

# SITE C PROJECT

Working Group

Environmental Impact Statement Presentation

February 19, 2013

Agenda Topic	Presenter
Overview	Susan Yurkovich
Need, Alternatives & Project Benefits	Mike Savidant
EA Methodology & Environmental Background	Bettina Sander
Environmental Valued Components	Paul Higgins
Aboriginal Groups	Trevor Proverbs
Socio-Economic Valued Components	Siobhan Jackson
Wrap Up	Danielle Melchior

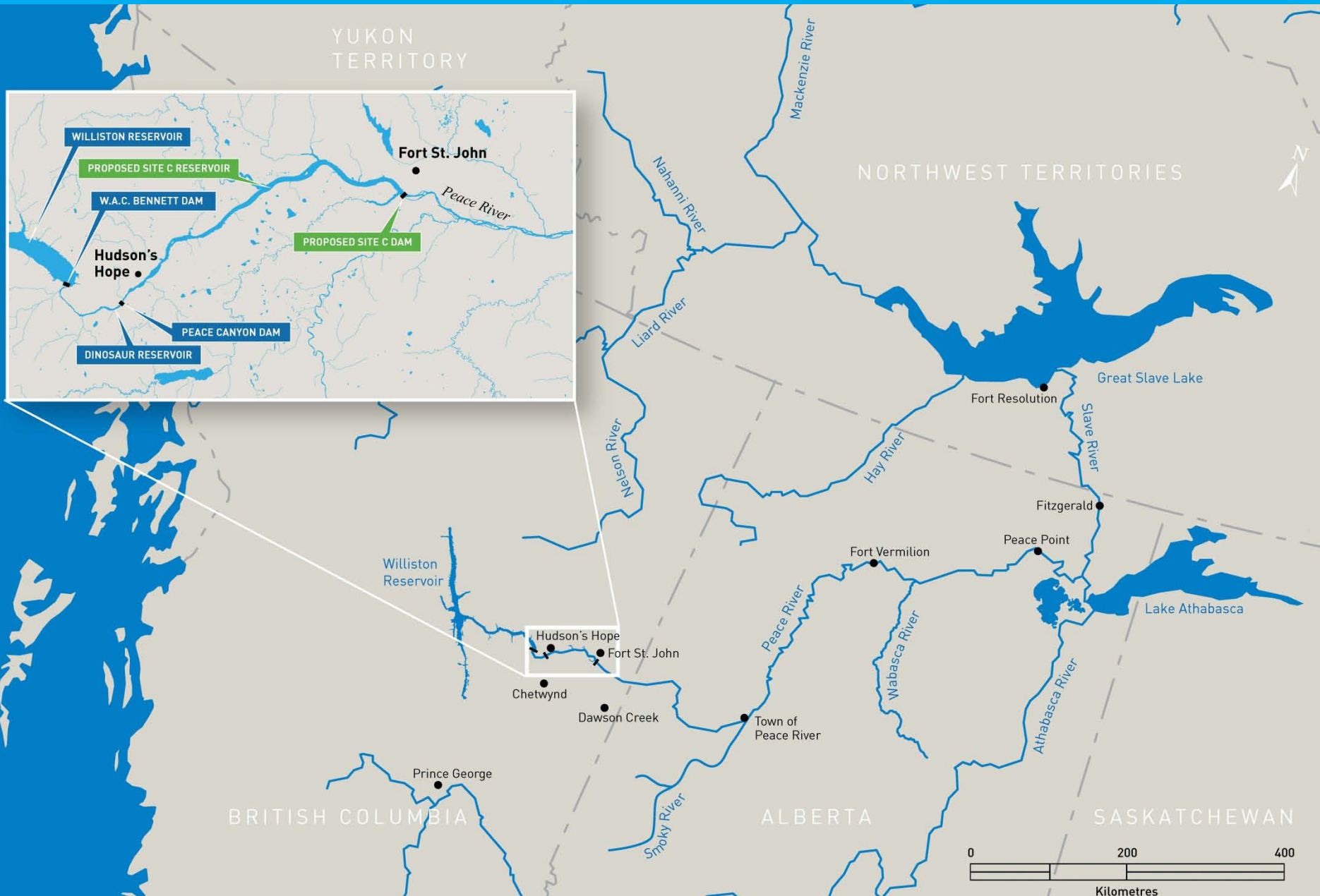
Provide an overview of the EIS

- Answer questions and provide clarification on the EIS
- Provide a roadmap to enable review comments
- Address how the EIS meets the EIS Guidelines

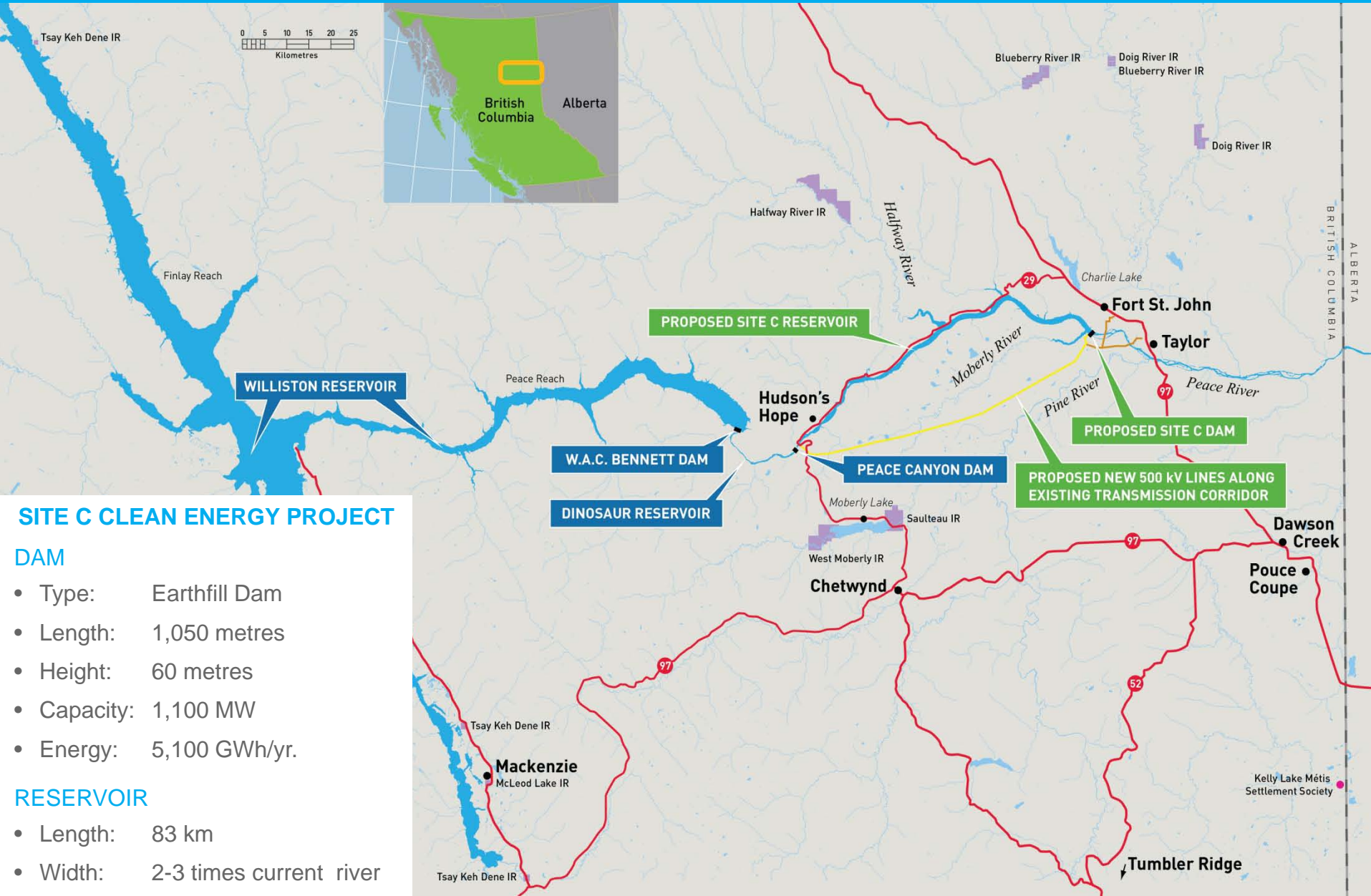
Volume 1 Executive Summary, Introduction, Project Planning and Description	Volume 2 Assessment Methodology and Environmental Effects Assessment	Volume 3 Economic and Land and Resource Use Effects Assessment	Volume 4 Social, Heritage, and Health Effects Assessment	Volume 5 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests and Information, Environmental Management Plans, and Federal Information Requirements
1 Introduction	10 Effects Assessment Methodology	16 Local Govt Revenue	28 Population and Demographics	34 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests and Information Requirements
2 Proponent Description	11 Environmental Background 11.1 Previous Development 11.2 Geology, Terrain, and Soils 11.3 Land Status, Tenure, and Project Requirements 11.4 Surface Water Regime 11.5 Water Quality 11.6 Groundwater Regime 11.7 Thermal and Ice Regime 11.8 Fluvial Geomorphology and Sediment Transport Regime 11.9 Methylmercury 11.10 Microclimate 11.11 Air Quality 11.12 Noise and Vibration 11.13 Electric and Magnetic Field	17 Labour Market	29 Housing	35 Summary of Environmental Management Plans
3 Project Overview	12 Fish and Fish Habitat	18 Regional Economic Development	30 Community Infrastructure and Services	36 Compliance Reporting
4 Project Description	13 Vegetation and Ecological Communities	19 Current Use of Lands and Resources for Traditional Purposes	31 Transportation	37 Requirements for the Federal Environmental Assessment
5 Need for, Purpose of, and Alternatives to the Project	14 Wildlife Resources	20 Agriculture	32 Heritage Resources	38 Summary of Potential Residual Effects of the Project
6 Alternative Means of Carrying out the Project	15 Greenhouse Gases	21 Forestry	33 Human Health	39 Complete Lists of Mitigation and Follow-up Measures
7 Project Benefits		22 Oil, Gas and Energy		40 Conclusions
8 Assessment Process		23 Minerals and Aggregates		
9 Information Distribution and Consultation		24 Harvest of Fish and Wildlife Resources		
		25 Outdoor Recreation and Tourism		
		26 Navigation		
		27 Visual Resources		

