MEPA Revised Protocols on Climate Change and Environmental Justice



July 20, 2021 Submittal of North American Megadam Resistance Alliance

Tori Kim, Director MEPA Director at Executive Office of Energy and Environmental Affairs Commonwealth of Massachusetts 100 Cambridge Street Boston, MA 02114

By email only to: MEPA-regs@mass.gov

Re: MEPA Office Revised Protocols on Climate Change and Environmental Justice

Dear Director Kim,

The North American Megadam Resistance Alliance submits the following comments

regarding the Massachusetts Environmental Policy Act (MEPA) Public Involvement Protocol for

EJ Populations.

Exhibit 1: March 22, 2021: North American Megadam Resistance Alliance comments: *Massachusetts Interim Clean Energy and Climate Plan for 2030 and Decarbonization Roadmap*

Exhibit 2: August 5, 2020: Press Release: Canadian Innu First Nation of Pessamit & Atikamekw First Nation of Wemotaci (Province of Quebec) - *Quebec Export of Electricity to the United States - The moment of truth for Pessamit and Wemotaci First Nations*

Exhibit 3: August 18, 2020: Press Release: Innu-Atikamekw-Anishnabeg Coalition -Appalaches-Maine Interconnection Line: Reparations or Confrontation, Say Pessamit, Wemotaci, and Pikogan First Nations Exhibit 4: October 7, 2020: Press Release: Innu-Atikamekw-Anishnabeg Coalition - *Opposition to the New England Clean Energy Connect Electricity Transmission Line Project to Massachusetts: Five Indigenous communities take their cause to the United States*

Exhibit 5: December 3, 2020: Press Release: Innu-Atikamekw-Anishnabeg Coalition - *Export of Canadian Hydropower to the United States - First Nations in Quebec and Labrador Unite to Oppose Hydro-Quebec's Project*

Exhibit 6: December 10, 2020: Press Release: Innu-Atikamekw-Anishnabeg Coalition - *Report* on the Appalaches-Maine Hydropower Interconnection Project - Quebec Imposes Unconstitutional Guidelines to Public Hearings Commission

Exhibit 7: January 22, 2021: Press Release: Innu-Atikamekw-Anishnabeg Coalition -Hydro-Quebec is Counting its Chickens Before they Hatch - Commentary By The Innu, Atikamekw, Anishnabeg Coalition About Hydro Quebec's Hydroelectricity Export Project to the United States

Exhibit 8: July 6, 2021: Press Release: Innu-Atikamekw-Anishnabeg Coalition - Short Circuit of Hydro-Quebec's Interconnection Line with Maine - Formal Notice Served to the Government of Quebec and Hydro-Quebec by Five First Nations

Exhibit 9: March 30, 2021: Letter to Prime Minister Trudeau: Innu Nation - *Innu Nation request* for designation re: Hydro-Quebec TransEnergie Application for the Applaches-Maine Interconnection Power Line Project

Exhibit 10: March 30, 2021: Letter to the White House: Innu Nation - *Presidential Permit for New England Clean Energy Connect*

Exhibit 11: August 14, 2020: *Final Submittal of North American Megadam Resistance Alliance to International Trade Commission re: Investigation* 332-574 *(imports of Canadian hydropower)*

Exhibit 12: 2020-2021: North American Megadam Resistance Alliance Petition - *Reject Canadian Hydropower: A Human Rights and Environmental Disaster*

Exhibit 13: April 2021: Publication: *Hoodwinked in the Hothouse: Climate False Solutions - Hydroelectricity*

Exhibit 14: 2021: Comments on the ISO-NE 2019 Electric Generator Air Emissions Report



NORTH AMERICAN MEGADAM RESISTANCE ALLIANCE

Protecting rivers & communities by resisting megadams & transmission corridors

www.northeastmegadamsresistance.org

March 22, 2021

Kathleen Theoharides, Secretary Executive Office of Energy and Environmental Affairs Commonwealth of Massachusetts 100 Cambridge Street, Suite 900 Boston, MA 02114

By email only to: gwsa@mass.gov

Re: Massachusetts Interim Clean Energy and Climate Plan for 2030 and Decarbonization Roadmap: Comments

Dear Ms. Theoharides,

The North American Megadam Resistance Alliance ("NAMRA") submits the following comments on Massachusetts's interim Clean Energy and Climate Plan for 2030 ("2030 CECP") and the Decarbonization Roadmap ("the Roadmap"). The 2030 CECP provides details on the actions the Commonwealth proposes to take through the 2020s to ensure that statewide greenhouse gas ("GHG") emission limits are 45% below the reported 1990 level. The 2030 CECP is prepared in coordination with the development of the 2050 Decarbonization Roadmap

such that the strategies, policies, actions outlined in the plan aims to help the Commonwealth achieve net zero GHG emissions by 2050. This interim report builds upon the 2010 publication of the Clean Energy and Climate Plan for 2020 as part of the Global Warming Solution Act's ("GWSA") implementation policies. The Executive Office of Energy and Environmental Affairs ("EEA") is soliciting public comment before finalizing the 2030 CECP.

As detailed below, the CECP and Roadmap proposals are flawed because Massachusetts fails to account for GHG emissions from electricity used in Massachusetts and generated elsewhere -- specifically by Canadian hydroelectricity -- in its 2030 CECP reduction strategies. Canadian hydropower imports account for about 19% of New England's electricity usage as of 2019 according to the Independent Services Operators of New England ("ISO-NE"). Neither Massachusetts nor ISO-NE account for the greenhouse gas emissions from electricity generated by Canadian hydropower and used in New England. Nor are these emissions accounted for in Canada. This is a GHG accounting loophole at a time of climate crisis. Perpetuating this loophole under the CECP and Roadmap contravenes the GWSA by undercounting GHG emissions both in the 1990 baseline inventory and every year after that. As a result, Massachusetts electricity usage actually emits more GHG than what is reported. This makes Massachusetts's GHG reporting inaccurate and paints a false picture of the state's actual GHG emissions.

I. Factual Background

From 2000-2008, Massachusetts imported about 4,748,725 megawatt hours of electricity from Quebec Province in Canada.¹ Massachusetts has developed climate policies over the past decade to help drive emission reductions, particularly within the electricity sector. The 2050

¹ See Mass. Exec. OFF. of Energy and Env't AFF, Statewide Greenhouse Gas (GHG) Emissions Baseline and Projection Update (2020) (table depicting data from 2000-2008 on Massachusetts's share of Quebec net electricity exports).

Decarbonization Roadmap calls for a continued transition away from carbon intensive electricity sources and toward imported Canadian hydropower and high-voltage interstate transmission lines.² The roadmap falsely describes hydropower as "a clean energy generation resource" that is "highly controllable and effectively dispatchable."³ In an effort to shift the state from a fossil fuel-dependent grid to a renewable energy grid, Massachusetts passed *An Act to Promote Energy Diversity* in 2016. In part the Act requires utilities to solicit 9.45 terawatt hours per year of "clean energy generation."⁴ In response, utilities contracted with Central Maine Power ("CMP") for the delivery of hydropower via high-voltage transmission lines through the New England Clean Energy Connect ("NECEC") project.⁵ The contract was approved by the Department of Public Utilities.

The NECEC project is slated to deliver Canadian hydropower generated by 63 hydroelectric generation stations in Eastern Canada, including 1/6 of which is generated at the Upper Churchill Falls facility in Labrador/Newfoundland Province. The Canadian hydropower industry is owned by the individual provinces making them state-run monopolies. The Canadian Government and the hydropower monopolies market this hydroelectricity as "clean."⁶ In fact, peer reviewed science shows that the emissions from Canadian hydropower can be on par with fossil fuels. This electricity destroys rivers, biodiversity and is resulting in ongoing environmental racism according to Indigenous communities from whose land most of this electricity is taken without compensation and without consent.⁷

² Mass. Exec. Off. of Energy and Env't Aff., Massachusetts 2050 Decarbonization Roadmap at 55 (2020) ³ *Id.* at 63.

⁴ Mass. Exec. Off. of Energy and Env't Aff., Interim 2030 CECP 35 (2020).

⁵ *Id.* at 8, 35.

⁶ Hydro-Quebec Has Left Quebec's First Nations Behind, BANGOR DAILY NEWS (Feb. 7, 2021),

https://bangordailynews.com/2021/02/07/opinion/contributors/hydro-quebec-has-left-quebecs-first-nations-behind/. ⁷ See, <u>www.quebechydroclash.com</u> and <u>www.50yearspastdue.ca</u> for positions of the Atikawekw, Pessamit Innu and Anishnabe Coalition and the Innu Nation of Labrador opposing the export of Hydro-Quebec electricity to the U.S. without compensation.

HydroQuebec's electricity generation has been negatively impacting Indigenous communities since the 1970s and the new dams built for export to Massachusetts via NECEC perpetuate what they describe as cultural genocide. Flooding lowlands to create hydropower storage reservoirs has led to the release of methylmercury from plants and soil which poisons wild caught foods including fish, duck, and seals relied on for physical and spiritual survival by groups such as the Pessamit Innu First Nation and the Innu and Inuit.⁸ The dams and associated related infrastructure such as transmission corridors have shifted migratory patterns for fish and key game animals hunted by Indigenous people, further disrupting their food sources.⁹ Construction and operation of hydroelectric facilities has destroyed and continues to destroy ancestral lands and traditional livelihoods of Indigenous people in Eastern Canada, including communities in Labrador impacted by Hydro-Quebec's production and export of one-sixth of its electricity supply generated at the Upper Churchill facility. The Phase 1 Lower Churchill project, the Muskrat Falls dam, was built without the consent of all Indigenous community members and over the opposition of the Grand Riverkeeper of Labrador, Inc. and a wide network of social justice, environmental and Indigenous groups. Massachusetts' refusal to acknowledge the climate injustices and environmental racism perpetuated by Hydro-Quebec' electricity imports is at odds with the professed "climate justice" and "environmental justice" pronouncements of the CECP and Roadmap and Governor Baker's own policies. Importing more of this hydropower via NECEC so HydroQuebec, a state-owned monopoly, can grow its profits by selling to U.S. consumers is not acceptable.¹⁰

⁸ Id.; see also Hydro-Quebec and the Mercury Issue, Hydro-QUEBEC,

https://www.hydroquebec.com/sustainable-development/specialized-documentation/mercury.html (last visited March 12, 2021) (HydroQuebec conducted a study and acknowledged the increase of mercury levels in its reservoirs, but nonetheless concluded that "the health benefits of eating fish far outweigh the mercury-related risks").

⁹ Hydro-Quebec Has Left Quebec's First Nations Behind, supra note 3.

¹⁰ See *id.* (discussing how HydroQuebec makes billions of dollars each year by profiting off its illegitimate occupation of indigenous land).

The NECEC Canadian hydropower import proposal faces strong public opposition and has divided government officials.¹¹ Corridor opponents in Maine have collected 80,506 certified signatures for a state-wide referendum to require legislative approval for any electrical power line exceeding 50 miles.¹² The NECEC project requires 53 miles of new corridor and will cut through treasured mountain areas of Northern Maine.¹³ Much of the controversy surrounds the concern that NECEC will precipitate irreparable environmental damage to Maine's prized landscapes with little return for Maine residents.¹⁴ In October 2020, the Natural Resources Council of Maine, Sierra Club Maine, and Appalachian Mountain Club filed a federal lawsuit in the U.S. District of Maine challenging the U.S. Army Corps of Engineers' Environmental Assessment of the NECEC project.¹⁵ The case is currently before the First Circuit which granted the plaintiffs' injunction pending appeal on January 15, 2021.

II. Legal Background

Massachusetts passed the GWSA in 2008 to establish a comprehensive regulatory program that would address climate change through ambitious GHG reduction targets.¹⁶ The overarching goal of the GWSA is to reduce emissions 10-25% below statewide 1990 levels by 2020 and at least 80% below by 2050. EEA has also adopted a statewide target of Net Zero GHG

¹¹ See PUC's Decision on CMP Corridor Deeply Flawed, NAT. RES. COUNCIL OF MAINE (Apr. 11, 2019), https://www.nrcm.org/maine-environmental-news/pucs-decision-cmp-corridor-deeply-flawed/ (state-wide poll found that 65% of Mainers oppose the project).

¹² If the legislature passes the referendum, it would specifically prohibit a line where CMP wants to build. Don Carrigan, *Threshold Met For Referendum on \$1B Utility Corridor Project*, NEWS CENTER MAINE (updated Feb. 22, 2021)

https://www.newscentermaine.com/article/news/local/threshold-met-for-referendum-on-cmp-1b-utility-corridor-proj ect/97-bcbc5b41-5ac2-41f9-b655-c6571a652bcd.

¹³ Id. ¹⁴ Id.

¹⁵ __

¹⁵ Environmental Groups File Lawsuit Challenging Army Corps for Indefensible CMP Corridor Analysis, NATURAL RESOURCES COUNCIL OF MAINE (Oct. 28, 2020),

https://www.nrcm.org/news/lawsuit-challenging-army-corps-cmp-corridor-analysis/.

