas that are considered environmentally sensitive. In the potential Project footprint, hand falling would be reserved for small areas with low merchantable wood volumes, steep slopes, poor ground access or sensitive sites.

Environmentally sensitive areas or areas on steep slopes having little or no merchantable wood and large numbers of small diameter trees and brush may be cleared with a motorized hand brush saw[3].

4.1.2 Feller-Buncher / Mechanical Brushing

Feller-bunchers are the primary method of falling merchantable trees in British Columbia today. The process is fast and considerably safer than hand falling.

After falling and removal of merchantable trees, a mechanical brush saw such as the Pro Mac [4] mounted on an excavator could be utilized to cut remaining slash and small stems.

4.1.3 Post Cutting Movement of Logs and Biomass

After merchantable trees are felled, they need to be moved. In machine operable areas merchantable trees would be moved to the roadside either by skidding with grapple or line skidders or by crawler tractor. Merchantable trees in areas felled by chainsaw would be moved to log landings by helicopter. In both cases the logs would be de-limbed and topped at the roadside or landing prior to being loaded onto logging trucks for transportation to a lumber, pulp or OSB processing facility within nearby communities. Skidding of merchantable trees would occur prior to mechanical brushing, as this minimizes damage to logs.

---

[3] ***Website -*** (Ontario Ministry of Natural Resources, 1998). Provides detailed information on the pros and cons of clearing with brush saws as opposed to chain saws and mechanical brushing tools:
[4] ***Website –*** (Pro Mac Manufacturing Ltd., 2009)

Helicopters would be used as a tool to access small, steep and/or hard to access stands within the potential Project footprint. Helicopters would be used to deliver machinery and personnel, to remove merchantable wood, and to remove non-merchantable waste wood in areas where incineration is not an option due to open burning regulations.

In difficult to access clearing sites, the removal of non-merchantable waste wood can be carried out through the use of helicopters equipped with a grapple. The volume of waste wood would vary considerably in these smaller harvest units.

4.1.4 Mechanical Piling of Waste Wood

Within all merchantable and non-merchantable vegetated stands, varying amounts of non-merchantable waste wood (i.e., branches, tree tops, small trees, saplings, slash and brush) exist and would need to be accumulated and removed. The majority of this waste wood would likely be mechanically raked together after removal of the merchantable tree species.

For ground accessible harvest units it was assumed crawler tractors with brush rakes would be used while a micro-mechanical rake might be utilized on helicopter accessible harvest units.

4.1.5 Hand Piling of Waste Wood

Hand piling would be restricted to proposed harvest units that have poor ground access and/or are environmentally sensitive and are typically narrow and/or steep riverside stands. These harvest units range between less than one hectare and upwards to twenty hectares in size.

4.2 Wood Management Assumptions

The proposed harvest and clearing report was constructed with the assumption that all wood above stump height would be removed from the Project footprint as merchantable logs or waste wood. While removal of stumps would likely be required in some areas, such considerations are beyond the scope of this report and should be integrated into reservoir preparation planning if the project proceeds to future stages.

4.2.1 Merchantable Logs

Merchantable logs delivered to landings or to roadside would either be coniferous or deciduous species to be subsequently delivered to the appropriate manufacturing facility.

4.2.2 Waste Wood

BC Hydro clearing contractors may choose to burn waste wood piles on-site rather than transporting them to landings or incineration sites. This decision to burn piles on-site would be subject to smoke control regulations and the results of future environmental studies. The BC Ministry of Environment is in the process of reviewing and revising the Open Burning Smoke Control Regulation (under the *Environmental Management Act*) through a public consultation process. Under revised regulations smoke sensitivity zones may be established across the Province[5]. Under the proposed regulatory changes, the potential Project area would exist primarily within areas having moderate (with some high) smoke sensitivity classifications. If this regulation is passed prior to or during harvest and clearing activities, open burning in the Project area may be curtailed. Forced air burning of waste wood in large steel containers with an on-site loader is the most probable, cost effective solution. Waste wood located near the Hudson's Hope or Taylor communities may need to be transported away from the communities; however the remainder of the wood may be disposed of on-site.