## TABLE OF CONCORDANCE

Section of the Environmental Impact Statement Guidelines	Summary of Environmental Impact Statement Guidelines Requirements	Environmental Impact Statement	
		Volume of the Environmental Impact Statement	Section of the Environmental Impact Statement
1.1 Guiding Principles	<p><b>Environmental Assessment</b> Environmental Assessment (EA) is a comprehensive process to identify and evaluate the potential effects of a proposed major project and ways to avoid or mitigate adverse effects.</p> <p><b>Public Participation</b> The overall objective of public participation is best achieved when all parties have a clear understanding of the proposed project as early as possible in the review process. The public will be provided with opportunities to participate in the environmental assessment process.</p> <p><b>Aboriginal Consultation</b> BCEAO and Canada are committed to working constructively with Aboriginal groups to ensure that the Crown fulfills its duties of consultation and accommodation. The proponent must ensure that it engages with Aboriginal groups that may be affected by the project, or that have asserted or established Aboriginal rights or treaty rights in the project area, as early as possible in the project planning process. An environmental assessment conducted in accordance with the agreement between the Ministers of Environment of BC and Canada with respect to the environmental assessment of the Project and with these EIS Guidelines, which have been developed under that Agreement, will meet the objectives of these principles.</p>	Volume 1	Section 1.1
1.2 Purpose of the Environmental Impact Statement	<p>The EIS will describe the provincial triggers for the environmental assessment. Pursuant to Part 4 of the Reviewable Projects Regulation, an environmental assessment is required because the Proponent is proposing the following:</p> <ul style="list-style-type: none"> <li>▪ Construction of a new hydroelectric power generating station with a rated nameplate capacity of greater than 50 MW</li> <li>▪ A new 500 kV transmission line greater or equal to 40 km in length</li> <li>▪ A new sand and gravel pit that will have a production capacity of greater than or equal to 500,000 tonnes per year, or over a period of less than or equal to a period of four years of operation greater than or equal to 1,000,000 tonnes,</li> </ul>	Volume 1	Section 1.2







## SITE C CLEAN ENERGY PROJECT

### DAM

- Type: Earthfill Dam
- Length: 1,050 metres
- Height: 60 metres
- Capacity: 1,100 MW
- Energy: 5,100 GWh/yr.

### RESERVOIR

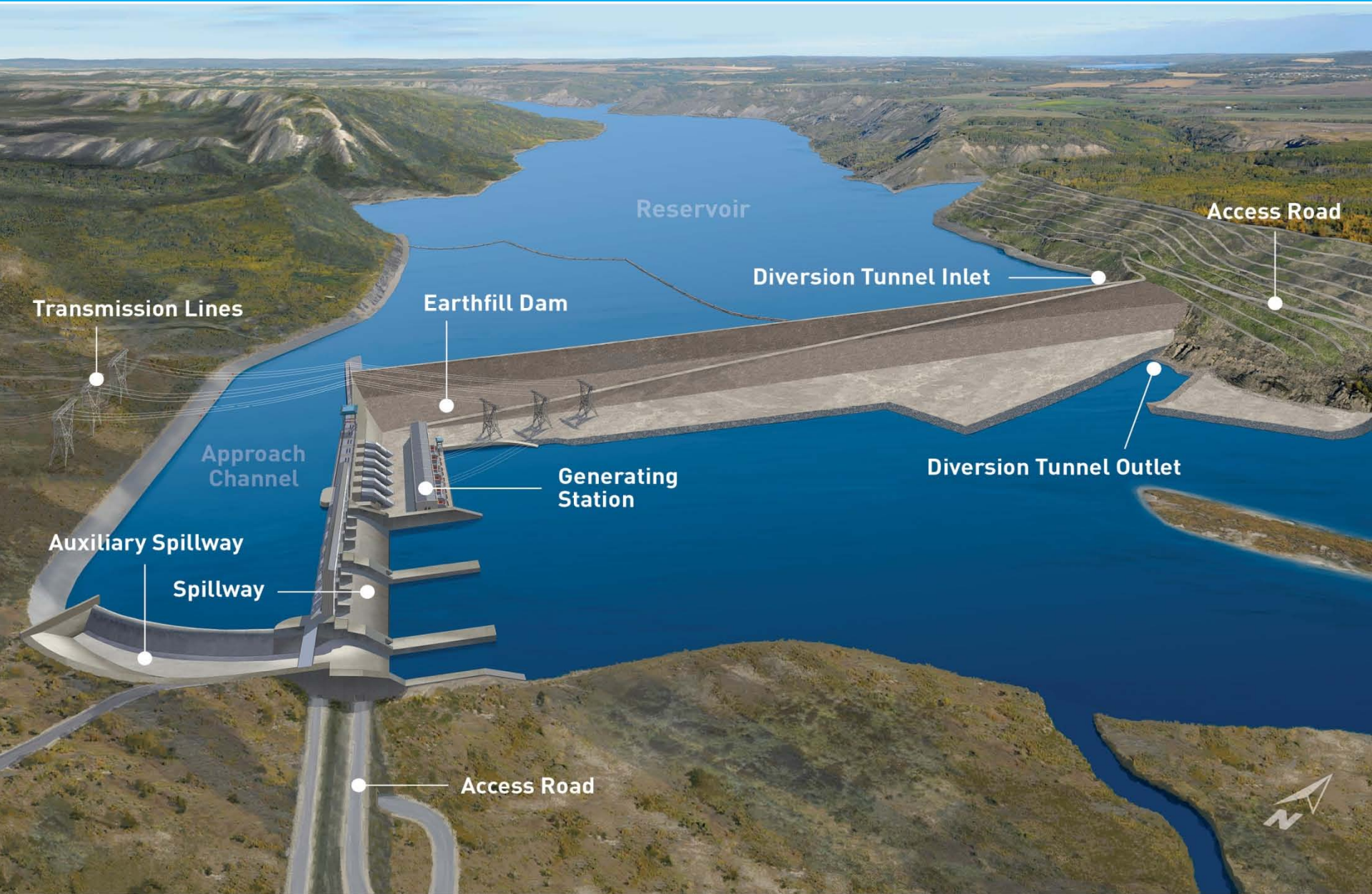
- Length: 83 km
- Width: 2-3 times current river