¹⁶ See Global Warming Solutions Act Background, Exec. Office of Energy and Envt'l Affairs, https://www.mass.gov/service-details/global-warming-solutions-act-background.

emissions by 2050 which Governor Baker announced in January 2020.¹⁷ To help achieve these goals, the GWSA provides a framework for Massachusetts to promulgate reporting mandates for large GHG-emitting facilities and establish a baseline assessment of statewide GHG emissions.¹⁸

Under Section 3(a) of the GWSA, EEA is required to adopt "an interim 2030 emissions limit accompanied by plans to achieve this limit in accordance with said section 4; provided, however, that the 2030 interim emissions limits shall maximize the ability of the commonwealth to meet the 2050 emissions limits."¹⁹ Section 4 outlines several factors to be considered by the Secretary in developing the targets, such as the feasibility of the measures to comply with the emissions limit, the potential economic and noneconomic benefits of reduction measures, and the relative contribution of each source to statewide GHG emission levels.²⁰ As implied by the language of Section 3(a), the priority of the provision is to ensure that the 2030 CECP sets Massachusetts on track to achieve its 2050 emission targets.

Section 2(5) of the GWSA states that Massachusetts's Department of Environmental Protection ("DEP") shall establish reporting requirements for GHG emissions from all consumed electricity sources.²¹ This includes "transmission and distribution of line losses from electricity generated within the commonwealth or imported from outside the commonwealth."²² Thus, GHG emissions from facilities other than those located in Massachusetts should be reported since those sources contribute to the total consumption of electricity in the state. Further, the statute does not distinguish between national and international sources of electricity. The NECEC contract, approved by the Department of Public Utilities with the support of the Department of

¹⁷ Mass. Exec. Off. of Energy and Env't Aff., Interim 2030 CECP 4 (2020).

¹⁸ See Global Warming Solutions Act Background, Exec. Office of Energy and Envt'l Affairs,

https://www.mass.gov/service-details/global-warming-solutions-act-background.

¹⁹ GWSA, § 3(b)(2) (2008).

 $^{^{20}}$ *Id.* §§ 4(b), (d), (e).

 $^{^{21}}$ Id. § 2(5).

²² Id.

Energy Resources ("DOER") but over the opposition of the Attorney General of Massachusetts for the delivery of Canadian hydropower falls under this reporting mandate. However, neither Massachusetts nor ISO-NE have a reporting mechanism or system to account for GHGs from HydroQuebec hydropower that is currently imported to and used in Massachusetts or what will be used in the future -- meaning these emissions omitted from the Commonwealth's GHG emissions inventory. According to sworn testimony in proceedings before the U.S. International Trade Commission in 2020, NECEC's 20-year contract "roughly equates to about 17 percent of [Massachusetts] total electric demand."²³ Thus, 17% of the electricity will be counted as having zero emissions when this is not the case.

III. Greenhouse Gas Emissions From Hydropower

Hydropower is often referred to as a "low-carbon" and "renewable" source of electricity.²⁴ This myth has been challenged for decades. Over the last 15 years, scientists have increasingly acknowledged the significant amounts of carbon dioxide ("CO2") and methane that can be released by hydropower facilities.²⁵ Mounting evidence reveals elevated CO2 and methane levels following the creation of a hydroelectric reservoir.²⁶ This initial uptick in GHG emissions can be attributed primarily to the decay of submerged trees and disturbed sediments after flooding.²⁷ CO2 and methane emissions that result from organic matter decomposition can decline following the initial flooding, as revealed by a study on the Eastmain reservoir in

²³ Transcript, U.S. International Trade Commission, Investigation No. 332-574: 68:2-18: Testimony of Patrick Woodcock, MA DOER, July 29, 2020.

²⁴ Cuihong Song et al., *Cradle-to-Grave Greenhouse Gas Emissions from Dams in the United States of America*, 90 Renewable and Sustainable Energy Reviews 5 (2018).

²⁵ Brad Hager Dec. at 3.

²⁶ Cristian Teodoru et al., *The Net Carbon Footprint of a Newly Created Boreal Hydroelectric Reservoir*, GLOBAL BIOGEOCHEMICAL CYCLES, May 2012, at 1.

²⁷ Brad Hager Dec. at 7; Andreas Maeck et al., *Sediment Trapping by Dams Creates Methane Emission Hot Spots*, ENVT'L SCI. & TECH. 8130, 8130 (2013).

Quebec, Canada, but levels stabilize at values that are still higher than those from the surrounding landscape.²⁸ The release of GHG emissions due to biomass decomposition from flooding is the largest source of direct GHG emission for hydropower.²⁹ Sources of indirect emissions from hydropower include construction work on the facility itself, transportation of materials and workers, and waste disposal.³⁰

GHG emissions from reservoirs are highly dynamic and can vary greatly depending on location, age, and climate.³¹ An ideal reservoir is one sited in narrow mountain valleys above the treeline.³² Since these areas have less vegetation, they do not emit as much as GHGs as the shallow, lowland areas with forests once they are flooded. Unfortunately, "many of HydroQuebec's reservoirs flood vast tracts of low-lying woodlands, resulting in massive deforestation" and thus produce higher emission levels.³³ Peer-reviewed scientific literature ranks the carbon footprint of HydroQuebec amongst the dirtiest hydropower generators in the world.³⁴ One particular study revealed that GHG emissions from six of HydroQuebec's reservoirs range from about that of a natural gas power plant to over twice that of coal-fired power plants.³⁵ Another study of a 485 MW reservoir in Northern Quebec found that net CO2 equivalent emissions rate of a new hydroelectric dam in a boreal forest landscape could exceed the emissions of a new natural gas facility over the first few years of the asset's life.³⁶

²⁸ Teodoru et al., *supra* note 21, at 12.

²⁹ William Steinhurst et al., *Hydropower Greenhouse Gas Emissions*, SYNAPSE ENERGY ECON. 12 (2012)

³⁰ *Id.* at 11.

³¹ Teodoru et al., *supra* note 21, at 1.

³² Brad Hager Dec. at 6–7.

³³ Id.

³⁴ *Id.* at 8.

³⁵ See *id.* at 3 (emissions from natural gas power plants are approximately 400g CO2e per kilowatt hour and approximately 1,000g CO2e per kilowatt hours from coal power plants).

³⁶ See Teodoru et al., supra note 21.

Studies suggest that hydropower production could release more GHG emissions than fossil fuel energy when taking into account the entire life cycle of the emissions.³⁷ A comprehensive understanding of life cycle GHG emissions from hydroelectric dams requires the application of a life cycle assessment ("LCA").³⁸ An LCA is a method used to evaluate the totality of environmental impacts of a product or service from "cradle to grave."³⁹ As part of an LCA for a hydroelectric dam, GHG emissions are calculated beginning with the construction of the facility all the way through the decommissioning phase.⁴⁰ Failing to account for emissions at the "end-of-life stage" could lead to an underestimation of a dams' total GHG contribution.⁴¹ It is important to factor in the impacts of decommissioning hydroelectric facilities at the end of their life cycle when considering this particular energy source and its implications for climate change.⁴² In addition, one study concluded that newly flooded boreal reservoirs (such as HydroQuebec's) "have life cycle emissions that likely exceed those of other renewable sources."⁴³

A GHG such as CO2 does not remain localized once emitted.⁴⁴ Rather, CO2 disperses evenly throughout the atmosphere and transcends the borders of any state or country.⁴⁵ This is known as the "spillover effect" which recognizes that the costs and benefits of GHG regulations may not be fully internalized within a state.⁴⁶ Addressing climate change requires the consideration of global emissions rather than just local emissions.⁴⁷ This is especially pertinent in

³⁷ Song et al., *supra* note 19.

³⁸ Sergio Pacca, *Impacts From Decommissioning of Hydroelectric Dams: A Life Cycle Perspective*, 84 CLIMATIC CHANGE 281, 282 (2007).

³⁹ Id.

⁴⁰ See id.

⁴¹ Song et al., *supra* note 19, at 14.

⁴² See Pacca, *supra* note 31, at 291–92.

⁴³ William Steinhurst et al., *supra* note 26, at 20.

⁴⁴ Raymond B. Ludwiszewski & Charles H. Haake, *Cars, Carbon, and Climate Change*, 102 NW. U. L. REV. 665, 679 (2008).

⁴⁵ Id.

⁴⁶ *Id.* at 680.

⁴⁷ Brad Hager Dec. at 2.

the context of hydropower, an energy source that has been found to emit a global average of 173 kg of CO2 and 2.95 kg of methane per megawatt hour of electricity produced.⁴⁸

IV. The 2030 CECP Fails to Account For Hydropower Emissions

Hydropower emissions exceed that of all other renewable energies and are far greater than previously assumed.⁴⁹ The uncertainties that persist in measuring emissions from hydroelectricity generation underscores the need for more extensive monitoring and investigation. Underlying these uncertainties is the idea that hydropower is not as universally beneficial to climate needs as previously claimed.⁵⁰ Collecting more data on emissions and minimizing climate impacts must be a priority in the design and construction of new hydropower facilities.⁵¹ A comprehensive evaluation of hydropower is vital for Massachusetts to determine the feasibility of this energy source for its emission reduction goals. However, EEA has neglected to account for emissions from hydroelectric dams in its interim 2030 CECP.

As DOER testified, over a 20-year period 17% of Massachusetts electricity consumption will be coming from NECEC hydropower imports (assuming the transmission corridor is ever built). Massachusetts must account for the emissions from existing and future Canadian hydropower imports. Otherwise, it is playing a dangerous shell game with GHG accounting during a climate crisis – the very crisis the CECP and Roadmap purport to address.

 ⁴⁸ See Laura Scherer & Stephan Pfister, *Hydropower's Biogenic Carbon Footprint*, PLos ONE, Sept. 2016, at 7 (table depicting global estimates of carbon and methane emissions from a study of ~1,500 hydropower plants).
 ⁴⁹ *Id.* at 1.

⁵⁰ Ilissa B. Ocko & Steven P. Hamburg, Climate Impacts of Hydropower: Enormous Differences Among Facilities and Over Time, ENV'T SCI. & TECH., at M (2019).
⁵¹ Id.

The CECP and Massachusetts's GHG emission inventory are supposed to account for, at a minimum, direct GHG emissions.⁵² Direct emissions are defined under the GWSA as "emissions from sources that are owned or operated, in whole or in part, by an entity or facility including, but not limited to, emissions from factory stacks, manufacturing processes and vents, and company owned or company-leased motor vehicles."53 This definition broadly encompasses all energy sources that are owned or operated by an entity without qualification. HydroQuebec's generating fleet comprises of 61 hydroelectric generating stations, 24 thermal plants, and 28 large reservoirs⁵⁴ which will be employed to supply the NECEC project, plus the Upper Churchill hydropower facility in Labrador that accounts for 1/6th of Hydro-Quebec's supply, for a total of 63 generating stations used to supply exports. Hydro-Quebec itself identified that its hydropower facilities release an estimated 17 kg of CO2 emissions per megawatt hour.⁵⁵ Even ignoring the scientific evidence that this estimate is far too low,⁵⁶ Massachusetts should have at least accounted for the acknowledged emissions from Hydro-Quebec's energy generation. Just as coal-fired power plants must report the emissions from their smokestacks, Hydro-Quebec must report the direct emissions of each kilowatt imported into Massachusetts. To date, the Canadian hydropower industry, including Hydro-Quebec, has failed to substantiate claims of "low carbon" or "zero carbon" emissions from its hydroelectricity generation.

Massachusetts's GHG inventory does not include GHG reporting on a lifecycle basis.⁵⁷ In an internal memo from 2013, DEP officials recognized the existence of lifecycle GHG emissions from large-scale hydropower sources but stated that "taking these into account is not consistent

⁵² Bram Claeys & Sharon Weber, Memo Re: GHG Emissions From Large Hydro in the Context of the CECP, Mass. DEP, (April 9, 2013) [hereinafter Mass. DEP GHG Memo].

⁵³ GWSA, § 1 (2008).

⁵⁴ Power Generation, HydroQuebec, https://www.hydroquebec.com/generation/ (last visited Mar. 18, 2021).

⁵⁵ Brad Hager Dec. at 3.

⁵⁶ Id.

⁵⁷ Mass. DEP GHG Memo, *supra* note 43.

with the current scope of the CECP and GHG inventory for any fuel."⁵⁸ Since lifecycle emissions are not considered for any other type of electric generation, Massachusetts officials apparently believed it to be inappropriate to consider them for hydropower. This stance is legally and scientifically wrong, and it enables EEA to ignore the GHG emissions associated with the creation, operation, and decommissioning of Hydro-Quebec facilities including the Upper Churchill generating station that produce electricity for export to Massachusetts.⁵⁹ If the goal of the 2030 CECP is to set Massachusetts on a path towards decarbonization, the state must take into account hydropower emissions from "cradle to grave." Furthermore, LCA's for hydropower typically cover a minimum time period of 100 years.⁶⁰ The time frame for adequately assessing GHG emissions does not align with Massachusetts's goal to reach net zero emissions by 2050.

The 2030 CECP itself only mentions hydropower a handful of times when describing the procurement of "clean energy" to achieve the goal of Net Zero emissions in 2050.⁶¹ Characterizing hydropower as "clean" is a glaring misrepresentation of the scientific evidence demonstrating that hydroelectricity production in fact emits significant amounts of CO2 and methane. In particular, it disregards the apparent discrepancies between Hydro-Quebec's allegedly minimal carbon footprint and the science showing significant emissions from its reservoirs.⁶² Furthermore, the question of whether the NECEC project will result in the construction of new hydroelectric reservoirs in Quebec is not fully settled.⁶³ The possibility remains that HydroQuebec will need to construct new reservoirs to meet the growing demand for energy, resulting in additional flooding and elevated GHG emission levels due to organic matter

⁶³ Id.