Disposal of waste wood along the proposed Highway 29 re-alignments and the transmission line would be carried out in mobile burn boxes that are dragged along the right-of-way by the clearing contractor. This is to minimize smoke visibility dangers to travelers along the highway and safety issues near existing transmission lines.

Disposal of waste wood to bioenergy plants was considered in the development of this report. However, at this time there are no bioenergy plants or pellet plants in the Peace region that can utilize the volume of waste material that would result from the proposed clearing process. It is possible alternative disposal options may be available in the region in the future. If the project were to proceed to Stage 3, it is recommended that BC Hydro

[5] ***Website –*** (BC Ministry of Environment, 2008)

further assess the feasibility of alternative disposal options through consultation with local communities, stakeholders and regulators.

4.2.3 Seeding

After completion of vegetation clearing, all disturbed areas would require seeding to ensure that undesirable brush or trees do not re-establish themselves prior to flooding or road or transmission line development. Areas should be seeded with a standard agronomic mix containing short-lived species that would hold the soil until the construction work is completed. A mix with red fescue would be suitable.

4.3 Proposed Harvest Unit Access

Access to areas that require clearing can be accomplished via three means: road, air and water. Each proposed harvest unit had identified with it a method by which personnel and equipment would access the area, and the means by which wood could be removed.

4.3.1 Road Access

Road access was identified using digital road coverages acquired from the Ministry of Forests and Range, Peace Region forest licensees, the Oil and Gas Commission, ortho-photos and Google Earth. Access maps had several road classifications. These included paved surfaces, one-lane gravel roads, two lane gravel roads and rough roads and trails. The current physical condition of existing gravel roads was estimated based upon the level of recent logging activity witnessed on ortho-photos and Google-Earth images, road width, and slope. Areas where logging and/or oil and gas activity appeared recent (e.g. 3 to 5 years) were assumed not to require significant upgrade. Access routes without recent development activity were assumed to require upgrade. New road construction was proposed using linkages to existing road networks, and a maximum adverse (loaded hauling uphill) grade of 12 percent was considered for short distances as a constraint for all new roads. Construction of “On block” roads within proposed harvest units were assumed to be temporary travel routes.

Road information was summarized based upon whether it occurred within the potential Project footprint or outside the potential Project footprint. Roads that either exist or would be

constructed directly within areas affected by the reservoir, dam construction site clearing or transmission line were considered ***within*** the Project footprint. All other roads were ***outside*** the Project footprint. Roads located both within and outside the Project footprint were classified as new construction, road requiring upgrade and roads not requiring upgrade.

4.3.2 Air Access

Access for personnel and equipment into locations that are inaccessible by road (or determined not feasible for other reasons such as environmental consequence), were assumed to be accessed utilizing large helicopters.

4.3.3 Water Access

The location of the majority of the wood to be cleared in the potential Project footprint is adjacent to the Peace River. Hence access to vegetated islands would be a major concern in the development of clearing considerations. Access to islands is possible through the use of ice bridges, barges, Bailey bridges, steel bridges and/or helicopters. This clearing report assumed the use of ice bridges, steel bridges and helicopters. However, changes to water levels or weather conditions may preclude the suitability for the construction of ice bridges at some of the proposed locations. Bailey bridges are not recommended, and while barges are likely very cost-effective, information on water depths at landing locations was lacking[6]. As new information is acquired by BC Hydro regarding water depths and the feasibility or infeasibility of the location of proposed ice bridges, these findings can be considered in reservoir preparation planning at a later stage.

Ice bridges were proposed to islands where the water span was relatively narrow and the water depth was believed to be relatively shallow - thus having a lower flow velocity. Information regarding historic ice conditions on the Peace River was reviewed from the Government of Alberta's web site: http://environment.alberta.ca/forecasting/RiverIce/PeaceRiverArchive.html. The website revealed that the main channel of the Peace River seldom freezes between the Peace Canyon Dam and Taylor BC.; primarily due to the speed of the water flow and inadequate winter temperatures in this region. Therefore, both summer and winter access to proposed

[6] Future water depths as a result of water discharge from the W.A.C Bennett Dam are unknown, and would likely not be regulated in consideration for the proposed clearing project.