**CLEAN**  
ENERGY PROJECT

# Site C Dam Site Component



Reservoir

Access Road

Diversion Tunnel Inlet

Transmission Lines

Earthfill Dam

Approach Channel

Diversion Tunnel Outlet

Auxiliary Spillway

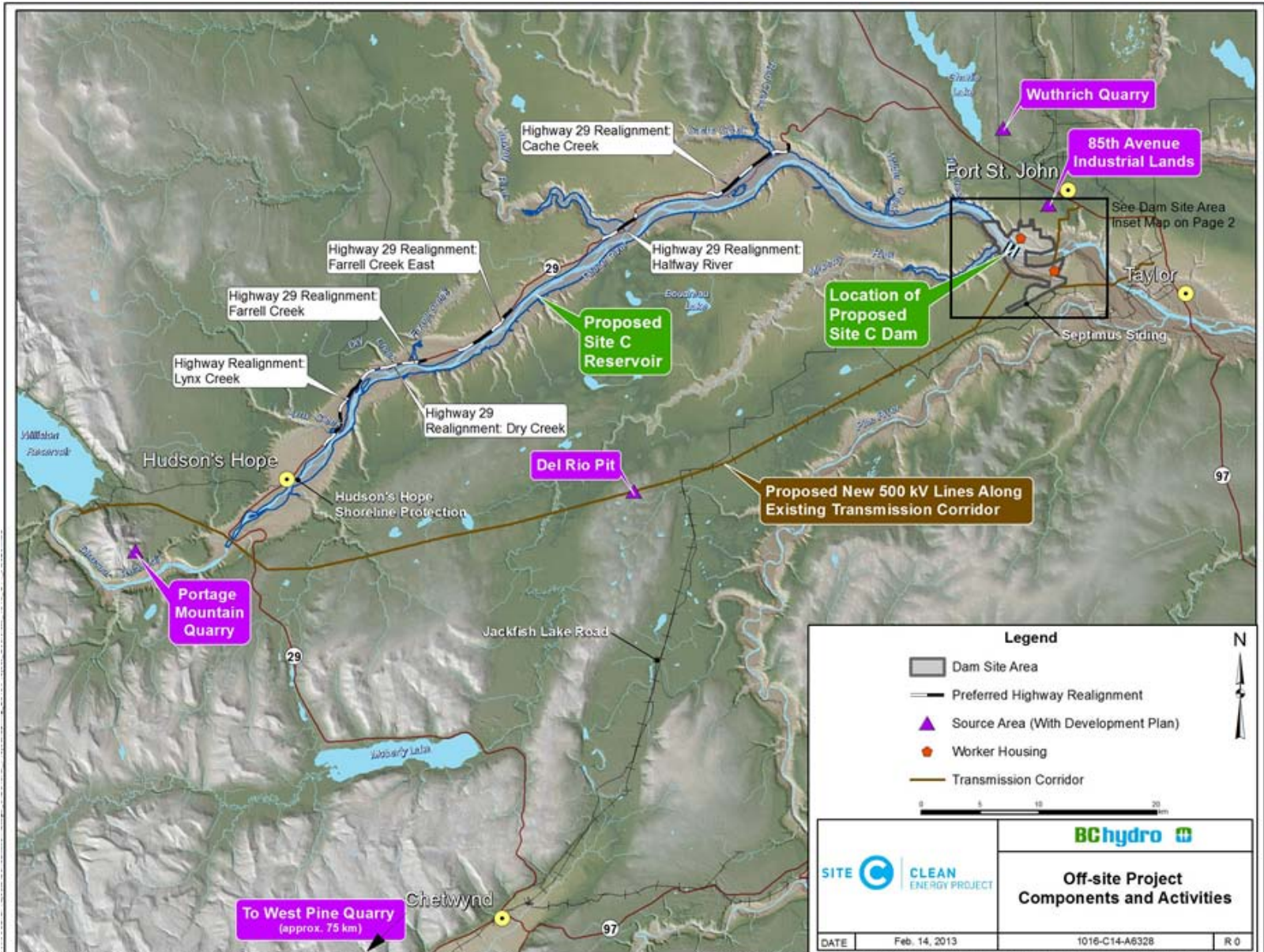
Generating Station

Spillway

Access Road







# Need, Alternatives & Project Benefits

Michael Savidant

- Project is required to meet growing customer demand
- Large hydro projects have a long lead-time, and as a result Need is evaluated in the long-term time frame (5 – 20 years)
- Need is established by evaluation of:
  - Current and Forecasted customer demand  
(residential, commercial, and industrial customers)
  - Existing and committed supply-side resources  
(BC Hydro heritage facilities, upgrades, and IPP contracts)
  - Conservation and efficiency activities  
(The Demand-Side Management (DSM) Target)
- Customer demand is expected to increase by 40 per cent over 20 years, excluding potential load from new LNG facilities
- BC Hydro's existing and committed resources, DSM activities, and Revelstoke 6 are not expected to be sufficient to meet this demand

- BC Hydro reviewed a broad range of potential alternatives
- Some resources were screened out because they were not viable
  - i.e. barred by legislation or policy, or not technically or economically feasible
- The remaining Available Resources were used in portfolio analysis and consisted of:
  - Clean or renewable IPPs (i.e. wind, run-of-river hydro, biomass, pumped storage and geothermal)
  - BC Hydro Resource Smart potential (i.e. upgrades to existing BCH facilities)
  - Natural gas–fired generation within the 93% clean or renewable target in the *Clean Energy Act*
- To evaluate alternatives, BC Hydro developed portfolios of Available Resources that would provide comparable energy and capacity.
  - Site C portfolios
  - Clean Generation portfolios
  - Clean + Thermal Generation portfolios



- The financial, technical, environmental, and economic development attributes of the portfolios were compared
  - **Financial:** life-cycle cost of the portfolios to ratepayers
  - **Technical:** characteristics of the energy and capacity delivered (i.e. reliability and flexibility)
  - **Environmental:** Land footprint, affected stream length, GHG emissions, local air emissions
  - **Economic Development:** GDP, jobs
- Based on this analysis, BC Hydro concluded that the Project provides the best combination of financial, technical, environmental, and economic development attributes and is, therefore, the preferred option to meet the need for energy and capacity in the planning horizon
- Hydroelectric projects are complex, require a long lead time to plan, design, undertake environmental assessment and construct

- **Economic Development Benefits:**
  - The Project creates benefits at the local, provincial, and federal level due to the purchase of goods and services
  - Economic development during the construction period is expected to add \$130 million to regional GDP and \$3.2 billion to the provincial GDP
- **Employment Benefits:**
  - The Project would create approximately 10,000 direct construction jobs and 33,000 total jobs through all stages of development and construction
  - During operations, the Project is expected to provide 25 direct jobs per year, with 135 additional jobs per year in environmental monitoring and supplier industries
- **Economic Benefits to Aboriginal Groups and Local Communities:**
  - BC Hydro is working to encourage Aboriginal and local participation through investments in training and education and promotion of job opportunities within the local community