⁵⁸ Id.

⁵⁹ See Pacca, supra note 31, at 290.

⁶⁰ See, e.g., William Steinhurst et al., *supra* note 26, at 16.

⁶¹ See Mass. Exec. Off. of Energy and Env't Aff., Interim 2030 CECP 38 (2020).

⁶² See Brad Hager Dec. at 8.

decomposition.⁶⁴ The Canadian government states that it plans to build more dams to supply electricity to the U.S. New dams are under construction on the Romaine River, the Lower Churchill Project (Muskrat Falls) was built for export, and Nalcor Energy is planning to build a third dam on the Churchill River at Gull Island for export out of the province via the Atlantic Loop. This means that Massachusetts is responsible for new dam construction in Canada-massive multi-billion dollar dams that would never be allowed to be in New England where even the smallest dam removal is the subject of millions in state spending and self-congratulation for saving river ecology.

A study requested by the U.S. Department of Energy ("DOE") further highlights the uncertainty surrounding the GHG emission data and information for the NECEC project.⁶⁵ In 2019, DOE expended taxpayer dollars to contract for a review of CMP's analysis of purported climate benefits from Canadian hydropower delivered by the NECEC transmission lines.⁶⁶ The scope of the review included scientific reports that reflected a broad range of assumptions for the project.⁶⁷ Ultimately, these reports did not allow the reviewer to make any conclusive statements on the reasonableness of the GHG emissions data.⁶⁸ The information provided in the studies was "not sufficient . . . to perform a detailed assessment,"⁶⁹ reinforcing the need for Massachusetts to adequately evaluate hydropower emissions before relying upon this energy source to meet its emission reduction targets.

V. Conclusion

⁶⁴ See *id*.; Teodoru et al., *supra* note 21, at 11. A recent study concluded that HydroQuebec would be unable to meet the export demand from the NECEC project, possibly necessitating the construction of new hydroelectric facilities. CANADIAN HYDROPOWER EXPORTS TO THE NORTHEAST U.S.: NEW TRANSMISSION CORRIDORS LINKED TO POTENTIAL NEW DAMS, NORTHBRIDGE ENERGY PARTNERS.

⁶⁵ Brad Hager Dec. at 3.

⁶⁶ ICF's Review of Central Maine Power's Analysis of Climate Benefits Associated with the Proposed New England Clean Energy Connect (NECEC) Project, DOE (Jan. 8, 2019).

⁶⁷ Id.

⁶⁸ Id.

⁶⁹ Id.

Stated bluntly, "[h]ydropower is dirty energy, and should be regarded just like fossil fuel."⁷⁰ There is documented scientific evidence that hydroelectric reservoirs emit substantial amounts of GHGs during the flooding stages of construction and throughout the entire life cycle of the facility. Multiple studies have concluded that these emission levels exceed those of traditional renewable energies and hover near those of fossil fuel plants. However, Massachusetts plans to increase reliance on imported hydroelectricity from Quebec without accounting for the related GHG emissions – even though NECEC will be supplying 17% of the state's electricity if the CMP corridor is built. The Commonwealth completely disregards these emissions as it attempts to decarbonize the state and achieve net zero emissions by 2050. Massachusetts must consider GHG emission from hydropower as it pushes the state towards its clean energy goals and these considerations should be reflected in the 2030 CECP.

Very truly yours,

Margaret E. Sheehan, Esq.

Coordinator NAMRA <u>coordinator.namra@gmail.com</u> Phone: 508-259-9154

⁷⁰ Gary Wockner, *The False Promise of Hydropower*, WATERKEEPER ALLIANCE (2015) <u>https://waterkeeper.org/magazines/summer-2015-3/the-false-promise-of-hydropower/</u>. **Additional resources**: https://www.dropbox.com/sh/qoob5nh5gak3n2y/AABUMcoMEnjoxAMzs2YMUkina?dl=0





QUEBEC EXPORT OF ELECTRICITY TO THE UNITED STATES The moment of truth for Pessamit and Wemotaci First Nations

QUEBEC CITY, August 5, 2020 – The Canadian Innu First Nation of Pessamit and the Atikamekw First Nation of Wemotaci (Province of Quebec) are joining forces to put an end to the stranglehold of the Quebec government and Hydro-Québec on their traditional territories. They mean to obtain compensation for production facilities, reservoirs and transmission lines set up without their consent by threatening to derail a project to run a high-voltage transmission line through Maine to Massachusetts.

Currently, 36% of the total hydroelectric power installed by Hydro-Québec comes from Innu, Atikamekw and Anishnabeg traditional territories, protected by ancestral and treaty rights that have never been respected. In total, 33 production structures, 130 dams and dikes, 10,400 km² of reservoirs, tens of thousands of kilometres of transmission, distribution and road lines have been illegally installed. These facilities continue to be operated by Hydro-Québec in violation of the rights recognized by the Constitution Act of 1982 and the jurisprudence of the Supreme Court of Canada.

At the Cost of Others

For nearly a century, six Innu, Atikamekw and Anishnabeg communities have borne the brunt of successive hydroelectric developments that have allowed Quebec to industrialize and the majority of its citizens to access a better quality of life. Conversely, these successive and massive hydroelectric developments on their traditional territories have never translated into a better quality of life for the members of the communities most directly and negatively impacted. Quite the contrary! All internationally recognized well-being indicators are largely unfavourable for them compared to the entire population of Quebec and are comparable to those of third world countries.

A Suspended Sentence

The most recent legal episode in the Quebec government's crusade to evade the ancestral rights of the First Nations ended in 1996. The Supreme Court of Canada then definitively put an end to Quebec's claims that First Nations had no ancestral rights over the territory of the province. The illegitimate position of the government of Quebec nevertheless gave it enough time to de facto dispossess First Nations of their traditional territories. This rejection in the Supreme Court did not, however, convince Quebec to apply the necessary corrective measures. Since then, successive provincial governments have embarked on a strategy of perpetually delaying enforcement of the Supreme Court ruling. In doing so, Quebec scandalously self-awarded itself a suspended sentence.

Sand in the Gears

According to Chiefs René Simon of Pessamit and François Néashit of Wemotaci: "The First Nations directly affected by the odious regime imposed by Quebec with the complicity of the government of Canada, now have an important lever capable of establishing the rule of law, right where state brutality has always prevailed. Now is the time for our two communities to put up a concerted resistance to what is morally, legally and constitutionally indefensible! We intend to come down directly on the revenues that the government and Hydro-Québec expect to generate with their project to run a high-voltage line with a capacity of 1200 MW through the northeast of the United States." It should be remembered in this regard that Hydro-Québec has a significant energy surplus that cannot be absorbed by internal consumption. From a business standpoint, then, it's no wonder that the crown corporation is looking to improve its performance by selling power in the northeastern US. In this context, the weakening of the profit objective imposed by the state-owned company in its five-year 2020 to 2024 plan (\$16.1 billion) could have the consequence of encouraging Quebec to review its position regarding First Nations.

The Route Through Maine

Hydro-Québec's intentions in the United States are far from being unanimously supported there. In 2018, when Hydro-Québec was awarded the contract to deliver 9.45 TWh of energy to Massachusetts via the *Northern Pass* transmission line that was to cross New Hampshire from North to South, the Innu First Nation of Pessamit closely coordinated its action with regulatory bodies and American opponents of this project. Pessamit then assumed a leading role with the American media and various non-Native and Native American political bodies. In July 2019, after having exhausted all its legal options, the promoter saw its project definitively rejected by the Supreme Court of New Hampshire. Pessamit was instrumental in the termination of *Northern Pass*. After this resounding and still very recent failure, Hydro-Québec is now banking on the New England Clean Energy Connect (NECEC) project to honour its contract with Massachusetts. The state-owned company plans to run its electricity through Maine instead of New Hampshire, in order to reach Massachusetts. But history could repeat itself.

What We Are Demanding

Our First Nations cannot allow Hydro-Québec to financially benefit from our heritage without openly taking part in the debate in Maine about NECEC. After a century of denial on the part of the Quebec government, our communities have an unexpected opportunity to see our rights on their ancestral territories respected. We will resolutely seize this opportunity to force the settlement that has always been denied. The government of Quebec and Hydro-Québec have never had and still do not have the moral and constitutional legitimacy to operate 33 of the 63 hydroelectric production structures since they have never consulted and compensated the First Nations concerned. They have even less right to sell electricity in the United States when 13,200 MW, or 36% of the installed capacity in Quebec out of a total of 36,700 MW, has been usurped from the said First Nations. And if the government turns a deaf ear, Pessamit and Wemotaci will do their utmost to derail the project and ensure a resounding NO to NECEC!

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CONTACT: Suzane Chaloult 418 997-5962 Suzorr18@gmail.com APPALACHES-MAINE INTERCONNECTION LINE

Reparation or Confrontation, Say Pessamit, Wemotaci and Pikogan First Nations

THETFORD MINES, AUGUST 18, 2020 : During a meeting of the Bureau d'audiences publiques sur l'environnement (BAPE – Quebec environmental review board) held in Thetford Mines (QC-CAN) on Tuesday, August 18, the Innu of Pessamit, the Atikamekw of Wemotaci and the Anishnabek of Pikogan reiterated, through their spokespersons, their intention to oppose the proposed power line running through the state of Maine to Massachusetts and to do everything possible to derail this project it if their rights are not respected.

"As long as we have not obtained compensation for the electricity usurped using production facilities, reservoirs and transmission lines built on our ancestral territories without notice, without impact studies, and without our consent, we will do everything to prevent the Appalaches-Maine Interconnection Line (in Quebec) and its American counterpart (in the state of Maine), the New England Clean Energy Connect (NECEC) project, from happening," said representatives of these three First Nations.

They explained to the BAPE commissioners that currently, 36% of the total hydroelectric power installed by Hydro-Québec, i.e. 13,200 MW, comes from traditional Indigenous territories which are protected by ancestral rights that have in fact never been respected. In total, 33 production structures, 130 dams and dikes, 10,400 km² of reservoirs, tens of thousands of kilometres of roads, transmission and distribution lines have been illegally put in place.

Enriching Quebec by Impoverishing Indigenous Peoples

These infrastructures are still operated by Hydro-Québec in violation, in particular, of the Royal Proclamation of 1763, various treaties, rights recognized by the Constitution Act of 1982, jurisprudence coming from the Supreme Court of Canada and the United Nations Declaration on the Rights of Indigenous Peoples (see Articles 8, 20, 26 and 29). By allowing Hydro-Québec to take control of our traditional territories, the Quebec government has upset the family units and the socio-economic balance of the communities of Pessamit, Wemotaci and Pikogan. It has contributed to eliminating habitats, making food harder to find and water bodies more difficult to navigate, all while replacing the economic practices of fishing, hunting and trapping with social transfer payments. This is how our First Nations have allowed Quebec to industrialize, giving the majority of its citizens access to a better quality of life, while the well-being indicators for our communities are comparable to those in third-world countries.

Enough is enough!

In their presentation to the BAPE, the three communities affirmed that they will not allow Hydro-Québec to benefit from the Atikamekw, Innu and Anishnabek heritage in their deal with the United States without openly participating in the debate currently taking place in the state of Maine. "Hydro-Québec recently announced with great fanfare that everything was settled on that side of the border, but they're mistaking dreams for reality," said one of the representatives. This is a serious underestimation of the solidarity between the First Nations of Quebec and New England. In 2018, Pessamit made a major contribution to the derailment of the Northern Pass transmission line project that would cross New Hampshire from north to south. If

the Quebec government turns a deaf ear, Pessamit, Wemotaci and Pikogan will do their utmost to disrupt the NECEC project next!"

Remedial Measures

"Given that the electricity intended for Massachusetts was acquired unconstitutionally by Hydro-Québec with the complicity of the Quebec and Canada governments, and that the operation of the production works goes against the case law emanating from the Supreme Court of Canada in particular; given that the directive from the Ministère de l'Environnement et de la Lutte contre les changements climatiques (Quebec Ministry of the Environment) concerning the Appalaches-Maine project, as well as the Hydro-Québec impact study, do not even address the issue of legitimacy of 36% of the electricity that Hydro-Québec intends to sell in the United States without our consent; given that no account has been taken of the development of case law on Indigenous rights; considering that the systematic and uninterrupted invasion of our ancestral territories is based on a series of unilateral decisions allowing Hydro-Québec to occupy our territories indefinitely and without compensation, where the merits of our claims are nevertheless recognized by the Crown:

WE, the Pessamiulnut, the Wemotaci Iriniwok and the Abitibiwinnik, demand that remedial measures be put in place before any new export project is carried out into the United States. We confirm our firm opposition to the Appalaches-Maine Interconnection project as long as our rights are not respected."

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CONTACTS :

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Pikogan

Steve Rankin 819-732-6591

Pessamit Gérald Hervieux

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PRESS RELEASE

OPPOSITION TO THE NEW ENGLAND CLEAN ENERGY CONNECT ELECTRICITY TRANSMISSION LINE PROJECT TO MASSACHUSETTS

Five Indigenous communities take their cause to the United States

WASHINGTON, October 7, 2020 – In a brief submitted to the US Department of Energy (USDOE) in Washington, the First Nations of Pessamit (Innu), Wemotaci (Atikamekw), Pikogan, Lac Simon and Kitcisakik (Anishnabeg), have once again expressed their opposition to the development of an electricity transmission line from Quebec to southern Maine to supply Massachusetts.