Harvest Units requiring a crossing of the Peace River necessitate the utilization of watercraft, helicopter or some form of steel bridging.

Consultation with industry professionals and experienced contractors provided valuable insights and reference material obtained from several web sites provided the following background information regarding water access within the potential Project footprint.

Ice Bridges

- Require a thickness of 36 to 52 inches for an off-highway logging truck. The thickness depends on whether logs may be used to line the crossing.
- Building time is 1 inch per day @ -30ºC, ½" per day at -10ºC.
- Are typically built in the Fort Nelson area across portions of a river where the river is widest to reduce depth and water is moving at slow speeds.
- Use along the Peace River should be restricted to the shallow areas between islands.
- Should not be used to cross the main channel of the Peace River, due to the low probability of sufficiently cold temperatures.

Steel Bridges

- The steel bridges used most often in the BC north and on BC Forest Service Roads are modular and come in 10 foot segments. Spans of up to 60 feet can be transported relatively easily by low-bed truck.
- Spans that exceed 70 feet will typically require intermediate supports, although a 120' span has been reported in the area.
- Have decking and guard rails that are relatively easily replaced and are wider and stronger than Bailey bridges;
- There is no limit on the crossing distance by using concrete blocks as mid-stream abutments with the weight of the blocks and the bridge securing the crossing. However restrictions on stream depth and stream velocity may be a consideration. Therefore, winter, low-water crossings work best.

5.0 Delivery Locations

For the purposes of these considerations, merchantable logs were assumed to be delivered to the closest processing facility owned by the forest tenure holder from which the logs would be harvested. There are two types of merchantable logs; coniferous and deciduous. Table 5.0a describes the delivery locations for the biomass that was considered as part of this assessment.

Table 5.0a Delivery Locations for Merchantable Logs

Delivery Location	Coniferous Logs	Deciduous Logs
West Fraser Mills Ltd. – Chetwynd Forest Industries	X	
Canfor – Chetwynd (Closed indefinitely)		
Canfor – Fort St. John	X	
Tembec Industries Ltd. – Chetwynd		X
Louisiana Pacific Canada Ltd. – Dawson Creek		X
Canfor – Taylor Pulp		X
Canfor \ LP OSB – Fort St. John		X

6.0 Harvest Considerations, Area and Volume

The area and volume of wood affected by these proposed harvesting considerations (excluding the Highway 29 re-alignment options) are shown in Table 6.0a through Table 6.0e. The totals from the Highway 29 re-alignment options were excluded from these tables as some of the re-alignment options overlap others and overlap the reservoir; hence the sum of the totals would be overestimated as a result of double-counting.

Table 6.0a describes the total vegetated areas and volumes affected by the potential Project footprint, subdivided by footprint location and species. Since this assignment concentrated solely on vegetated lands, the totals presented may differ from other BC Hydro reports. Table 6.0b describes the potential area and volumes within the project footprint by land ownership title. Table 6.0c is similar but by timber supply area (TSA) and tree farm license area (TFL).

Table 6.0d describes the areas and volumes by licensee operating area. It is important to note that '*Operating Areas'* are strictly an administrative tool used by forest licence holders to bring order and logic to the many legislative, geographic, and economic factors effecting the achievement of harvest rights. Operating areas have no legal force or effect (with exception to some non-replaceable forest licence holders that may have geographically defined Exhibit A's appended to their licence). Within the Dawson Creek and Fort St. John Timber Supply Areas (TSA) both deciduous and coniferous license boundaries overlap each other. As a result, the values in this table are double-counted where overlap occurred.

Table 6.0e describes the potential areas and volumes affected by the proposed clearing considerations by harvest system and clearing action.