- **Benefits to BC Hydro Ratepayers:**
  - The project has a lower cost than portfolios of alternatives, and would provide savings to ratepayers
  - The project would reduce uncertainty in customer rates, as operating costs would be stable and predictable
  - The proposed substation would improve system reliability for customers in the Project area due to a closer connection to the transmission system
- **Benefits to Taxpayers:**
  - Construction of Site C would result in a total of \$486 million for all three levels of government through taxation revenues generated by the project
  - During operations, the project would contribute \$43 million per year to provincial and local governments through grants-in-lieu, school taxes, and water rental fees, plus a return on equity to the Province each year

- **Environmental and Sustainability Benefits:**
  - The Project optimizes the use of existing BC Hydro assets on the Peace River, delivering 35% of the energy of G.M. Shrum generating station with a reservoir area of 5% of the area of Williston
  - Project generation is flexible, and can vary within a short period of time. This would allow the Project to facilitate the integration of more intermittent resources such as wind and run-of-river hydro into the BC Hydro system
  - The Project would have among the lowest emissions of greenhouse gases per unit energy over the Project life compared to other alternative resources
  - The Project would increase the amount of fish habitat area with corresponding increases in aquatic productivity



# Q & A

# Environmental Assessment & Background

**Bettina Sander**



- Identify the issues, concerns and interests raised by Regulators, Agencies, Aboriginal groups, and the Public
- Identify Valued Components (VCs): Environmental, Social, Economic, Heritage and Health
- Determine where you study and how it varies over the life of the project (Spatial and Temporal Boundaries)
- Describe Baseline Conditions and Potential Project-related Effects
- Identify Mitigation Options (Avoid, Mitigate, Compensate)
- Characterize Residual Effects and Determine Significance
- Cumulative Effects Assessment

Project component	Valued component	Effects avoided or mitigated	Avoidance or mitigation measure
<b>Dam, generating station and spillways</b>	Wildlife Resources	Loss of wildlife habitat	Maximize relocation of surplus excavated material upstream of dam
	Wildlife Resources	Loss of wildlife habitat	Minimize footprint on big island downstream of dam
	Wildlife Resources	Loss of wildlife habitat	Reduction of footprint and disruption of wetland habitat and clearing by relocating worker accommodation
	Fish and Fish Habitat	Dissolved gas supersaturation	Spillway design modified to minimize dissolved gas
<b>Reservoir</b>	Community Infrastructure and Services	Erosion of slopes at Hudson's Hope	Extended shoreline protection
<b>Highway 29 realignments</b>	Community Infrastructure and Services	Potential erosion by reservoir	Re-align Highway 29 at Dry Creek and Farrell Creek east
	Agriculture	Loss of agricultural land	Selection of alignment at Lynx Creek that includes a portion of Millar Road



Project component	Valued component	Effects avoided or mitigated	Avoidance or mitigation measure
Quarried and excavated construction materials	Wildlife Resources	Loss of bat hibernacula	Elimination of Tea Creek from consideration as a source of temporary riprap
	Human Health	Reducing heavy truck traffic on public roads – lower risk to human safety, less noise and dust	Selection of a conveyor for transporting till from 85th Avenue Industrial Lands to dam site area
	Wildlife Resources	Disturbance to caribou	Restriction on blasting at West Pine quarry to no greater than historical levels during the periods January 16 to March 31 and May 15 to June 14 each year
	Transportation	Traffic congestion in Hudson's Hope and on Highway 29	Source permanent riprap for dam, generating station and spillways from West Pine Quarry as opposed to Portage Mountain Quarry
	Minerals and Aggregates	Use of aggregate in project area	Source aggregate for Highway 29 re-alignment from areas that would be inundated

- The Project would introduce changes to the physical environment
- Descriptive information and technical data collected, analysed and modelled
- Predicted changes to land, air and water were taken into account in the effects assessment
- Detailed information provided in Volume 2 Section 11
- E.g.,

Changes in sediment in surface water  fish and fish habitat  
 human health

Technical Study	Valued Component
Geology, Terrain & Soils	Agriculture; Community Infrastructure and Services; Forestry; Greenhouse Gases; Heritage; Navigation; Outdoor Recreation and Tourism; Vegetation and Ecological Communities; Visual Resources; Wildlife Resources; Fish and Fish Habitat; Current Use of Lands and Resources for Traditional Purposes; Oil, Gas and Energy; Harvest of Fish and Wildlife Resources
Surface Water Regime	Community Infrastructure and Services; Fish and Fish Habitat; Harvest of Fish and Wildlife Resources; Navigation; Outdoor Recreation and Tourism; Transportation; Current Use of Lands and Resources for Traditional Purposes; Wildlife Resources
Water Quality	Fish and Fish Habitat; Human Health
Groundwater Regime	Agriculture; Community Infrastructure and Services; Human Health
Thermal and Ice Regime	Fish and Fish Habitat; Navigation; Outdoor Recreation and Tourism; Transportation; Wildlife Resources; Current Use of Lands and Resources for Traditional Purposes
Fluvial Geomorphology and Sediment Transport	Community Infrastructure and Services; Fish and Fish Habitat; Navigation; Vegetation and Ecological Communities; Wildlife Resources; Oil, Gas & Energy; Human Health (water quality); Greenhouse Gases
Methyl Mercury	Human Health; Fish and Fish Habitat;
Micro-Climate	Agriculture; Navigation; Transportation
Air Quality	Human Health
Noise and Vibration	Fish and Fish Habitat; Human Health; Wildlife Resources
EMF	Human Health

# Q & A

# BREAK

## 10:30-10:45 am

# Environmental Valued Components

Paul Higgins



## Key Aspects:

- Changes to Habitat
- Health and Survival
- Movement

## Key Information Sources:

- Historic field studies (1970s - early 1990's)
- Multi-year field studies (2005- 2012) of Fish and Fish Habitat (Volume 2 Appendix O)
- Project Description (Section 4)
- Technical Studies:
  - Surface Water regime (Section 11.4)
  - Water quality (Section 11.5)
  - Thermal and Ice (Section 11.7)
  - Fluvial Geomorphology and Sediment Transport Regime (Section 11.8)
  - Methyl-mercury (Section 11.9)
- Additional modeling and studies:
  - Aquatic Productivity (Volume 2 Appendix P)
  - Fish Passage (Volume 2 Appendix Q)
  - Total Dissolved Gas assessments
- Traditional Land Use Studies



Rotary screw trap

Aspect	Potential Effect	Key Mitigation
<p><b>Changes to Fish Habitat</b></p>	<p><b>Construction</b></p> <ul style="list-style-type: none"> <li>• Change in habitat due to construction of the dam and generating station, Highway 29, and Hudson’s Hope Shoreline Protection</li> <li>• Change in habitat due to the construction headpond and reservoir filling</li> </ul> <p><b>Operation</b></p> <ul style="list-style-type: none"> <li>• Transformation of reservoir habitat during reservoir operation</li> <li>• Downstream habitat changes</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Management Plans</li> <li>• Construction footprints are being finalized to reduce the size of the construction footprint.</li> <li>• Remediation and improvement of fish habitats affected by construction activities</li> <li>• Riparian area planting along the reservoir shoreline to provide riparian habitat and bank stabilization.</li> </ul> <ul style="list-style-type: none"> <li>• Limit reservoir fluctuation to 1.8 m</li> <li>• Enhancement of side channel complexes between the dam site and the Pine Rivers</li> <li>• Creation of wetted channels and back channel restoration on the south bank island downstream of the dam</li> <li>• Compensation options that are technically and economically feasible will be implemented</li> </ul>

# Fish and Fish Habitat Potential Effects and Key Mitigation

Aspect	Potential Effect	Key Mitigation
<p><b>Health and Survival</b></p>	<ul style="list-style-type: none"> <li>• Changes to Health and Survival due to Sedimentation</li> <li>• Stranding of Fish</li> <li>• Total Dissolved Gas (TDG)</li> <li>• Fish Entrainment</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Management Plans to mitigate sedimentation effects</li> <li>• Fish relocations and habitat contouring to reduce fish stranding mortality</li> <li>• Spillway design modification to reduce TDG</li> <li>• Operational modification to reduce TDG</li> <li>• Large diameter diversion tunnels that provide low risk of fish mortality.</li> <li>• Incorporating smooth and gradual transitions in tunnels and tunnel exits.</li> <li>• Completing tunnel linings with a smooth concrete surface finish.</li> <li>• Reducing any obstructions (e.g., boulders) in the tunnel tailrace area.</li> </ul>
<p><b>Movement</b></p>	<ul style="list-style-type: none"> <li>• Change in fish movement</li> </ul>	<ul style="list-style-type: none"> <li>• Trap and haul program for large bodied fish</li> <li>• Periodic relocation of small bodied fish, as appropriate</li> </ul>