Claiming that 36% of the total hydroelectric power installed by Hydro-Quebec has been stolen from us since it is produced in our respective ancestral territories from reservoirs, dams, power plants and various other installations, without prior consultation, without our consent and without compensation, our five communities together are denouncing the export project known in the United States as the New England Clean Energy Connect (NECEC) project.

Our American Allies

We have presented our brief to the USDOE which is responsible for issuing the presidential permit needed for construction of the line in the United States. Our brief is supported by a broad coalition of environmental organizations, Indigenous communities, and New England citizen groups, who also oppose this project. Several media outlets, as well as various regulatory and American political authorities, have also taken note of our action.

Just like 2018, again!

The leaders of our five communities stated that they want to seize this opportunity to force the settlement that has always been denied to us and to obtain justice for what is morally, legally and constitutionally indefensible. In 2018, the Pessamit First Nation helped derail the Northern Pass transmission line project that would have cut through the state of New Hampshire from north to south to bring electricity to Massachusetts. Faced with the inaction of the Quebec and Canadian governments, and in the face of this new attempt by Hydro-Québec to send 9.45 TWh per year to the northeast of the United States, our leaders recall that history could be repeated, again:

"If governments turn a deaf ear to our rights, Pessamit, Wemotaci, Pikogan, Lac Simon and Kitcisakik will do their utmost to derail the NECEC project in return!"

We Refuse to Continue to be Robbed!

Speaking on behalf of his elected Counselor Guy Laloche of Wemotaci declared the following: "Hydroelectric infrastructures are still being operated by Hydro-Québec on our ancestral territories against the rights recognized by the Constitution Act of 1982 and jurisprudence of the Supreme Court of Canada. Yet the Innu, Atikamekw and Anishnabeg Nations were never conquered. We have never surrendered our rights or accepted their extinction. But we are still deprived of these rights by Quebec and its crown corporation, Hydro-Québec. Our approach is therefore to oppose the sale in the United States of what belongs to us, without our having a say. We refuse to continue to be robbed! "

Quebec Is Getting Richer at Our Expense

The Chief of Kitcisakik, Mr. Régis Penosway, added the following: "Our community is located at the foot of a dam which inundated a large area of our ancestral territory equal in size to the island of Manhattan (59.1 mi²). Although surrounded by Hydro-Québec installations, our homes have no electricity or running water and have no wastewater management infrastructure. Our First Nations have enabled Quebec to industrialize and the majority of its citizens to access a better quality of life, but the health and well-being indicators for our communities continue to be comparable to those in third-world countries."

The Campaign in Full Swing

As our campaign to oppose the NECEC project is in full swing and is arousing more and more interest in the USA, other Indigenous communities in Quebec are joining us and several First Nations of New England have announced their support. For our leaders, it is no longer a question of whether the governments of Quebec and Canada owe us reparation and compensation, but rather WHEN and HOW they intend to take restorative action. (For more information, see: <u>http://quebechydroclash.com/</u>)

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CONTACT INFORMATION:

Wemotaci Adam Jourdain 418 350-0009 Export of Canadian Hydropower to the United States - First Nations in Québec and Labrador Unite to Oppose Hydro-Québec Project

NEWS PROVIDED BY Innu-Atikamekw-Anishnabeg Coalition → Dec 03, 2020, 11:02 ET

WEMOTACI, QC, Dec. 3, 2020 /PRNewswire/ - Five First Nations in Québec, the Innu of Pessamit, the Atikamekw of Wemotaci, and the Anishnabeg of Pikogan, Lac Simon and Kitcisakik, have joined the Innu Nation of Labrador to oppose Hydro-Quebec's massive new power transmission corridor to the United States. In two separate briefs addressed to the Canada Energy Regulator (CER), the six Indigenous Nations expressed their opposition to the construction and operation, by Hydro-Québec, of a transmission line dedicated to the export of electricity to New England. The CER has the power to block the project if it does not comply with constitutional requirements.

Resolutely focusing on defending their constitutional rights, the five First Nations communities located in Québec denounce the administrative strategies put forward by the Québec government, its environment ministry (Ministère de l'Environnement et de la Lutte contre les changements climatiques – MELCC), and its state-owned corporation Hydro-Québec, to circumvent the framework provided by the Constitution Act of 1982, contravene its own Environment Quality Act, ignore the jurisprudence established by the Supreme Court, and flout Canada's international commitments.

No exports without compensation

The Innu Nation's brief argues that Hydro-Québec has always refused to discuss compensation with the Labrador Innu for the harm done to their traditional territory over the past half century. Innu Nation's spokesperson, Deputy Grand Chief Mary Ann Nui, said "Innu Nation will not stand by and allow history to repeat itself. Over the past 50 years, vast areas of our ancestral lands were destroyed by the Churchill Falls hydroelectric project, people lost their land, their livelihoods, their travel routes, and their personal belongings when the area where the project is located was flooded. Our ancestral burial sites are under water, our way of life was disrupted forever. Innu of Labrador weren't informed or consulted about that project then - and now - Hydro-Quebec, without talking to us, intends to export electricity that is partly produced on our lands to the United States. It is further insult to the Innu, and we refuse to be ignored, it is out of the question as an Indigenous people who have already suffered great harm from Hydro-Quebec that we would allow this to happen."

Electricity that comes from our lands

It's the same story in Québec, where the Innu, Atikamekw and Anishnabeg Chiefs express their frustration. "Over the years, Hydro-Québec has built dams, flooded territories and developed facilities without even telling us about it," says the Chief of Pessamit, Mr. Jean-Marie Volant. Chief François Neashit of Wemotaci adds: "Our grandparents used to eat the fish they caught in the Saint Maurice River, but, since the construction of Hydro-Québec's many dams, this is no longer possible. Large parts of our territory have been destroyed, and the worst thing is that all this has been done without anyone bothering to consult us." Monik Kistabish, Adrienne Jérôme and Régis Pénosway, the Chiefs of the Anishnabeg of Pikogan, Lac Simon and Kitcisakik , also criticize Hydro-Québec for consistently refusing to discuss compensation for the damages caused by its installations. "Hydro-Québec wants to export electricity to the United States, but, unlike Ontario, which is fulfilling its constitutional obligations, Québec shows no willingness to compensate our communities for the flooding and destruction of our traditional territories," they state. "This electricity comes from our lands, and we're not going to be pushed around any longer."

Putting the project on hold

Although they are filing two separate briefs, both the Innu Nation and the coalition of First Nations from Québec note that Prime Minister Justin Trudeau has committed to implementing the United Nations Declaration on the Rights of Indigenous Peoples. "If Prime Minister Trudeau is serious about this commitment, it could force Hydro-Québec to put its export project to the United States on hold until compensation for the destruction of our ancestral lands has been negotiated with our First Nations," stated Innu Nation Deputy Grand Chief Mary Ann Nui.

Not without our consent

The projects that Hydro-Québec has built on the lands of our First Nations have enabled Québec to industrialize and have provided the majority of its citizens with a better quality of life. However, the indicators of well-being for First Nations communities continue to be comparable to those of least developed countries – a reality that has created and sustained a system in which there are two classes of citizens. To add insult to injury, Hydro-Québec now expects to sell electricity produced on our lands to the United States, and to thereby improve the well-being of American citizens, without even thinking of compensating us for the damage it has caused to our ancestral lands since the beginning of the 20th century. This will <u>not</u> happen without our consent!

SOURCE Innu-Atikamekw-Anishnabeg Coalition

Report on the Appalaches-Maine Hydropower Interconnection Project

NEWS PROVIDED BY Innu-Atikamekw-Anishnabeg Coalition → Dec 10, 2020, 11:17 ET

Quebec Imposes Unconstitutional Guidelines to Public Hearings Commission

PIKOGAN FIRST NATION, QC, Dec. 10, 2020 /PRNewswire/ - **A report recently issued by the Quebec Bureau of Public Hearings on the Environment (BAPE) regarding the Appalaches**-Maine Interconnection project (the Canadian segment as what is known in the USA as the New England Clean Energy Connect project - NECEC), clearly states that the Quebec Ministry of the Environment (MELCC) instructed it not to address the question of where the electricity destined for the United States is being produced. In so doing, the Ministry has ignored the constitutional rights of the First Nations from whose territories much of that electricity comes from.

In its report, the BAPE writes that from the outset, it was not in their mandate to investigate the legitimacy of Quebec hydroelectric production and to take a position on the subject. However, they indicate that they are aware of the limitations imposed on them by the Quebec government: "During the second part of the public hearing, the Innu First Nations of Pessamit and the Atikamekw of Wemotaci deplored the occupation of their traditional territory, which they consider illegitimate, for the production of a significant portion of Quebec's hydroelectricity. As a result, they demand remedial measures for this occupation before any further export of electricity to the United States is carried out and they therefore strongly oppose the project."

According to the Chiefs of the Pessamit Innu First Nation, the Wemotaci Atikamekw First Nations and the Anishnabeg Pikogan, Lac Simon and Kitcisakik First Nations, the comments from the BAPE are proof that the Quebec Provincial Government used the MELCC and its state-owned company Hydro-Québec to circumvent the framework provided by the "Constitution Act, 1982" to contravene its own Environment Quality Act, to ignore the jurisprudence established by the Canadian Supreme Court, and to flout Canada's international commitments. It's as if a country that exports products to Canada refused to confirm that no one had been exploited in the manufacturing of these goods. That would be unacceptable! And yet Quebec is doing the same thing in the case of our First Nations.

An Illegitimate Project

The fact that the BAPE recognizes that it was not allowed to address the question of the origin of the electricity intended for New England via the NECEC strengthens the position of the Innu-Atikamekw-Anishnabeg coalition, in challenging the legitimacy of the Hydro-Québec project before the Canada Energy Regulator by invoking the disrespect of its constitutional rights.

SOURCE Innu-Atikamekw-Anishnabeg Coalition

Hydro-Québec is Counting its Chickens Before they Hatch

NEWS PROVIDED BY Innu-Atikamekw-Anishnabeg Coalition → Jan 22, 2021, 11:32 ET

COMMENTARY BY THE INNU, ATIKAMEKW, ANISHNABEG COALITION ABOUT HYDRO QUÉBEC'S HYDROELECTRICITY EXPORT PROJECT TO THE UNITED STATES

KITCISAKIK, QC, Jan. 22, 2021 /PRNewswire/ - Once again Hydro-Québec has celebrated a premature victory regarding the interconnection line it plans to build through the State of Maine to Massachusetts. In a press release published Friday January 15, 2021, in the Province of Quebec, the state-owned corporation indeed announced that "The Federal Department of Energy (US-DOE) has granted the presidential permit to the New England Clean Energy Connect transmission line project (NECEC). – According to the document – All regulatory authorizations necessary for the realization of the project have therefore been obtained in the United States."

Not so fast!

On that same Friday January 15, the United States Court of Appeals issued an injunction to block the start of construction, thus suspending the application of the presidential permit. Hydro-Québec was careful not to publicize this setback. The state-owned corporation also neglected to mention that a referendum is due to be held in Maine in 2021 with an aim of blocking the project.

The situation is not under control!

Following steps taken by a number of U.S. environmental and political circles actively supported in Canada by our coalition of five indigenous communities, namely the First Nations

of Pessamit, Wemotaci, Pikogan, Lac Simon and Kitcisakik, it is estimated that a growing portion of the population in the State of Maine now oppose the Hydro-Québec project. If opponents to this project win the referendum, Hydro-Québec could see its dream of massive exportation to Massachusetts collapse. It could also be forced to reassess its position regarding the constitutional rights of the Innu, Atikamekw and Anishnabeg people from whose territories 36% of this electricity is being produced and whose lands suffer dire consequences.

A questionable communications approach

"Already in 2016, Hydro-Québec made similar claims in the case of the *Northern Pass* line meant to transit through New Hampshire to Massachusetts, says Régis Pénosway, Chief of the Anishnabeg of Kitcisakik. But as a result of pressure exerted by our American allies with our support, Hydro-Québec was forced to back down and the project collapsed. Regarding its current project, the state-owned corporation had already prematurely cried victory in 2020 and did so again in 2021, with new fallacious statements aimed at the Quebec media. Just recently, Hydro-Québec announced its intention to launch a new interconnection line project, this time to New York City, and will no doubt continue to use the same kind of information strategy. But once again, it will have to face our opposition."

Half-truths

The Hydro-Québec press release says that on the Quebec side of the border, "... regulatory assessments are continuing with regards to the Canadian portion of the project. So far, the transmission line project has obtained approvals from the Quebec agency responsible for energy and the protection of agricultural land." However, the press release neglects to mention that the export project is neither approved by the government of Quebec nor by the government of Canada. The coalition of our five First Nations has formally notified the Canada Energy Regulator (CER) of its opposition to this project. By virtue of our constitutional rights recognized by the CER, we will therefore be actively involved in the ongoing process which will continue until spring 2021.

Serious discussions

For decades, Hydro-Québec has been ignoring the constitutional rights of our First Nations and the *United Nations Declaration on the Rights of Indigenous Peoples*. Quebec Premier, François Legault, must recognize the reality of systemic racism within his government and engage in a process of reconciliation. As long as he persists in considering the future of his state-owned corporation without consulting our First Nations, without obtaining their consent, without compensation and without partnerships with them, Hydro-Québec's projects in the United Stated will be doomed to failure. The time has come for serious discussions!