Table 6.0a Clearing Statistics

Summary Statistics		Reservoir	Dam Site	Transmission Line	Road Construction (New & Upgraded)	Total
Volume (cubic metres)	Total Merchantable	739,756	73,071	89,919	22,124	924,870
	Merchantable Conifer	300,355	12,699	35,173	5,102	353,329
	Merchantable Deciduous	439,401	60,371	54,746	17,022	571,540
	Waste wood in treed areas	366,455	56,130	58,483	13,911	494,979
	Waste wood in NCC areas	36,811	1,194	1,469	0	39,474
	Total Volume (Merch + Non-merch)	***1,143,022***	***130,395***	***149,871***	***36,035***	***1,459,323***
Area (hectares)	Merchantable conifer (>100m3/ha)	959	3	103	20	1,085
	Merchantable deciduous (>75m3/ha)	2,041	436	280	92	2,849
	Non-merchantable conifer (<100m3/ha)	0	0	79	4	83
	Non-merchantable deciduous (<75m3/ha)	383	155	184	17	739
	Total Treed	3,383	594	646	158	4,781
	Total NCC	1,227	40	49	0	1,316
	Total Forested	***4,610***	***634***	***695***	***158***	***6,097***

Area may be different from other reports as this refers only to forested lands

Table 6.0b Areas and Volumes Cleared by Land Ownership Title

Land Ownership	Merchantable Conifer Volume (m3)	Merchantable Deciduous Volume (m3)	Estimated Waste Wood Volume (m3)	Forested Area (ha)	Non-Treed (NCC) Area (ha)	Total Clearing Area (ha)
Crown	346,316	536,837	503,555	4,478	1,227	5,705
BC Hydro	757	4,944	4,665	48	13	61
BC Hydro - Leased	6,256	29,760	26,234	255	76	331
Private	0	0	0	0	0	0
Total	***353,329***	***571,541***	***534,454***	***4,781***	***1,316***	***6,097***

Table 6.0c Areas and Volumes by TSA / TFL

Timber Supply Area / Tree Farm License Area	Merchantable Coniferous Volume (m3)	Merchantable Deciduous Volume (m3)	Estimated Waste Wood Volume (m3)	Forested Area (ha)	Non-Treed (NCC) Area (ha)	Total Clearing Area (ha)
Fort St. John	162,220	225,021	224,175	1,830	879	2,709
Dawson Creek	179,715	320,759	292,232	2,744	419	3,163
TFL # 48	11,394	25,760	18,046	207	18	225
Total	***353,329***	***571,540***	***534,453***	***4,781***	***1,316***	***6,097***

Table 6.0d Areas and Volumes by Licensee Operating Areas 1

Forest License / Tenure	Merchantable Coniferous Volume (m3)	Merchantable Deciduous Volume (m3)	Estimated Waste Wood Volume (m3)	Forested Area (ha)	Non-Treed (NCC) Area (ha)	Total Clearing Area (ha)
Louisiana Pacific (PA#10 - Deciduous License)	138,847	256,086	227,434	2,335	282	2,617
Canfor (PA#12 - Deciduous license)	38,709	109,994	100,009	782	347	1,129
Tembec (PA#13 - Deciduous License)	70,224	103,958	97,635	756	184	940
British Columbia Timber Sales (BCTS)	44,453	33,991	37,733	359	126	485
Shared BCTS/Canfor	134,610	200,662	196,868	1,564	761	2,325
Canfor Forest Products Ltd	72,524	102,902	98,057	788	210	998
Unallocated	4	294	521	4	10	14

[1] It is important to note the license operating areas have no legal force or effect unless identified in a non-replaceable forest license Exhibit A. They are strictly an administrative tool used by forest licence holders to bring order and logic to harvest planning. Pulpwood agreement (PA) operating areas overlap many of the coniferous operating areas. As a result, some of the values in this table have been double-counted as one licensee may have "rights" to the deciduous-leading stands and another to the coniferous leading stands.