## Downstream of the Dam

- Greater variation in flow would affect habitat between the dam and the Pine River
- Downstream of the Pine fish habitat would remain very similar to that observed today

## Upstream of the Dam

- Transformation of the river to a reservoir would create a new and productive ecosystem
- Species composition would change to accommodate new habitats – some species increase, and some species may decline
- Three distinct groups may be lost:
  - Moberly River Arctic grayling
  - Migratory Halfway River bull trout
  - Mainstem spawning mountain whitefish



## Key Aspect:

- Habitat Alteration and Fragmentation

## Key Indicator:

- Terrestrial ecosystems
- Rare plants

## Key Information Sources:

- Field survey and mapping of terrestrial ecosystems (Volume 2 Appendix R)
- Provincial data bases for vegetation and ecological communities
  - BC Forest Cover Mapping
  - BC Vegetation Resource Inventory
  - BC Conservation Data Centre
- Traditional Land Use Studies



Example of a Terrestrial Ecosystem Map

# Vegetation and Ecological Communities Potential Effects and Key Mitigation

Aspect	Potential Effect	Key Mitigation
<b>Habitat Alteration and Fragmentation</b>	Alteration and Fragmentation of Ecological Communities	<ul style="list-style-type: none"> <li>• Environmental Management Plans</li> <li>• Minimize project footprint</li> <li>• Undertake targeted surveys in the RAA to locate additional occurrences of the 18 directly affected rare plant species</li> <li>• Maintain a spatial database of rare plant occurrences within LAA</li> <li>• Establish Environmental Protection Zones to protect occurrences adjacent to construction sites</li> <li>• Time, as feasible, construction activities to reduce effects to rare plants and sensitive and rare ecological communities</li> <li>• Maintain surface flow patterns to wetlands, as feasible</li> <li>• Manage invasive species within the Project activity zone</li> <li>• Translocate rare plants that would otherwise be lost due to the Project</li> <li>• Provide funding to existing suitable habitat enhancement projects or land purchase to protect areas under threat</li> <li>• Support development / operation of a nursery for propagation of rare plants</li> </ul>
	Loss of occurrence of rare plants	



- Creation of the reservoir would alter and fragment some unique terrestrial communities including:
  - tufa seeps
  - marl fen
  - riparian floodplain forests
- Loss of occurrences of rare plants



## Key Aspects:

- Habitat alteration and Fragmentation
- Disturbance and displacement
- Mortality

## Key Indicators:

- Butterflies and dragonflies
- Amphibians and reptiles
- Migratory birds
- Non-Migratory gamebirds
- Raptors
- Bats
- Furbearers
- Ungulates
- Large carnivores





## Key Information:

- Historic Field Studies (1970 – early 1990's)
- Field Studies 2006 to 2012 (Volume 2 Appendix R)
- Terrestrial Habitat Mapping (Volume 2 Appendix R)
- Technical Studies:
  - Surface Water regime (Section 11.4)
  - Water Quality (Section 11.5)
  - Thermal and Ice (Section 11.7)
- Traditional Land Use Studies





## Potential Effect

## Key Mitigation

Habitat Alteration and Fragmentation

- Establish barriers and Environmental Protection Zones to avoid direct disturbance to wetland sites.
- Create new wetland habitat areas for migratory birds and a range of other species.
- Retain vegetation on steep, unstable slopes that would be highly susceptible to landslides if the vegetation was removed.
- Retain non-merchantable trees and vegetation in riparian areas within buffer zone from the reservoir's high water mark
- Incorporate nest boxes for cavity-nesting waterfowl into wetland and riparian zone mitigation plans, where feasible.
- Incorporate bat roosting habitat features into new bridge designs, where feasible.
- Install bat boxes on free-standing poles or on facility walls where their presence will not interfere with operations and maintenance.
- Provide artificial fisher den boxes within forested stands with limited natural den trees
- Maintain surface flow patterns to maintain wetland function

Potential Effect	Key Mitigation
<p><b>Disturbance and Displacement</b></p>	<ul style="list-style-type: none"> <li>• Erect eagle nest platforms along the reservoir shoreline</li> <li>• Remove nests that could be lost during seasonal flooding associated with dam construction</li> <li>• Establish no clearing buffer around active nests, where feasible</li> <li>• Establish barriers around Sharp-tail grouse leks adjacent to Project Activity Zones</li> </ul>
<p><b>Mortality</b></p>	<ul style="list-style-type: none"> <li>• Design a portion of wetlands created to compensate for habitat loss to remain fish free to eliminate predation of invertebrates (dragon fly larvae), amphibians, and reptiles</li> <li>• Include amphibian passage structures in road design where roads are adjacent to wetlands or amphibian migrations</li> <li>• Clear forested habitat before inundation begins</li> </ul>

- Habitat alteration and fragmentation is the primary effect on Wildlife Resources
- Breeding habitat for certain migratory birds that are species at risk (Canada Warbler, Cape May Warbler, Yellow Rail, and Nelson's Sparrow) will be affected by the Project.
- For all other indicator species, proposed mitigation will be effective and the Project will not jeopardize the persistence of these species in a regional context.