SOURCE Innu-Atikamekw-Anishnabeg Coalition

Short Circuit of Hydro-Québec's Interconnection Line with Maine - Formal Notices Served to the Government of Québec and Hydro-Québec by Five First Nations

NEWS PROVIDED BY Innu-Atikamekw-Anishnabeg Coalition → Jul 06, 2021, 09:00 ET

LAC SIMON, QC, July 6, 2021 /PRNewswire/ - A coalition of five First Nations in the Province of Québec, Lac Simon, Kitcisakik and Abitiwinni (Anishnabeg Nation), Wemotaci (Atilamekw Nation) and Pessamit (Innu Nation), have initiated a Formal Notice procedure intended to force the Government and Hydro-Québec to suspend the construction of the interconnection line between their own power grid and that of Maine. If the Province and Hydro-Québec don't comply, the case will be sent to Court with the intention of shutting down the hydroelectric export project to Maine and Massachusetts.

This action expresses the Coalition's exasperation and anger towards the state-owned corporation and its sole shareholder, the Government of Québec. Both persist in ignoring the ancestral and constitutional rights of our First Nations on whose lands more than 36 % of the electricity destined for export to the United States is produced, without any of our communities having been consulted, compensated, or accommodated.

Years of injustice

In their Formal Notice, our members argue that the process leading to the adoption by the Government of Québec of a decree allowing the construction of the interconnection line is unconstitutional, and tainted with serious illegalities. They also point out that the various installations built by Hydro-Québec on our ancestral lands (reservoirs, hydroelectric power plants, electric pylons, etc.) over a period of many decades, have adversely impacted wildlife, vegetation, and accessibility to our traditional hunting grounds, threatening our way of life, our culture, and our livelihood itself.

Who knows?

To meet anticipated energy demand from the United States, Hydro-Québec is currently in the process of greatly increasing its installed capacity in our ancestral territories. Our First Nations, however, have noticed an unprecedented water deficit caused by climatic changes. Amongst other effects, this has triggered significant decrease in water levels during spring and summer. How will Hydro-Québec solve the squaring of the circle? It will have to provide Americans with large volumes of electricity during peak season, which in the Northeastern United States happens to be during spring and summer, precisely when water resources in our lands are reaching historically low levers year after year. As incredible as this may sound, Hydro-Québec doesn't have a clue.

Enough is enough!

One thing is certain: whatever solution Hydro-Quebec decides to adopt, our First Nations will directly suffer the repercussions since the state-owned corporation has always drained our ancestral territories' resources at the expense of our populations who are struggling to survive. But enough is enough! The time has come to address these ongoing abuses. We can no longer be on the wrong side of history.

Pass the buck

Over a period of more than a year, the Coalition has taken our cause to different government forums, including the *Bureau d'audiences publiques sur l'environnement* (BAPE – Québec environmental review board), the Canada Energy Regulator, both Prime Ministers of Québec and Canada, and of course also to top management at Hydro-Québec. Our goal was to have $_{\alpha S}$

our ancestral and constitutional rights recognised, considered, and fulfilled prior to the implementation of Hydro-Québec's "American Project". But everyone passed the buck. No one was ready to consider the obvious: that our First Nations' rights continue to be violated as they have for decades, and that the adoption by the Government of Québec of a decree allowing the construction of the interconnection line with Maine is both illegal and in blatant contempt of the honour of the Crown.

See you in Court

If Hydro-Québec and its sole shareholder, the Government of Québec, both refuse to conduct the environmental studies and consultations required, and if they don't put in place appropriate insertion measures mandatory for all major projects taking place in our lands; if once again they decide to ignore our demands for consultation and compensation for past and anticipated damages; if they persist in applying discriminatory policies reminiscent of a dark period in Canadian history: we'll see them in Court! They should keep in mind, however, that the arc of history bends towards justice, and in such cases, the Supreme Court of Canada has always leaned towards correcting the wrongs inflicted on First Nations.

SOURCE Innu-Atikamekw-Anishnabeg Coalition



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March 30, 2021

The Right Honourable Justin Trudeau, P.C., M.P. Prime Minister of Canada Office of the Prime Minister 80 Wellington Street Ottawa, Ontario K1A 0A2

BY EMAIL: justin.trudeau@canada.ca; justin.trudeau@parl.gc.ca

Dear Prime Minister,

RE: Innu Nation request for designation re: Hydro-Québec TransÉnergie Application for the Appalaches-Maine Interconnection Power Line Project

We write on behalf of the Innu Nation regarding Hydro-Québec's application for a permit from the Canadian Energy Regulator ("CER") to build the Appalaches-Maine Interconnection Power Line Project (the "Project").¹

Innu Nation requests that Cabinet designate this Project as an international power line that is to be constructed and operated in accordance with a certificate issued under section 262.

Counsel for Innu Nation has previously written to the CER, as well as to the Minister for Natural Resources, regarding our concerns with the Project: specifically, that the Project will allow Hydro-Québec to further profit from the Churchill Falls Generating Station ("CFGS") by selling electricity generated at that facility into U.S. markets.

We write to you because the letter received from the Minister for Natural Resources dated March 2, 2021, was unresponsive to our concerns. It is critical that that an appropriate process is put in place to address the concerns of Innu Nation and other First Nations regarding this Project and the related projects in the United States. For this reason, we have also written to President Biden regarding the New England Clean Energy Connect (NECEC).

¹ CER Application No. C01914.

It is clear that this Project should be designated by Cabinet to ensure there is a proper review. Prior breaches of the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP) with respect to the CFGS must be addressed in order for this project to be in the public interest.

As you are aware, the CFGS was built, without Innu consent, on Innu lands. This territory is a key part of the Innu of Labrador's land claim that was accepted for negotiation by Canada in the 1980s, and the Innu of Labrador have never given up their aboriginal rights and title to it.

The CFGS has caused untold and ongoing damage to the Innu of Labrador's territory and way of life. Hydro-Québec – which played a critical role in the design and construction of the CFGS and takes most of the electricity generated by that facility – has made no effort to compensate the Innu for those damages. The Innu continue to live every day with the legacy of environmental degradation and damage caused by the CFGS. Meanwhile, Hydro-Québec continues to reap extraordinary profits from that project (estimated at up to \$80 billion to date).

Hydro-Québec's breach of UNDRIP

The construction and operation of the CFGS has breached, and continues to breach, a number of the Innu's rights under UNDRIP, which the Project will only facilitate, e.g.:

- The Innu were deprived of lands they traditionally owned by the construction of the CFGS. Hydro-Québec therefore breached the Innu's rights under Article 26 to the lands and resources in their territory;²
- The CFGS destroyed wildlife, plant and fish species, and other resources on which the Innu have historically relied. The Innu were therefore deprived of the productive capacity of lands on which they have traditionally relied, contrary to their rights under Article 29; ³
- Innu lands were taken and used for the construction of the CFGS without their input, and certainly without their free, prior, and informed consent. Hydro-Québec therefore breached Innu rights under Article 32;⁴
- The Innu have not received restitution or just, fair, and equitable compensation from Hydro-Québec for the lands taken from them for the construction and operation of the CFGS. The negative effects of these breaches are felt every day by the Innu. The harms persist. By not providing compensation, Hydro-Québec has breached the Innu rights under Article 28.⁵

Allowing the Project to proceed while UNDRIP breaches remain unaddressed is not in the public interest.

² United Nations Declaration on the Rights of Indigenous Peoples, Resolution adopted by the General Assembly on 13 September 2007, A/61/L.67 and Add.1), available <u>here</u>, p. 19

³ United Nations Declaration on the Rights of Indigenous Peoples, Resolution adopted by the General Assembly on 13 September 2007, A/61/L.67 and Add.1), available <u>here</u>, p. 21

⁴ United Nations Declaration on the Rights of Indigenous Peoples, Resolution adopted by the General Assembly on 13 September 2007, A/61/L.67 and Add.1), available <u>here</u>, p. 23

⁵ United Nations Declaration on the Rights of Indigenous Peoples, Resolution adopted by the General Assembly on 13 September 2007, A/61/L.67 and Add.1), available <u>here</u>, p. 20

The Governor in Council must designate the Project under s. 258(1) of the *Canada Energy Regulator* Act.

We ask Cabinet to issue an order under s. 258(1)(a) of the *Canada Energy Regulator Act* designating the Project as an international power line that is to be constructed and operated in accordance with a certificate issued under s. 262(a) of that Act. Our view is that this process is more consistent with the requirement of UNDRIP and your government's commitment to reconciliation.

The certificate process, and the requirement for Cabinet approval, will allow for a more robust consideration of the concerns regarding UNDRIP.

Conclusion

Granting Hydro-Québec's permit application will give it new ways to profit from the CFGS, while continuing to shirk its responsibility for the CFGS' impacts on the Innu. The Innu Nation therefore appeals to you and the Governor-in-Council to take reasonable steps to ensure that the matter is fairly considered and addressed.

Nin,

Grand Chief Etienne Rich

Deputy Grand Chief Mary Ann Nui

CC: The Hon. Seamus O'Regan, P.C., M.P., Minister of Natural Resources Ms. Katie Telford, Chief of Staff to Prime Minister Justin Trudeau, Government of Canada Nancy Kleer, Partner, Olthuis Kleer Townshend LLP


www.innu.ca

□ Box 186 Natuashish, NL AOP 1A0 T 709 478 8943 F 709 478 8833
 □ Box 119 Sheshatshiu, NL AOP 1M0 T 709 497 8398 F 709 497 8396
 □ Box 1106 Stn C, Goose Bay, NL AOP 1C0 T 709 896 3883 F 709 896 1180

March 30, 2021

Mr. Adrian Saenz Deputy Director Office of Public Engagement The White House 1600 Pennsylvania Avenue Washington DC 20500

BY EMAIL: Adrian.Saenz@who.eop.gov

Dear Deputy Director,

RE: Presidential Permit for New England Clean Energy Connect

We represent the Innu Nation and we are writing to express our legitimate concerns about the unethical nature of a Hydro-Québec hydroelectricity export project to the United States, with our hope that your Administration will intervene.

The project, known as the New England Clean Energy Connect (NECEC) project, involves the building of a 145-mile, 1,200 MW HVDC transmission line from the Quebec border to Lewiston, Maine, where it will connect to the existing New England electrical grid and be directed to Massachusetts. About onesixth of the electricity being supplied by Hydro-Québec will be generated by the Churchill Falls Generating Station, which is located on Innu Nation territory in Labrador.

On April 13, 2020, the Innu Nation submitted official comments about the March 13, 2020, Draft Order issued by the Maine Department of Environmental Protection (the "Department") concerning the NECEC project. A copy of this document is appended to this letter.

In these comments, we explain our grievances against Hydro-Québec, which has never compensated us for the extensive damages caused to our traditional territory by the damming of the Churchill River to build the Churchill Falls Generating Station – damages that destroyed our hunting grounds, gathering places, livelihood, and way of life.

On October 6, 2020, we filed a \$4 billion claim against Hydro-Québec in the Supreme Court of Newfoundland and Labrador as compensation for the illegal taking of our land to build the Churchill Falls Generating Station and for the harm it caused to our people.

We also stated that the NECEC project should not be permitted unless the Department imposes a condition that states: "Prior to the start of construction, the applicant must submit to the Department documentation of permission to use Innu Territory that includes the signature of a duly authorized representative of the Innu Nation."

Despite the numerous environmental, economic and ethical objections raised against the NECEC project, the US Department of Energy (the "DOE") issued a Presidential Permit for the project on January 15, 2021, just one day after the DOE's Office of Electricity released its environmental assessment of the project. This left many stakeholder groups, including a coalition of Innu, Atikamekw and Anishnabeg First Nations from the province of Quebec, without the opportunity to have their concerns addressed and their questions answered.

Hydro-Québec and its sole owner, the Quebec government, have been violating the rights of First Nations for several decades. The United States should seriously reconsider whether it wants to source its energy from a company that pretends to offer green electricity while it reaps billions of dollars in profits at the expense of the First Nations whose lands it exploits.

With these concerns in mind, we are strongly urging the DOE to set aside the Presidential Permit issued for the NECEC project and to conduct a comprehensive impact study, including considerations identified in Sections 101 and 102(2)(F) of the National Environmental Policy Act. This would allow the DOE to acquire a more complete and balanced perspective about the violation of our rights by Hydro-Québec and the Quebec Government before it considers issuing a new Presidential Permit.

If you would like more information about our grievances against Hydro-Québec, we invite you to consult the appended document (official comments submitted by the Innu Nation to the Maine Department of Environmental Protection on April 13, 2020).

We would welcome the opportunity to meet with you to discuss this matter in further detail.

In the meantime, we sincerely thank you for your time and your consideration and look forward to your reply to our correspondence.

Nin,

Grand Chief Etienne Rich

Deputy Grand Chief Mary Ann Nui

CC: The Right Honourable Justin Trudeau, P.C., M.P., Prime Minister of Canada Nancy Kleer, Partner, Olthuis Kleer Townshend LLP

UNITED STATES INTERNATIONAL TRADE COMMISSION INVESTIGATION NO. 332-574



PART I of III

August 14, 2020 Final Submittal of North American Megadam Resistance Alliance

Exhibit 1: Petition to United States Governors and New York City Mayor from Canadian communities impacted by hydropower development and signatures from Indigenous community members and allies

Exhibit 2: *Penobscot Tribe Comments* on U.S. Army Corps of Engineers Review of NECEC Hydropower Transmission Corridor

Exhibit 3: Innu Nation Comments with Supporting Documents on NECEC Hydropower Transmission Corridor

Exhibit 4: Letter to the Editor, The Altamont Enterprise, August 12, 2020: CHPE electricity would not be safe, clean or renewable



Reject Canadian hydropower!