Table 6.0e Area and Volume Cleared by Harvest System and Action

Harvest System	Clearing Action	Merchantable Coniferous Volume (m3)	Merchantable Deciduous Volume (m3)	Estimated Waste Wood Volume (m3)	Forested Area (ha)	Non-Treed (NCC) Area (ha)	Total Clearing Area (ha)
Helicopter	Hand Falling of Merchantable Timber (chainsaw)	63,239	66,080	68,415	678	165	843
	Hand Falling Post Harvest (brush saw)	62,601	65,487	67,666	670	164	834
	Hand Falling of NCC Polygons (brush saw)	3,099	9,866	12,466	111	82	193
	Micro-Mechanical Clearing of NCC Polygons	13,650	10,572	13,340	86	124	210
	Hand Collection of Biomass	49,369	56,581	57,512	593	105	698
	Micro-mechanical Collection of Biomass	13,650	10,572	13,340	86	124	210
	Helicopter removal of Merchantable Fibre	62,601	65,487	67,666	670	164	834
	Helicopter removal of non-Merch Biomass	63,019	67,153	70,855	679	228	907
Conventional	Mechanical Falling (feller-buncher)	290,309	504,387	456,498	4,102	851	4,953
	Mechanical Brushing of NCC Polygons	216,860	312,805	295,321	2,421	1,095	3,516
	Hand Clearing (Post Mechanical Harvesting)	290,309	504,387	456,498	4,102	851	4,953
	Biomass Collection of all polygons	290,309	505,088	464,481	4,108	1,095	5,203
	Skidding to roadside	290,309	504,387	456,498	4,102	851	4,953

References

Website – Government of Alberta Ministry of Environment. 2009. Website accessed October 2008: http://environment.alberta.ca/forecasting/RiverIce/PeaceRiverArchive.html

Website – BC Ministry of Environment, 2008. Website accessed October 2008: http://www.env.gov.bc.ca/epd/codes/open_burning/pdf/OBSCR_map.pdf

Website – Invasive Plant Council of BC. 2006. Website accessed October 2008: http://www.invasiveplantcouncilbc.ca/publications/forum_presentations/2006/NWIPC%20Pilot.pdf

Website – Ontario Ministry of Natural Resources. 1998. Website accessed October 2008: http://www.mnr.gov.on.ca/MNR_E005369.pdf

Website – Pro Mac Manufacturing Ltd. 2009. Website accessed October 2008: http://www.promac.bc.ca/

Appendix A

OGMAs and Protected Areas

Table A-1a; A-1b and Figures A-1a; A-1b that follow describe the area and volume in old growth management areas (OGMAs) and the Peace River - Boudreau Proposed Protected area that would be affected by the Project footprint.

Table A-1a Areas and Volumes within OGMAs

	Volume (m3)				Area (ha)				
Project Area	**Gross**	**Merch. Decid.**	**Merch. Conifer**	**Total Merch.**	**Merch. Conifer**	**Merch. Decid.**	**Non-merch. Conifer**	**Non merch. Decid.**	**Total**
Reservoir Area	452,176	201,642	129,621	331,263	428.0	819.6	0.0	223.3	1,659.4
Existing Roads	2,745	1,838	30	1,868	0.1	11.4	0.1	0.0	12.3
New Roads	13,442	6,998	2,388	9,385	12.0	34.0	1.2	2.1	54.5
Total	***468,363***	***210,478***	***132,039***	***342,516***	***440.1***	***865***	***1.3***	***225.4***	***1,726.2***

Table A-1b Areas and Volumes by Peace-Boudreau Proposed Protected Area

	Volume (m3)				Area (ha)				
Project Area	**Gross**	**Merch. Decid.**	**Merch. Conifer**	**Total Merch.**	**Merch. Conifer**	**Merch. Decid.**	**Non-merch. Conifer**	**Non merch. Decid.**	**Total**
Reservoir Area and Dam Site	729,057	307,916	233,729	541,645	740	1,272	0.0	246	2,652
Existing Roads	1,033	684	6	690	0.0	3.9	0.0	0.0	3.9
New Roads	13,813	6,798	2,933	9,731	11.5	31.8	0.0	5.7	56.2
Total	***743,903***	***315,398***	***236,668***	***552,066***	***751.5***	***1,307.7***	***0.0***	***251.7***	***2,712.1***