Cape May  
Warbler



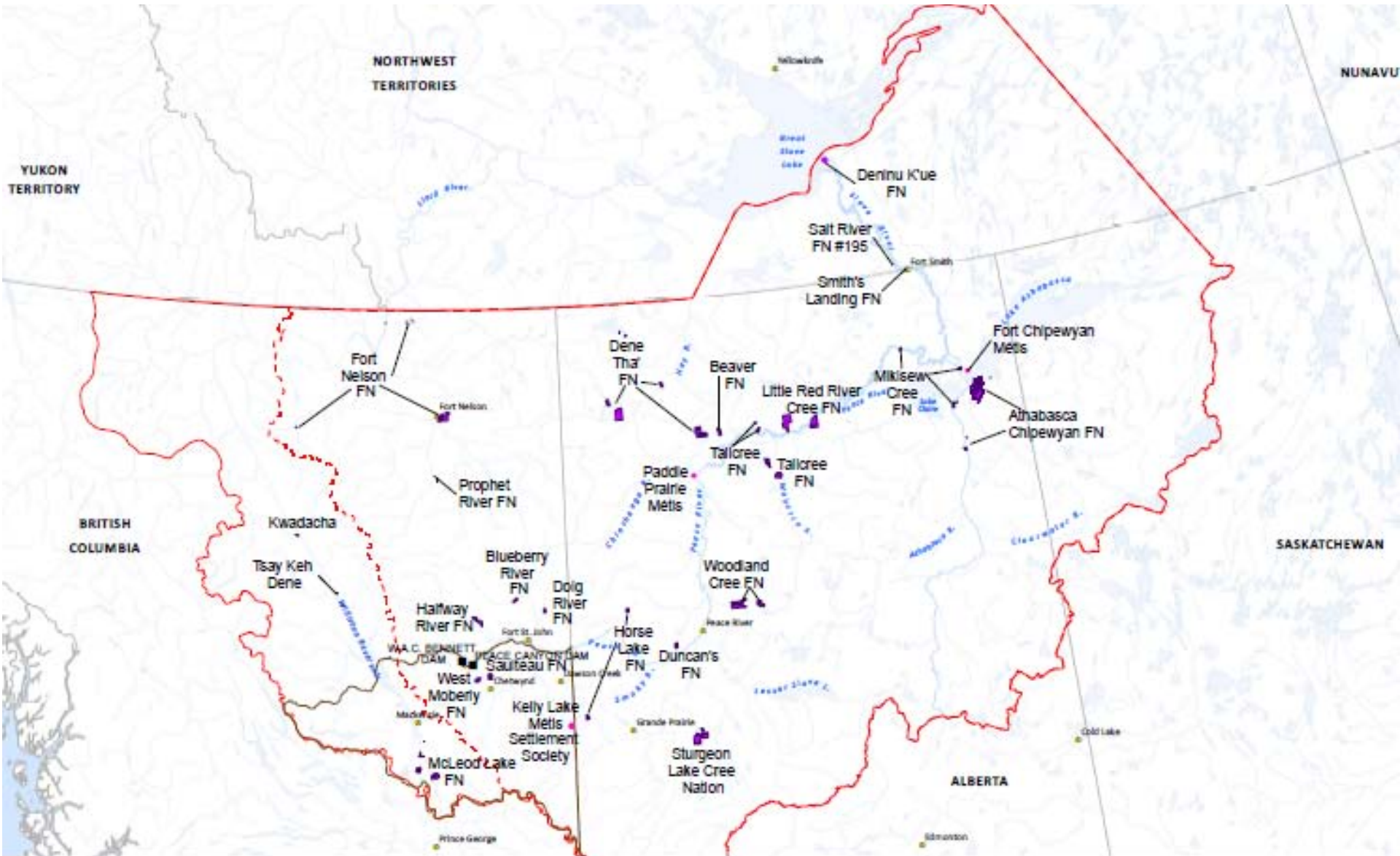
Canada  
Warbler



# Q & A

## Aboriginal Groups

## Trevor Proverbs



## Key Aspects:

- Fishing
- Hunting and trapping, and
- Other cultural and traditional uses, which considers gathering of plants and berries, and use of cultural sites and places.

## Baseline Conditions (Section 19.3):

- Includes information collected from many sources, including Project-specific Traditional Land Use Studies, Community Baseline Reports, or other Project-related information provided by Aboriginal groups at the time of writing that include information on past, current and future use of resources, as well as results from other EIS assessments.
- Information for all 29 Aboriginal groups is presented; where Aboriginal groups have identified current use within the LAA, they are carried through the assessment.

Aspect	Potential Effect	Key Mitigation
<b>Fishing</b>	<p>Fishing opportunities and practices of BRFN, SFN, T8TA (4), DFN and HLFN expected to be adversely affected during construction and operation due to reduced access to fishing areas (including potentially increased competition with non-Aboriginal anglers), and potentially reduced success in harvest of targeted species</p>	<ul style="list-style-type: none"> <li>• Consult on development of fish habitat compensation programs that align with BC Hydro compensation programs.</li> <li>• Seek input respecting mitigation strategies</li> <li>• Develop communications program to inform harvesters of events related to construction activities that may affect fishing opportunities or access</li> <li>• Develop communications program to inform harvesters of longer term changes in fish community composition</li> <li>• Implement mitigation measures set out in Fish and Fish Habitat.</li> </ul>

Aspect	Potential Effect	Key Mitigation
<p><b>Hunting and trapping</b></p>	<p>Hunting and trapping opportunities and practices of BRFN, SFN, T8TA (4), DFN, HLFN and DTFN may be adversely affected due to temporary reductions in availability of targeted species and temporarily reduced access to hunting areas during construction.</p>	<ul style="list-style-type: none"> <li>• Consult on development of wildlife habitat compensation programs that align with BC Hydro compensation programs</li> <li>• Seek input respecting mitigation strategies</li> <li>• Develop communications program to inform harvesters of events related to construction activities that may affect hunting and trapping opportunities or access</li> <li>• Continue to consult with Aboriginal groups on clearing plans and protocols</li> <li>• Implement mitigation measures set out in Wildlife Resources and Harvest of Fish and Wildlife Resources.</li> </ul>





<b>Aspect</b>	<b>Potential Effect</b>	<b>Key Mitigation</b>
<b>Other Cultural and traditional uses</b>	Due to permanent loss of use of, and access to certain culturally important places and valued landscapes within the LAA, the use of those areas by BRFN, SFN, T8TA (4), DFN, and HLFN will be permanently impacted.	<ul style="list-style-type: none"><li>• Ground truth TLUS information for specific areas within Project activity zone prior to construction.</li><li>• Develop communications program to inform harvesters of construction-related events that may affect opportunities to harvest plants, berries, and other resources.</li><li>• Identify permanent habitation structures used in the current use of lands and resources that may be lost to inundation and work with Aboriginal individuals to determine appropriate measures that could be implemented.</li><li>• Identify potential sites for re-location of medicinal and food plants to compensate for areas that will be inundated, and use only indigenous and/or non-invasive plants and grasses in re-vegetation programs.</li></ul>



<b>Aspect</b>	<b>Potential Effect</b>	<b>Key Mitigation</b>
<b>Other Cultural and traditional uses</b>	Due to permanent loss of use of, and access to certain culturally important places and valued landscapes within the LAA, the use of those areas by BRFN, SFN, T8TA (4), DFN, and HLFN will be permanently impacted.	<ul style="list-style-type: none"><li>• Engage around any reclamation phase that may present opportunities to restore ecological communities that support species of high traditional use value.</li><li>• Provide support for the indigenous plant nursery owned by WMFN and SFN located at Moberly Lake.</li><li>• The effect on other cultural and traditional uses would be significant because particular locations identified by BRFN, SFN and T8TA(4)- Bear Flats, Farrell Creek, and Attachie- would be inundated</li><li>• Consider implementing, in consultation with Aboriginal groups and BC where appropriate, specific initiatives that support culture.</li></ul>

### **Fishing:**

- Some aspects of the traditional purpose of the activity may be altered by transferring them to another location, fishing practices of Aboriginal people are adaptable, spatially and temporally.

### **Hunting and Trapping:**

- As the effect would be temporary in nature and may be accommodated in other areas of the LAA, the traditional purpose of the activity would not be undermined.

### **Other Cultural and Traditional Uses:**

- For BRFN, SFN and T8TA (4), the effect on other cultural and traditional uses is expected to be significant at particular high value places along the Peace, most notably at Bear Flats, Farrell Creek and Attachie. These spaces, identified by these Aboriginal groups to be of high value, will be inundated and access to them will be permanently changed.

- Assessment of impacts to exercise of rights considers BC Hydro's understanding of Treaty 8 rights and Aboriginal rights for non-treaty FNs and Métis groups, and the assessment under s. 19
- No impact to 11 of 21 Treaty 8 signatories, 2 non-treaty FNs, 6 Métis groups; awaiting TLUS results to make determination for one more Treaty 8 signatory
- Impact to 9 of 21 Treaty 8 signatories:
  - Project would reduce ability of BRFN, DFN, HLFN, SFN, DRFN, HRFN, PRFN, WMFN to exercise their treaty right to fish in the LAA during construction and operation.
  - Project would reduce the ability of BRFN, DTFN, DFN, HLFN, SFN, DRFN, HRFN, PRFN, WMFN to exercise treaty right to hunt and trap in the LAA during construction and operation.