GOVERNORS ANDREW CUOMO (NEW YORK), JANET MILLS (MAINE), CHARLIE BAKER (MASSACHUSETTS), GAVIN NEWSOM, (CALIFORNIA), BRAD LITTLE (IDAHO), JAY INSLEE (WASHINGTON), KATE BROWN (OREGON), AND MAYOR BILL DEBLASIO (NEW YORK CITY)



We are people directly impacted by Canadian hydropower

266 Signatures Collected Only 134 more until our goal of 400 SIGN THIS PETITION Welcome back. North American! Not North American? Click here. Comments

> ADD YOUR NAME

development in our communities.

We ask you to: reject Canadian hydropower and new dams and stop all proposed transmission lines to import Canadian hydropower to the United States!

- Canada's hydropower development is part of the country's shameful legacy of 450 years of colonialism. Aboriginal people were removed from their ancestral lands and government laws sought to erase our ways of life and traditions. Today the hydropower industry continues to push forward with megadams over local protests and resistance.
- Most of Canada's hydropower development has occurred on ancestral Aboriginal lands without our consent.
 Conflicts between Aboriginal communities and the Canadian hydropower industry continue today, destroying and dividing the social fabric of our communities.
- Many of us lack access to clean drinking water because our water supplies have been destroyed and contaminated by hydropower development.

You may receive updates from North American Megadam Resistance Alliance (NAMRA), the creator of this petition.

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- Many of our communities are impoverished, lack access to health care and modern communication and suffer from the trauma of seeing our traditional lands and communities destroyed by hydropower development.
- Canadian hydropower is not clean, green or renewable. In addition to destroying our communities and ways of life, Canadian hydropower destroys vast areas of forest, rivers and wetlands. The dams poison the environment and traditional food supplies with methylmercury.
- Massachusetts has a contract to buy Canadian hydropower for a transmission corridor through Maine.
 New York City is considering a purchase contract and a corridor from Canada.
- More new corridors are planned and new dams are being built to supply electricity to Boston, New York and Minnesota.

We urge you to visit our communities to see for yourself what 60 years of reckless hydropower development has done to our Northern communities.

This destruction will continue unless you stop buying this dirty energy. You are responsible for our suffering.

Please stop buying Canadian hydropower!

Note:

This petition as modified on July 7, 2020 to include Governors Gavin Newsom, (California), Brad Little (Idaho), Jay Inslee (Washington), Kate Brown (Oregon).

PETITION BY



NORTH AMERICAN MEGADAM RESISTANCE ALLIANCE (NAMRA) Lyme, New Hampshire

To: Governors Andrew Cuomo (New York), Janet Mills (Maine), Charlie Baker (Massachusetts), Gavin Newsom, (California), Brad Little (Idaho), Jay Inslee (Washington), Kate Brown (Oregon), and Mayor Bill DeBlasio (New York City) From: North American Megadam Resistance Alliance (NAMRA)

Reject Canadian hydropower and new dams. Stop all transmission lines to import Canadian hydropower to the United States.

We are people directly impacted by Canadian hydropower development for over 60 years. We suffer great harm from this energy development. It is not clean or green.

Canada's hydropower development is part of the country's shameful legacy of 450 years of colonialism. Aboriginal people were removed from their ancestral lands and government laws sought to erase our ways of life and traditions. Today the hydropower industry continues to push forward with megadams over local protests and resistance.

Most of Canada's hydropower development has occurred on ancestral Aboriginal lands without our consent. Conflicts between Aboriginal communities and the Canadian hydropower industry continue today, destroying and dividing the social fabric of our communities.

Many of us lack access to clean drinking water because our water supplies have been destroyed by hydropower development.

Many of our communities are impoverished, lack access to health care and modern communication and suffer from the trauma of seeing our traditional lands and communities destroyed by hydropower development.

Canadian hydropower is not clean, green or renewable. In addition to destroying our communities and ways of life, Canadian hydropower destroys vast areas of forest, rivers and wetlands. The dams poison the environment and traditional food supplies with methylmercury.

Massachusetts has a contract to buy Canadian hydropower for a transmission corridor through Maine. New York is considering a corridor from Canada to New York City. Other corridors are planned. New dams are under construction in Canada to supply Boston, New York and cities in Minnesota. We urge you to visit our communities to see for yourself what 60 years of reckless hydropower development has done to our Northern communities. This destruction will continue unless you stop buying this dirty energy. You are responsible for our suffering. Please stop buying Canadian hydropower.

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Full documentation, knowledge base, and tutorial videos are available here.

GET IN TOUCH

Send us an email with your name and your message at **support@actionnetwork.org** and we'll get back to you as soon as possible.

WANT TO PARTNER WITH US?

						nyalo inpactor i catori report
First name	Last name	Email	City	State	Country	Comments
Stephen	Crowley	steve.crowley1@gmail.com			us	
Rita	monias	rfrossmonias@hotmail.com			CA	we do not need anymore environmental damage, we have alternative energy. Hydro electric dams (projects) are not clean, green, nor are the renevable.
Rita	Renefiel	rebofi@omail.com		Newfoundland and Labrador	CA	we do not need anymore environmental damage, we have attemative energy, Hydro exectine dama projects are not clean, green, nor are not energian. Hydro exectine dama projects are not clean, green, nor are not energiand and the second and the second and the second and the second area and the second and the second area area.
Willa	Parrott	willow_bee@hotmail.com			CA	dams on the new million to say - enough is enough
Ken	Boon	chinookloghomes@xplornet.com			CA	
Julie	Caswell	crashwe11@yahoo.com			US	No CMP Corridor-it is shovel ready through VT or send it into MA through NY. We don't want our woods destroyed- Keep Spain out of Maine!!!
Donna	Mendelsohn	devoncat84@gmail.com			US	Above and beyond the immeasurable direct damages to local life, human and otherwise, present and future, mega dams are now recognized as immense long term liabilities to the public at large on multiple levels. For such
Mike	Gildersleeve	mgdiverse@hotmail.com	Mission	British Columbia	CA	
Peter	Abrams	peter.abrams@utoronto.ca			CA	
F	D	fmdietz@vcn.bc.ca	Vancouver	British Columbia	CA	It seems like Mega projects of any kind bring along with them much destruction to local environment and society. I'm always amazed that Economy ignores these two facets. Without good environment and good social cont
Holly	Wells	wellshollym@yahoo.com			US	
Tracey	Doherty	dohertyt1014@gmail.com			US	Living in Labrador next to Muskrat Falls dam fiasco. Let the rivers run!!
Elaine	Davidson	elaine.y.davidson@gmail.com		Publish Calumbia	US	
Susan	Daniels	swestwgcable.com		British Columbia	CA	
onery	Cantola	shewitt@coa.edu			US	
Dawn	Boon	dawnmboon@gmail.com			CA	I wholeheartedly agree with the petition to reject Canadian hydropower. I, as a Canadian see the overall negative impact of hydro dams. There are many more productive, efficient power sources available to your nation, in yo
						I wish my country Canada, would also turn away from hydro power
Adrienne	Peacock	apeacock@telus.net	Anmore	British Columbia	CA	There is nothing "green" about mega dams. Small scale local renewables are the way of the future.
Jeremy	McElfresh	i.mcelfres@gmail.com			US	It's obvious that Mainers don't want this.
Heather	Rumancik	hir/448mun.ca			CA	The Dense Direc Miller is scheduled to be Booded for fraction unster and policial searces. Two ware will have to my for the Sile C dam for decoder. For what? There have done are not not of the future
Stan	Turner	z1turner@vahoo.ca		Alberta	CA	The reserved very server and should not be allowed in a civilized country.
Melanie	JacquesStaats	vicbogfamily@gmail.com	North Concord	Vermont	US	
Rebecca	Kingdon	rebeccarkingdon@gmail.com		Manitoba	CA	
Emily	Unger	ehunger@mymts.net			CA	
Ann	Roberts	mainemiss100@gmail.com			US	Power from Megadams leaves behind a trail of horrific destruction on many levelsplease educate yourselves.
Mathew	Sepp	matscammelWgmail.com		1	CA	
Solance	Garson	sloarson@omail.com			CA	My community suffered when these hydro dams were build, they promised jobs, homes and businesses when they know these commit lawaves and consultants walked saw with hundred of millious of dollars, they and and an an
Carren	Dujela	carren@telus.net	Saanich	British Columbia	CA	men very serve very very very very very very very
Thomas	Gaffney	brokenfeather8@yahoo.com			US	
Rita	monias	rfrossmonias@hotmail.com			CA	land and water protection needed. Helping by signing the petition.
Rachel	Atkins	rachelcatkins@gmail.com	Richmond	Vermont	US	
Rachel	Atkins	rachelcatkins@gmail.com	Richmond	Vermont	US	
Damon	Hines	damonhines56@gmail.com			CA	
Don	vangerburgh Rosenkranz	uswanger roogmail.com		Manitoba	CA	Canadian Generate Machines.
Calvin	Spence	calvinspence087@gmail.com			CA	Constant of the constant and the constant of t
Lizzie	Jekanowski	lizzie.jek@gmail.com			US	
Joan	Saxe	joansaxe@gmail.com	Freeport	Maine	US	Keep the dollars in the US
Peter	Kerr	pkerr@uniserve.com	Kelowna	British Columbia	CA	
Daniel	Hyde	tonkahyde@gmail.com			US	
Cariton	Richards	carltonsmusik10@gmail.com			CA	From my many years of cleaning up the debris along the shores where hydro dams are located, i have seen things i shouldnt have, arimals floating on water because of the pollution caused by hydro dams, waters are not s
Lindsay	Brown	lindsaybrownian@gmail.com	Vancouver	British Columbia	CA	Our Canadian hydropower & NOT GHEEM it's direct more destructive and more expensive than cleaner alternatives (it's corporate welfare for big engineering limits and investors), and is violating rights across this country. D
April	Thomas	secweperncorassroots@hotmail.com			CA	Pejeu canazian nyoropowen non communities impacted by nyoropowen and canazia's regary or coloniaism.
Sandee	Tranfield	sednaspirit@yahoo.com			CA	
Laura	Oochoo	Laura00ch00@gmail.com			CA	#WaterisLife
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Erin	Gibbs	kazzycatkaz@gmail.com			CA	
George A M	Smith	georgesmith@telus.net		British Columbia	CA	
Jackie	Larkin	jlarkin@gddc.com	Metchosin	British Columbia	CA	
JoAnne	Jarvis	iojarmur@gmail.com			CA	
Mike	Gildersleeve	mgdiverse@hotmail.com	Mirrion	British Columbia	CA	
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Mane Mane Heidey Listen Cristen Cristen Cristen Arienes Arienes Pare Pare Pare Pare Pare Pare Pare Pare	Gildersleve Gildersleve Sosti Cabraa Cabraa Hooppor Shada Paacad Wang Paacad Nada Beck Wang Sockang Haland Hahard	Dadarszafilozosásbar al. Dadarszafilozosásbar al. Szározosásbar al. ELISZZBAL com citosobarszek filosol (Jacobarszek filosol Usahosákan al. Szárosásbar S	Masion Masion Vancouver Annore Vancouver Vancouver Vancouver Vancouver	Britsh Columbia Britsh Columbia Britsh Columbia Britsh Columbia Britsh Columbia Britsh Columbia Britsh Columbia Marie Marie Marie	CA CA US US US US CA US US US US US US US US US US	Hydo devisionment has taken over where the federal government and residential schools left off. Our water is in derivable, our fish are dying. The validie cannot keep up with the fluctuation of the valees and our islands are disappearing. We don't need any more damd Electicity from megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. The validie cannot keep up with the fluctuation of the valees and our islands are disappearing. We don't need any more damd Electicity from megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. Electicity from megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. Electicity from megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. Electicity from megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. Electicity from megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. Electicity from megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. Electicity form megadams is containly not clean, green or meneable, unlike the apricultural/forested land they obliterate. Electicity form megadams is containly not clean they obliterate the apricultural forested or years until it's done and then everybody who has worked to hand will lose jobs. We will lose acres and acres of land for Elege scale corporate hydro in stolen land len't green or clean Electicity form meneable detrimental to all involved Electicity form method for the scale for the scale fore and will deterate th
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Mane Mane Herdey John Cristma Cristma John Cristma Herdey Mane Mane Mane Mane Mane Mane Mane Mane	Glidersleve Glidersleve Sotti Gonzalez Cabrea Hoepport Shinda Deacot Nakay Hoeport Sottama Sottama Hosh Sottama Hosh Sottama Sottama Hosh Sottama Sottama Hosh Sottama Sottama Hosh Sottama Sottama Hosh Sottama Sottama Hosh Sottama Sottama Sottama Hosh Sottama Sot	makinaselhatnai cam hatay, acata in a sub- ELB323kai com erina taranghigmal com intra taranghigmal com intra taranghigmal com intra taranghigmal com intra taranghigmal com taranghigmal	Masion Masion Vancouver Va	Britsh Columbia Miaria Maria	CA GA US US CA CA CA CA CA US US CA US US US US CA US US US CA CA CA CA CA CA CA CA CA CA	Hydo devisionment has taken over where the fielderal government and residential schools lift off. Our water is in derivable, our fish are dying. The wildfie cancol keep up with the fluctuation of the waters and our islands are disappearing. We don't need any more damd Electicity from megadams is certainly not clean, green or menerable, unlike the apicultural/forested land they dollterate. The school control of the waters and our islands are disappearing. The school control of the waters and our islands are disappearing. We don't need any more damd Electicity from megadams is certainly not clean, green or menerable, unlike the apicultural/forested land they dollterate. The school control of the waters are or or researche, unlike the apicultural/forested land they dollterate. The is not necessary or wanted by so many of us! You say it will benefit us which it will. For a couple of years until it's done and then everybody whe has worked so hard will cas jobs. We will cose acres and acres of land for Large scale coporate hysis on stolen land int't green or clean Large scale coporate hysis on stolen land int't green or clean Dams are extremely detirmental to all involved
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Mane Mane Herdey John Cristma Cristma Cristma Herdey Arisenso Herdey Mane Herdey Herde	Gildersleve Gildersleve Sotti Cabraa Labraa Hoeppor Sokota Paacok Sokota Mag Paacok Mag Mag Mag Sokota Sokota Sokota Holmon Sokota Mag Sokota Sokota Sokota Mag Mag Mag Mag Mag Mag Mag Mag Mag Ma	makenselhekensi ann hakey acatalisensi kensi kensi katalisensi kensi kensi kensi katalisensi kensi kensi kensi kensi kensi kensi hakea kensi kensi hakea kensi kensi hakea kensi kensi hakea kensi kensi hakea kensi kensi hakea kensi hak	Masion Masion Vancouver Va	Britsh Columbia Marine Marine Marine Marine Marine Marine	CA GA US US CA CA CA CA CA CA CA CA CA CA	hydro development has talen over where the federal government and residential schools list eff. Our water is in driviable, our fah are dying. The wielding carron been up with the fluctuation of the waters and our islands are disappearing. We don't need any more dama Development is certainly not clean, green or reneweable, unlike the apricultural/forested land they dollanate. The school hydro mangedams is certainly not clean, green or reneweable, unlike the apricultural/forested land they dollanate. The school hydro on subtract by to many of us! You say it will benefit us which it will. For a couple of years well it's done and then everybody who has worked to hard will lose jobs. We will lose acress and acres of land for Large acale corporate hydro on stolen land int't green or clean Dems are externely definitential to all involved We do to much better by budding realiset local networks of definituated solar and wind, storage, microgrids. Invest in or US economy, not the destroying magahydro. Carradian magadam hydrogover projects are highly definituated solar and wind, storage, microgrids. Invest in or US economy, not the destroying magahydro. Carradian magadam hydrogover projects are highly definituated solar and wind, storage, microgrids. Invest in or US economy, not the destroying magahydro. Carradian magadam hydrogover projects are highly definituated solar and wind, storage, microgrids. Invest in or US economy, not the destroying magahydro. Carradian magadam hydrogover projects are highly definituated solar and wind, storage, microgrids. Invest in or US economy, not the destroying magahydro. Carradian magadam hydrogover projects are highly definituated as and and wind, storage, microgrids. Invest in or US economy, not the destroying magahydro. Carradian magadam hydrogover projects are highly definituated as and wind, storage, microgrids. Invest in or US economy, not the destroying magahydro. Carradian magadam hydrogover projects are highly definituated as and wind, storage, microgrids and harmal affects pin