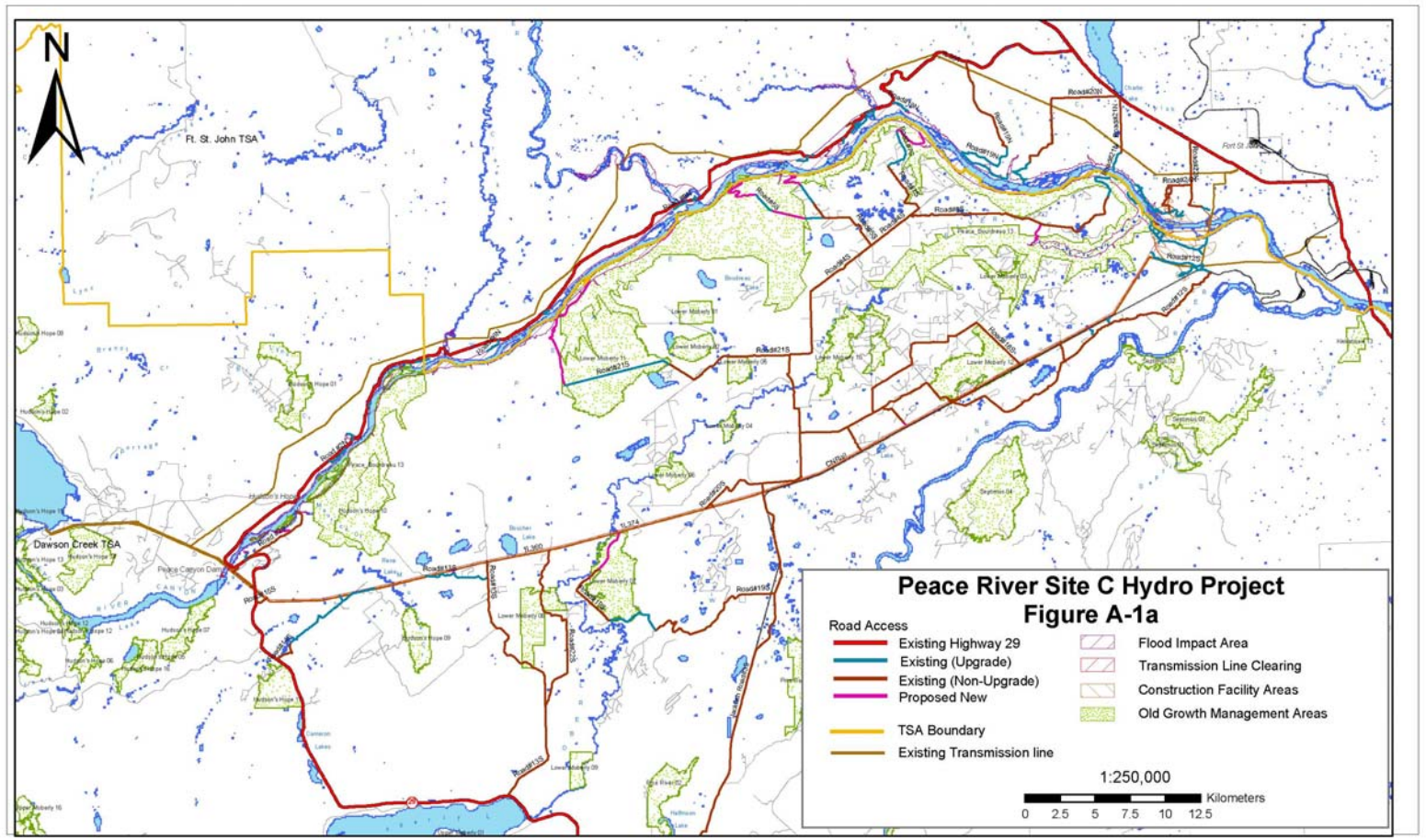

Figure A-1a. Old Growth Management Areas existing within and adjacent to the Site C Hydro project footprint