# Q & A

# WORKING LUNCH

12:00-12:30 pm

# Economic and Social Valued Components

Siobhan Jackson



## Key Aspects:

- Net change in GHG emissions from construction and operation of the Project
- Compare emissions intensity to other electricity supply options

## Key Information:

- Total direct emissions - fuel and electricity use, emissions associated with materials (concrete, fly ash, steel, stainless steel, aluminum, copper)
- Total net emissions – carbon model pre and post Project conditions, considers all major carbon stocks, land conversion to the reservoir, removal of trees and vegetation
- Total emission intensity – emissions per unit of energy produced by Project over 100 years

**Key Findings:**

- Net GHG from the Project would be a small fraction of provincial, national and global emissions
- Emissions intensity would be approximately 8g CO<sub>2</sub>e/ kWh
- GHG emissions intensity (g CO<sub>2</sub>e/ kWh) of other generation options: wind (14), solar (58), gas (545), coal (1,000)
- Mitigation: Implement fleet management to reduce fuel consumption, reduce long term conversion of land

**Conclusion:**

Net Project emission intensity is similar to wind power, and is much lower than thermal generation options

**Key Aspects:**

- Change to local government revenues and expenditures

**New Revenues:**

- BC Hydro grant-in-lieu payments during operations (\$1.3M annually)
- New in-community residents will pay local property taxes

**Key Mitigation:**

- Implement measures under Community Infrastructure and Services
- Provide one-time contribution to Hudson's Hope to address land no longer available for development
- Provide workforce camps that are largely self-sufficient,
- Pay user fees where appropriate (e.g. landfill use)
- Ongoing discussion with local governments to identify any areas with unaddressed cost burden

**Key Aspects:**

- Project need for labour and contractor opportunities, relative to local availability and skills

**Key Information:**

- BC Stats model to estimate regional labour market and contracting profiles, and to estimate provincial and regional outcomes
- First Nation community baseline studies

**Key Findings and Mitigation:**

- Strong match between project needs, regional labour and contractors
- Regional labour supply forecast to be low, Aboriginal labour market has most opportunity for increased participation
- BC Hydro will:
  - hire qualified local labour; enhance local labour supply through recruitment, training, local daycare
  - continue business liaison program, seek information on regional contractors (Project business directory, Aboriginal contractors)

## Population and Demographics, Housing, Community Infrastructure and Services, Transportation

### Key Considerations:

- In-migration of workers will result in change to resident population and temporary (camp) population, in turn affecting population and demographics, demand for housing, community infrastructure and services, and use of transportation routes
- Project activities will directly overlap with some community infrastructure (Peace River sewer and water infrastructure)
- Project activities will result in commuter and equipment transportation (air, road, rail), and include planned road upgrades
- First Nation community baseline studies



*An artists' rendering of a conceptual temporary camp*



# Social and Community Potential Effects and Key Mitigation

VC	Potential Effect	Key Mitigation
Population	<ul style="list-style-type: none"><li>• Regional population forecast, without the Project, is for substantial growth next 20 years.</li><li>• Project would advance growth by about 2 years during construction, post construction would return to regional forecast</li><li>• Up to 35% local workforce (existing and new residents)</li><li>• Potential net migration within region</li></ul>	<ul style="list-style-type: none"><li>• BCH provision of camps will moderate local population growth</li><li>• Camps will enable people to stay in their home communities and work on Project</li></ul>
Housing	<ul style="list-style-type: none"><li>• Pressure expected on rental housing market, other market housing would respond to demand, developable land available</li><li>• Rental market housing pressure may increase demand for non-market housing</li></ul>	<ul style="list-style-type: none"><li>• Scale camp capacity up or down</li><li>• Logistical support to workforce seeking local accommodation</li><li>• Build 40 new permanent workforce units in town, up to 10 affordable housing units in town</li><li>• Provide funds to support emergency or transitional housing</li><li>• Provide new RV spaces</li></ul>



VC	Potential Effect	Key Mitigation
<p>Community Infrastructure &amp; Services</p>	<ul style="list-style-type: none"> <li>• Increase in demand for services due to increase in permanent residents, and temporary (camp) residents during construction</li> <li>• Project displacement of infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Providers of public services (health care, K-12 education) would plan for increased service levels</li> <li>• Fund incremental RCMP resources during construction</li> <li>• Fund additional day care spaces</li> <li>• Provide the following services:               <ul style="list-style-type: none"> <li>• Health care to workforce, e.g. doctor, nurse (reduce use of local resources)</li> <li>• Camp housing, food and leisure facilities,</li> <li>• Site security, fire protection, first aid and medical transport, sewer and water</li> </ul> </li> <li>• Pay user fees for the following services:               <ul style="list-style-type: none"> <li>• Landfill use, and other areas based on agreement with local governments</li> </ul> </li> <li>• Remediate affected in-stream sewer and water infrastructure</li> </ul>

VC	Potential Effect	Key Mitigation
Transportation	<ul style="list-style-type: none"> <li>• Project use of existing roads, rail and air infrastructure</li> <li>• Potential changes to traffic operation (delay)</li> <li>• Minor traffic delays leading to a minor decline in level of service on some routes or intersections, but not below key service level thresholds</li> <li>• Potential for impeded access to some properties on some routes (farm mitigation plans will address for farm properties)</li> <li>• Small temporary increase in collision frequency on some routes</li> <li>• Long-term safety improvement due to lower collision frequency on permanently upgraded routes</li> <li>• Potentially higher accident rate due to poor visibility caused by fog during operations</li> </ul>	<ul style="list-style-type: none"> <li>• Develop or upgrade roads during construction</li> <li>• Road safety, assessed by route, considering peak traffic times and peak construction year, reservoir / climate considered during operations</li> <li>• Specific mitigation, upgrades and traffic management plans proposed for each route</li> <li>• Monitoring Taylor bridge and approaches for changes in fog hours and density</li> </ul>

# Q & A

# Land and Resource Use Valued Components

Siobhan Jackson

## Key Aspects:

- Change to agricultural land base (capability class and utility)
- Effects on individual farm operations
- Change to the agricultural economy
- Change to regional food production and consumption (food self-reliance)



## Key Information:

- Field program - update capability ratings (soil, climatic capability analysis)
- Agricultural utility – spatial analysis of areas likely to be used considering capability, location and accessibility, competing land use priorities, etc.
- Interviews with land owners and operators, agricultural associations, industry and government representatives
- Agricultural economic analysis, farm costs and revenues, current and projected land use and value, provincial and federal data
- Regional food crops and consumption

# Potential Effects and Key Mitigation

Potential Effect	Key Mitigation
<p>Loss of agricultural land</p> <ul style="list-style-type: none"> <li>• Permanent loss of 3,400 ha class 1 – 3 land</li> </ul>	<ul style="list-style-type: none"> <li>• Implement Agricultural Compensation Fund would support regional agricultural priorities, research and projects (485,000 ha class 1-3 remaining in Peace region)</li> </ul>
<p>Effects on individual farm operations</p> <ul style="list-style-type: none"> <li>• Majority of farm operations continue</li> </ul>	<ul style="list-style-type: none"> <li>• Implement Environmental Management Plans (soil management, reclamation, invasive plant management, traffic management, etc.)</li> <li>• Implement farm mitigation plans, environmental management plans</li> <li>• Monitor during early operations related to wildlife crop damage, crop drying, groundwater elevation, human and livestock access issues</li> </ul>
<p>Change to agricultural economy (540 ha currently cultivated)</p>	<ul style="list-style-type: none"> <li>• Implement Agricultural Compensation Fund – will increase regional economic activity and value</li> </ul>
<p>Change to regional food production</p>	<ul style="list-style-type: none"> <li>• No residual effect on region’s ability to be food self-reliant, on remaining land, for food that can be produced in the region</li> </ul>



## Forestry, Oil Gas and Energy, Minerals and Aggregates

- Key aspects:
  - Changes in land use, resource use and commercial activities
  - Any new or improved access to aggregate sources, and Project consumption of local aggregate
- Key information:
  - Spatial analysis of resources, tenures, Project overlaps and industry activity levels
  - First Nation community baseline studies
- Where necessary agreements will be implemented with third party tenure holders (e.g. to address tenure, road use and activity overlap) with government input as required related to crown-issued tenures



VC	Key Findings
Forestry	<ul style="list-style-type: none"> <li>• Project overlap less than 0.02% of timber harvesting land base</li> <li>• Regional mills have capacity to process Project merchantable timber (e.g. would replace existing volume)</li> </ul>
Oil, Gas and Energy	<ul style="list-style-type: none"> <li>• Project overlap about 0.11% of petroleum and natural gas tenure area in PRRD.</li> <li>• No other energy projects within the Project activity zone.</li> <li>• Effects on existing tenured activity or infrastructure will be addressed where appropriate with affected tenure holders.</li> </ul>
Minerals and Aggregate	<ul style="list-style-type: none"> <li>• BCH will leave useful stockpiles of material in quarries for MOTI use.</li> <li>• BCH will use inundated sources where possible such as for HWY 29</li> </ul>