Taylor	Galvin	tgalvin666@gmail.com			CA	
Zara	Syed	zaraixx@gmail.com			GB	
Thamer	Linklater	thamer.mager@gmail.com			CA	
Sandy	Greenberg	Greenberg.sandy@gmail.com	Marta a	Distant and	CA	
Апра	Dagenair Quertin	a dolihotmail.com	Mission	British Columbia	CA	
Kawni	Saric	kawni97@hotmail.com			CA	Fuck hydro, flooded m/ land and we had to relocate
George	Jackman	GJackman@riverkeeper.org			US	
George	Jackman	GJackman@riverkeeper.org			US	
Sara	Gronim	sgronim@erols.com			US	
Michael	Parrella	parrelia00@gmail.com			US	
Kassie	Kometani	kassandrakometani@gmail.com			US	
Jonn	Massan	jonnmodes/solegmail.com			CA	Inanes
Jean	Stewart	ieanmcohail@omail.com			US	
Sharon	Abreu	sharmuse@gmail.com			US	Back when I was a Trade Union delegate to the U.N. Commission on Sustainable Development, interfacing with the Energy Caucus, I became aware of how destructive hydropower is. I learned that, although it is generally co
Sarah	Snelling	sasnelling@gmail.com			CA	
Ann	Rogers	c.ann.rogers@shaw.ca			CA	
Carleton	Estes	Carletonestes@gmail.com			US	
Carleton	Estes	Carletonestes@gmail.com	Nesthern Deckir	Publish Columbia	US	No emp corridor
Kirsten	Pedersen	k pedersen85@hotmail.com	Norment Hockle	British Columbia	CA	Stop Site C. Scoper the better
Angela	Hollaus	ahollaus#omail.com			CA	Coenting without consent!
Emma	Darling	emma2323@hotmail.com			CA	V5T 3X2
Stuart	Macdonald	stuartmacdonaldca@gmail.com			CA	The site is also being constructed on grounds deemed unsuitable by geotechnical surveys which will in future be subject to ground shifts and thus danger to those living downstream.
Laura	Simocko	laura.simocko@gmail.com			US	
Gertrude	Kent	kentgert@gmail.com			US	Electricity that comes from mega dams, that distroy natural habitats, is not clean energy
Rusty	Garrioch	rustygarrioch084/icloud.com			CA	
Nakeisha	McDonald	morningstarm@outlook.com			CA	
Romola	Thumbadoo	romolavt@gmail.com			CA	Late Indigenous Elder William Commanda and Circle of All Nations have been petitioning for this formally since 2007 - consistent with the LAWS OF NATURE
Rose	LaBillois	abilois13@hotmail.com			CA	
John	Gonzalez	standingbearnetwork@gmail.com			US	Hydroelectric contributes to the cultural genocide of indigenous people
Valerie	Clark	wolfssong2004@aol.com			US	
Jody	Beatty	jodybeatty55@gmail.com			US	Our resources need to be protected!
Joay Joseph Ir	Wawatie	chipipishech@hotmail.com			CA	Cur resources reput ou protected:
Pamela	Schreiner	PamelaSchreiner@omail.com			GA	Water from loss and view set of the definition
Cliff	Dano	cliffdano23@gmail.com			CA	e encourse and a grant and a
Betty	Carpick	carpick.betty@gmail.com			CA	
Peggy	Beck	pegbeck2001@yahoo.com			US	
Crystal	Moore	cm7_25@hotmail.com			CA	
Ann	Ross	annmross79@hotmail.com			CA	I remember as a little girl swimming down the bank where I grew up in Cross Lake Manitoba. The water looked clean and ok. I can't imagine how at one time my granny told me the waters were so clear you can see the botto
Kelly	Janz	ksjanz@gmail.com		Publish Calumbia	CA	STOR OTE C
delores	smith	wopework@amail.com	North Vancouve	British Columbia	CA	stor site
Deb	Bermudes	bermudes@verizon.net	Terrar vancouve		US	Not clean or green!!!
Tom	Rankin	t2ieb@hotmail.com			CA	Your assistance in helping Canada move faster to truly renewable energy is appreciated. Covering forests and arable land with water is not renewable.
Laura	Fellows	laura_derry@hotmail.com			GB	
Jaxon	morgan	jaxonmorgan@gmail.com			US	no blood megawatts for US
Conlee	Burnett	conleeburnett@gmail.com			CA	
Isaiah	Johnson	icixxx@yahoo.com			US	
Janet	Molvor	mcivorjanet@yahoo.ca d saunder:7428btinternat.com			GR	
Jo-Anne	Harvey	rapunzel8441@gmail.com			CA	
James	Miles	injuneering@yahoo.ca			CA	If you're planning on descerating First Nations land you better check with them first
James	Miles	injuneering@yahoo.ca			CA	How about we run a pipeline through your Arlington cemetery that works for me
Louise	Garvin	lougarvin@shaw.ca	Vancouver	British Columbia	CA	
Katherine	Maas	katherine@kjmaas.com			CA	
Cindy	Bradley	zekothedawg@gmail.com			CA	
Lance	Harrison	harrisonlance84/gmail.com			CA	
Jillian	Putton	etutonatelus.net iiliansemid®amail.com			CA	
Michael	Penton	mikedo 879hotmail.com			CA	
Anita	Squire	anitadsquire@gmail.com			CA	
Katherine	Maas	katherine@kjmaas.com			CA	
Debra	Ellers	debra4stuff@gmail.com			US	
Maria	Mendes	memendes@hotmail.com			US	I support this petition. Hydropower is not green. Solar and wind are far better!
David	Fort	twintwa@hotmail.com	Verener	Publish Calumbia	CA	Stee Ste A
Juliet	nonask	iponask988botmail.com	vancouver	British Columbia	CA	sup site U.
Ann	Roberts	ann@theinsurancesourceofmaine.com			us	I am 200% behind this effort after finally opening my eyes to the horrific destruction of peoples, wildlife, land and life itself these Mega Dams cause.
Nellie	Diaz	pelliediazemail@gmail.com			US	
sharon	hughes	sharjh@shaw.ca	Saanich	British Columbia	CA	
George	Serhan	save a cowboy@yahoo.ca			CA	
Anita	Bruno	b.nyce550@gmail.com			US	
Nina	Sarmiento	nsamie28gmail.com			us US	As a marke reauteix reject dis comportor transmission into mass. Hidropower is NOT clean energy.
Darryl	Wood	darryl@leapcommunity.org			US	
Lee	Nicoloff	Inicolof1@gmail.com			US	
Randall	Jones	randyj49er@gmail.com			us	I am a retired CMP employee and it sickens me to see how low they have slid lately! I am vehemently opposed to the proposed corridor!
E. Jorce	Beardy	itheardy@hotmail.com			CA	Our family is directly impacted by budyn development, our family camp is in the midst of keecask dam
Penny	Joy	joy_penny@hotmail.com			CA	No new lydo dams are needed. There are enough.
Penny	Joy	joy penny@hotmail.com			CA	No new hydro dams are needed. There are enough.
susan	Hathaway	susangailhathaway@gmail.com			US	
Tracy	Miller	tracy miller@alumni.brown.edu			US	Large hydro projects are not "clean" energythey cause too much damage.
Kimberly	HOSS	sumperlyvandall@gmail.com			GA	
Heather	Beardy	heatherbeardy@gmail.com			CA	Nenga riyuru wan pensun:
Nellie	Ross	pellie.ross204@omail.com			CA	I'm signing the petition to stop hydro in destroying our beautiful Canadian lands and lakes. Too much damage has been done already ?
Jeffrey	Stone	stoneman7369@yahoo.com			US	Why is the a discrepancy in NY vs. the hydropower corridor proposed for Maine as an extension cord for MA??
						Hydroelectric power IS NOT GREEN POWER. I respectfully request the you rescind your endorsement of the NECEC project proposed to pass from Canada through the largest section of unsegmented forest East of the Missi
						Sincerely,
Mike	Gildersleeve	mgdiverse@hotmail.com	Mission	British Columbia	CA	
Lauren	Tierno	lauren.tierno@gmail.com			US	
Lisa	HART	.currier@outlook.com			CA	Canada's hydropower development is part of the country's shameful legacy of 450 years of colonialism. Aboriginal people were removed from their ancestral lands and government laws sought to erase our ways of life and tr
						Most of Canada's hydropower development has occurred on ancestral Aboriginal lands without our consent. Conflicts between Aboriginal communities and the Canadian hydropower industry continue today, destroying and
						Many of us lack access to clean drinking water because our water supplies have been destroyed and contaminated by hydropower development.
Candida	Monias	moniascandida03@gmail.com			CA	I'm in full support!
Sandra	Ross	Sandraross1764@gmail.com			CA	Cross Lake Mb
Sandra	Ross	Sandraross1764@gmail.com			CA	Cross Lake Mb
Rob	John	bobbarino1_4@hotmail.com			CA	Cease and Desist
David	Bighetty	uavu29myuch.ca david28myuch.ca			CA	
David	Bighetty	david2@myucn.ca			CA	