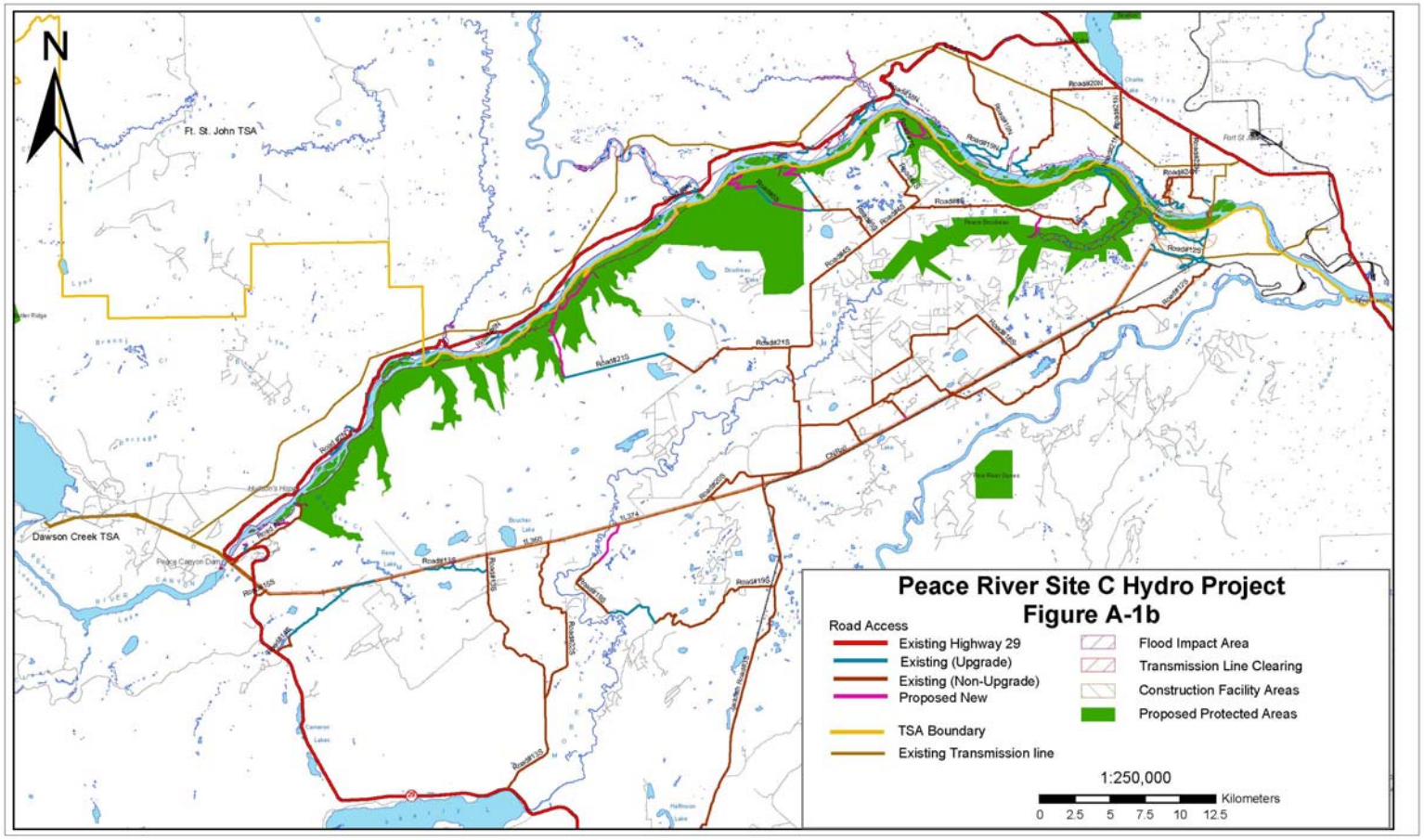

Figure A-1b. Peace-Boudreau Proposed Protected Area within and adjacent to the Site C Hydro project footprint