## Harvest of Fish and Wildlife Resources (public and tenured), Outdoor Recreation and Tourism, Visual Resources

- General approach: changes in opportunities, areas, or land use related to public activities on the land
- Harvest of fish and wildlife resources: changes in opportunities or areas for public fishing and hunting, tenured trapping and guide-outfitting, and changes to harvestable species (fish and wildlife assessment results)
- Outdoor recreation and tourism: changes to features and amenities, activities and locations used by residents and tourists
- Visual Resources: changes to the scenic viewpoints due to human disturbances, level of existing human influence on the landscape



Conceptual Rendering of Typical Boat Launch

VC	Potential Effect	Key Mitigation
<p>Outdoor Recreation and Tourism</p>	<p>Change in outdoor recreation / tourism infrastructure, use levels</p> <p>Temporary loss of opportunities during construction</p> <p>Permanent change in recreation setting to reservoir from river</p>	<ul style="list-style-type: none"> <li>• Build 3 new reservoir boat launches, with docks and day use areas, dam site viewpoint</li> <li>• Community Recreation Site Fund, funds to Hudson’s Hope, for community recreation site development</li> <li>• Regional Reservoir Navigation and Recreation Opportunities Plan</li> <li>• Public Safety Management Plans and communication</li> </ul>
<p>Harvest of Fish and Wildlife Resources</p>	<p>Change in areas, opportunities or infrastructure</p> <p>Temporary effect on fishing/hunting at active work sites</p> <p>Long-term benefit for fishing, hunting will continue</p> <p>Project affects 2.3% of area of 16 traplines, 0,8% of 4 guide-outfitter territories that overlap the LAA</p> <p>Harvestable species still available</p>	<ul style="list-style-type: none"> <li>• Outdoor recreation mitigation will support harvesting activities, access and opportunities</li> <li>• Agreements with trapline and guide outfitter tenure holders where Project activities affect their operations or infrastructure</li> </ul>



# Land and Resource Use Potential Effects and Key Mitigation

VC	Potential Effect	Key Mitigation
Visual Resources	<p>Change to visual resources:</p> <ul style="list-style-type: none"><li>• public viewpoints change in valley view from river to reservoir</li></ul>	<ul style="list-style-type: none"><li>• Implement restoration and re-vegetation of temporary use areas</li><li>• Use natural landscaping on Hudson's Hope shoreline protection</li><li>• Paint permanent buildings and above ground structures to blend in with character of surrounding environment where possible</li><li>• Select previously disturbed sites, or areas hidden from view for workforce camps where feasible</li></ul>

## Key Aspects:

- Changes to water based navigation, hazards, navigation restrictions
- Microclimate changes (fog) on aviation use at North Peace Regional Airport
- Changes to aviation use (routes) and visibility of overhead wiring
- Changes to operation of ice bridges (Shaftesbury and Tompkins Landing)

## Key Information:

- Existing navigable waters, navigation use,
- Potential Project navigation barriers, hazards or use restrictions
- Current navigation use, 2 year river survey, dam site vessel transit counts
- Aviation routes, visibility of Project components, structures, overhead wiring
- Microclimate model to predict changes to fog and aviation visibility
- Ice model used to assess changes to operations of ice bridges

Aspect	Potential Effect	Key Mitigation
Water-based navigation	<ul style="list-style-type: none"> <li>• Temporary, local disruptions during construction</li> <li>• Permanent navigation restriction past dam</li> <li>• New navigation opportunities on the reservoir</li> <li>• Potential debris hazards in waterways</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of new boat launches to enable reservoir boating, ongoing BC Hydro maintenance of downstream boat launches to enable river boating</li> <li>• Public safety management plan, communications to support boater safety</li> <li>• Reservoir Navigation and Recreation Opportunities Plan</li> <li>• Clearing plan – reduce debris with reservoir clearing, removal of vegetation to within 5m of reservoir surface, advance clearing of shoreline vegetation from erosion area, debris management during operations</li> </ul>
Aviation	<ul style="list-style-type: none"> <li>• No effects</li> </ul>	<ul style="list-style-type: none"> <li>• None required</li> </ul>
Ice Bridges	<ul style="list-style-type: none"> <li>• No effects</li> </ul>	<ul style="list-style-type: none"> <li>• None required</li> </ul>



# Q & A

# BREAK

## 2:00-2:15 pm

# Heritage and Health Valued Components

Siobhan Jackson

## Key Aspects, Changes to Palaeontological, Archaeological and Historical Resources:

- Change resource integrity (surface and subsurface disturbance, disturbance of structures or artifacts, compaction, erosion)
- Change resource accessibility (increased access, unauthorized collection, lack of access for cultural or research purposes)
- Other relevant heritage considerations raised by Aboriginal groups (e.g. known heritage or cultural features, ongoing consultation, ground-truthing of traditional land use studies)

**Key Information:** Heritage site potential analysis, inventory undertaken (field surveys) within Project activity zone



## Key Mitigation Measures:

- Avoid sites and reduce resource damage where possible
- Manage any found burials following provincial guidelines
- Document historical sites and relocate important structures, if found
- Recover heritage resources: staged scientific excavations, stratified sample excavations, systematic surface collection
- Commemorate heritage resources as appropriate
- Provide funds to local museums to support heritage programming
- Implement Heritage Resources Management Plan, Chance Find Procedure, construction phase monitoring, reservoir erosion monitoring (operations)



## Key Aspects:

- Changes in potable and recreational water quality
- Changes in ambient air quality
- Change in noise and vibration
- Change in electric and magnetic fields (EMF)
- Change in country foods, methylmercury in fish

## Key Information:

- Water quality, air quality, noise and vibration, EMF technical studies
- Human health risk assessment of methylmercury in fish
- Provincial and federal health standards and assessment guidelines
- Human use and settlement areas (receptors), country food use surveys (angler and Aboriginal fish catch, retention and consumption)

Aspect	Potential Effect	Key Mitigation
Air Quality	<ul style="list-style-type: none"> <li>No adverse effects on human health with mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>Implement air quality management plan for work sites, air quality monitoring</li> <li>Site management measures, barriers to reduce, contain particulate matter</li> <li>Use of smoke management plan</li> </ul>
Noise and Vibration	<ul style="list-style-type: none"> <li>No adverse effects on human health with mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>Implement noise &amp; vibration management plan and monitoring for work sites</li> <li>Site management measures, barriers to reduce, contain noise</li> </ul>
Water Quality	<ul style="list-style-type: none"> <li>No adverse effects on human health with mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>Implement spill prevention and response, erosion prevention and sediment control, groundwater protection plans</li> <li>Monitor water quality at Fort St. John and Taylor water systems during construction phase (precautionary, no effects expected on well systems)</li> </ul>
Country foods-methylmercury in fish	<ul style="list-style-type: none"> <li>No adverse effects on human health with mitigation measures</li> <li>Current and predicted methylmercury in fish within Health Canada acceptable levels</li> <li>Would not affect typical level of consumption of fish</li> </ul>	<ul style="list-style-type: none"> <li>No mitigation required</li> <li>Monitoring - methylmercury in fish, results will support public communication and enable good information about health benefits of fish consumption</li> </ul>



# Q & A

# Proponent's Conclusions & Next Steps for BC Hydro

Danielle Melchior

- EIS meets the requirements of the EIS Guidelines
- Based on the substantial work undertaken to date, the effects of the project can largely be mitigated through careful project planning, comprehensive mitigation programs, and ongoing monitoring during construction and operations.
- While the project has the potential to result in some significant residual effects, BC Hydro believes that those effects are justified by the need for the Site C project, and the environmental, economic and social benefits it would provide.

- Responding to Requests for Information or Clarification