David	Bighetty	david2@myucn.ca			CA	
Jimmy	Muskego	muskegojimmy@gmail.com			CA	
Nancy	Pittman	njoypitt@gail.com			CA	I sure hope this doesant happening good for our waters
Nancy	Pittman	njoypitt@gail.com			CA	I sure hope this doesant happening good for our waters
Donna	Rose	spiritedrose@gmail.com			CA	It is time to develop clean sources of energy and to protect the environment, wildlife, and all people
Robert	Baker	bobwbaker@outlook.com			CA	Dams are poorly thought out. There has been so many improvements in electrical components and efficiencies that massive hydro dams are both an obsolete design and a determined effort to disrupt a river system. The inte
Jeff	Watts	mrcade@maine.rr.com			US	
Peter	Gehrels	ppddlr@hotmail.com			CA	This is not green power, it's greed power.
Llewelyn	Pritchard	llewelynpritchard@gmail.com	Churchover	Warwickshire	GB	
Allyson	Vollmer	allysonvollmer@gmail.com			CA	
Stephanie	Torres	stephanielivingcod@gmail.com			US	I stand with our indigenous peoples
Stephanie	Torres	stephanielivingood@gmail.com			US	
Johanna	Gonzalez	joannab363@gmail.com			US	
Margyt	Dowzer	dowzer@maine.rr.com			US	Hydropower is not "clean".
Susan	Hopkins	susanhopkinsesg@gmail.com			US	
Isaiah	Johnson	icjxxx@yahoo.com			US	Hydropower is NOT clean or green.
Cristina	Cabrera	criscabreraeph@gmail.com			US	
Mary	McNamara	mmcnamara362@yahoo.com			US	Figure it out and make hydroelectric Dame safer
Joan	Lemmers	loslemmers@gmail.com			CA	WATER IS LIFE !
Mike	Gildersleeve	mgdiverse@hotmail.com	Mission	British Columbia	CA	
Levi	Nelitz	mattertransition@yahoo.com			CA	
Evelyn	Hunter	evyduty1@shaw.ca			CA	
Arnold	Evans	amoldevans66@hotmail.com			CA	
Aileen	Joachim-L'Etoile	lunarscapegardens@gmail.com			US	
Fawn	Warawa	fawn.indian@gmail.com			CA	
Deborah	Spencer	dspencer21661@gmail.com	Billerica	Massachusetts	US	
Wendy	Dee	scarletstarlet815@gmail.com			US	
Marie	Schopac	mschopac@gmail.com			US	
Lauren	Niedel	Iniedel@gmail.com			US	
Debra	Johnson	debrastartech@gmail.com			US	
Susan	Allen	su.allen50@gmail.com			US	
Victori	Boyd	nugua53@hotmail.com			US	
Peter	Mackie	ramstone1@shaw.ca			CA	
Susan	Bibbings	suebibs@gmail.com			CA	
Lisa	Savage	Isavage3@gmail.com			US	
Karen	Graham	keg.graham@hotmail.com			CA	
Laura	Simpson	babyjayden1956@gmail.ca			CA	
Kirsten	Pedersen	k_pedersen85@hotmail.com		British Columbia	CA	
Stephen	Chessor	schessor@hotmail.com			CA	
Karen	Bell	karbear38420@gmail.com			US	
Harmony	Eshkakwogan	eharmony994@gmail.com			CA	
John	Wheatcroft	johnwcw@shaw.ca	Langford	British Columbia	CA	Some of the dirtiest energy in the world will be created with the new Site c dam in B.C. Thousands of acres of farmland & wildlife habitat will be destroyed along with the pollution of 80 miles of the beautiful Peace River. They
Bruce	Bishoff	bbishoff2@gmail.com			US	
Paula	Hil	hope4us56@yahoo.com			US	
candy	warmuth	cheshire572@mail.com			US	
Fiona	Hoey	fionahoey@shaw.ca			CA	
Carol	Warren	warrenc52@yahoo.com			US	
Peggy	Beck	pegbeck2001@yahoo.com			US	This dam and the corridor is very destructive , to the people , the land , the animals and air . To promote the dam and corridor , has nothing to do with making Mainers life better . And everything to do with lining the pockets of
Caitlin	Wiens	caitinww@gmail.com			CA	Down with capitalist abuse of people and the environment
Paula	Denissen	fishden0117@yahoo.com			US	
Jason	Murphy	j.j.murph@hotmail.com			US	
France	Lepage	flepage1969@hotmail.com			CA	
Stephen	Osmond	kidcumminsblue@yahoo.com			US	It targets the Inuit and their land so I am signing this petition.
Cindy	Bradley	zekothedawg@gmail.com			CA	
Grace	Alexander	ib14621@yahoo.com			CA	Time to start using alternative energyGreen Energy. We don't need to use hydro any longer. And, YOU All know what adverse affects it has.
Jennifer	Scholefield	kitten 411@hotmail.com			CA	
Tori	Cress	torianncress@gmail.com			CA	

hydropower development has done to our Northern communities. estruction will contine This destruction will continue unless you stop buying this dirty energy. You are responsible for our suffering. Please stop buying Canadian Sarah Jaan Monias Email P& Box 866 Cross Lake, Mb. Email PO Box 866 Cross LAKE, MB WILF-RED MONIAS Email Kuntswaggen@hotmail.com Kennymuswagon Judy Blausnith Email por leed 074 @gmail.com bra Blacksmith Email PO Box, 493 Crosshake Email PO BOX 576 Crosslake M.B. rleenBlacksmith Email PO BOX 493 Cross Lake Olie BlackSmith Jary annow Email D.C. Box 65 Cruss Luch Athia A. Monias Email P.O. Box 65 Cross Lake Email P.O., Box 65 Cross Lake M stationias Fred Richard Jo Email P.O Box 25 11 Email P.O. Box 507 Cross L ndan Ress erion Monias Email P.J. Box 65 CrossLat

We urge you to visit our communities to see for yourself what on hydropower development to see for yourself what on nydropower development has done to our Northern commenced. This destruction will continue unless you stop buying this dirty energy. You are responsible for our suffering. Please stop buying Canadian Email Cross Lake Mb. 1157 po box Robejo hydropower! Name Aiden Umpherville Email @ miguel_ monias@ootlook.c Name MAPCOL WORKAZ Email CROSS Lake, MANITOBA. Email Woodshawra @ Gmael. Ca Name Shawna Wood Email Cross Lakermp ame Kenlinghell me Marthe Cerpful Email Cross Lake, MB ne filemnbellemail Nhp campbell 88 @ 9 ma Email Adion Campbell etarsnomp2 Email Crossbake, MF Haubre Minia Email CROSS LakeMB BC 1211e Mahan Email CrossLake Mb BX719 Allan Mahan Email Barbara Jamyucn. Ca ARBARA MAHAN Email Cross Lake M.b Bx UStin Mustego

Name Tommy I know Email thematimum (a) MSR. com Name Sandra Helerow Email shakerow & ymail.com Name Jugennie Morcheti Email eugennie 44 @gmail.com Name Grulelin Run Email Bry 631 Gron Luke Mik. Name MOJOGRADU Email By 915 Cron poly M.S. Name Shirley OXPTEMAIL P. Joy 11 Cher four DB. Name Ed. Michay Email P.O. Box 11) Crusshake MB. Rooss Name Vorgone Suet Email Box 11(9 Crussicatory) Name for BLefsmill Email Dor 10/2 (Ros LANG HB ROB OF Name Jukin K. MoniAS Email P.O. Box-65-CROSSLake, MB Name MARY & FOXTATIATINE BOX 182 CROSS CARE, MB Name Kenne Monics Email P.O Bax 65 Cross Lake Mb We urge you to visit our communities to see for yourself what 60 years of reckless hydropower development has done to our Northern communities. This destruction will continue unless you stop buying this dirty energy. You are responsible for our suffering. More new corridors are planned and new dams are being built to supply electricity to Boston, New York and Winnesota. Massachusetts has a contract to buy Canadian hydropower for a transmission corridor through Maine. New York City is considering a purchase contract and a corridor from Canada Please stop buying Canadian hydropower! Name Journe Grate Email Cross Lake, MB Name Maily Des Email Cross Lake, MB Name Rachel Grencillemail Cross Lake MB Name Arrold A. Blocksmithema Name Cronning Mithey Email Mars Lake, MA Name thury non Skilling Email CROSS LALRE MB Name Janothon North Email Cross Lake MVS Name Kerry S. MCKULY Email CrossLake 1 Mb Name Idalter JR Skulmesis Email Cross late, M.b Name Diane North Email Cruss Lalle, MB Name Dyline North Email Cruss Lyke MB Name Gent Mpth. Email Cruss Laila, MB Name Vince Ross Email CROSS LAKE, MRS Name BASICGERIAILLE EMail CROSS LAKE, MAB. Name Applicate Ross Email Cross Lake MB Name Anice Ross Email CROSS LAKe 1975 Name UKgorz Email Cross Lake mb Name KAYLA PLANTE Email CRUSSLAKE, MB Name Scule Marco Email CHUS CARE, NUS Name TuySS al OON Email OVOS Lave MB

Name Earland Scott Email Cross Nake MD Name fearly, Scott Email Coost when why Name forma Brachurry Email anora Jab MB Name Rochel Bradb wremail Chess Jubo M Name MATRICK Scoff Email CIPOSS LULPINS Name Denathan McKays Email cross Late MB Name Of the property Email The South (MY) Name Acuran North Email Cress. Lake Mb Name EApril D Scat Name MA Joburn Name Stally Name Jul & Dullina Email CZOSS / MXE 113 200-020 Name Andrew Krymuski Email Cross LAXE MB. Rob 000 Name Mersic Preserved Email Cross Larter M.R. Rob. ODD Name DAVIOL Scot Email CROSSCHLC MB Rebojo Name Remotel Scott Email (Rossluter MB Robe)0 Name AlleFer Miltoo Email cross / 440 MB. Roz 010 Name Carther Richards Email Carlford musit 10 gravil com Name Horace DiackSimity Email HBlackSimith 28 gmail.com Email (rass bake 146 Email Cross Lot MS 5 Email (1055 Leke, MB Email Dellar Itale oran , 2017 0 10 Mame Jennahan Wood Email Crosslake NameWhithy Man & Email Cross Lake Name Christ Stift Email Cross Lake Name Marcul Row Email Name Dongipin Crote Name Charla Robinson Email Cross Lake Name Cross of Haldiacu Email Cross Lake Name Suppriorie Suff Email CRoss LAKE Name Jantina Ross Email (ross bake Name Love Masch Email Cross Loke Name Act Configuration of the Configura Name Kleyanna Marer Email Cross Lake Name VivianScott Email (Hoss hate. Name Linda Montes Email Choss Loke Name Lumonelloss Email Cross lake Name TXLLE ROSS Email CLOSS LOKE Name HShluy North pruis monior Email (ross LA)ce Email Cross Lake Email Cross Lake 6

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Name Colin Macre Email CrossLoke Name Donarry Misk Strall Cross Loke Name paul Dright Lose Email Cross lake Name Pullud Mabur Email (1055 Locke Name Pearl McKur Email (1055 Locke Name Donise McKov Email Cross Lake Name EUGHZ TEMCHAREmail Cross Loke Name DelSey Musingen Email Cross Laike Name Miles Scott Email Crosslake Name ROMNIC NOST MEMAIL Cross Lake Name DAnnel Langue Email Name Name Name Name Name Name Name Name Email Email Email Email Email Email Email Email 5

Office of the Chief and Council

Kirk E. Francis *Chief*

Mark Sockbeson Vice-Chief

Maulian Dana Tribal Ambassador



Penobscot Nation 12 Wabanaki Way Indian Island, Maine 04468 Phone: (207) 817-7349 Fax: (207) 827-6042

July 22, 2020

Colonel William Conde District Engineer Commander U.S. Army Corps of Engineers New England District 696 Virginia Rd Concord, MA 01742

Dear Colonel Conde,

This letter serves formally to request on behalf of the Penobscot Indian Nation (the Nation") that the US Army Corps of Engineers prepare an Environmental Impact Statement (EIS) in connection with Central Maine Power's proposed New England Clean Energy Connect project ("NECEC"). The Nation makes this request for two reasons: (1) NECEC will have substantial impacts on Maine's environment and (2) NECEC will also have significant impacts on the INNU Nation in Labrador. Only a complete EIS can provide the comprehensive environmental evaluation necessary before any permitting decision can be made. And a failure to prepare an EIS has a high likelihood of being overturned in court, as the Standing Rock Sioux Tribe's recent victory in the Dakota Access Pipeline case demonstrates.

Since time out of mind the families of the Penobscot Nation have resided in the drainage area of the Penobscot River, with their hunting territory extending almost as far as the Upper St. John River. Their culture and subsistence depend on the natural environment and for millennia the Nation has vigorously defended it. As a riverine tribe with close spiritual and cultural ties to the River, the Nation believes that clean water is of central importance. Most recently the Nation has been extensively involved in efforts, among others, to improve the general water quality of the Penobscot River, clean up mercury and dioxin discharges, and restore shad and Atlantic Salmon in the River through, among other things, the dam removals undertaken by the Penobscot River Restoration project. Several federal agencies, including the Army Corps, have been involved and actively participated in these efforts.

Kirk E. Francis *Chief* Mark Sockbeson *Vice-Chief* Maulian Dana

Tribal Ambassador

Office of the Chief and Council



Penobscot Nation 12 Wabanaki Way Indian Island, Maine 04468 Phone: (207) 817-7349 Fax: (207) 827-6042

Given the Nation's concerns with the environment, it is our view that whenever a project is of the magnitude and has the impact of NECEC, and it is the subject of as much controversy as NECEC, the only environmental review appropriate is an EIS. Particularly here where the Kennebec River is a vital resource and substantial efforts have been made over the last years to restore its fishery and improve its water quality, a project that has the potential to affect the watershed must be carefully scrutinized. And it is hard to understand why the Government prepared an EIS for each of the very similar projects in Vermont and New Hampshire and would not do so here.

1. Maine Impacts

The proposed corridor would cut a new swath within a 54-foot wide by 53.1mile corridor through the unfragmented forest region of north western Maine extending from the Quebec, Canada border in Beatie Township to Moxie Gore. With the exception of the crossing of the Kennebec itself, CMP does not appear to have considered burying the proposed line the distance of this stretch of NECEC. The Vermont project actually proposed to underground virtually its entire length; there must be a complete evaluation of this possibility and whether it is an alternative. Similarly, the Vermont project itself, which has been fully permitted, must be evaluated as an alternative to this transnational project.

NECEC's substantial impacts to brook trout habitat, endangered species (Roaring Brook Mayfly and Northern Spring Salamanders) must be thoroughly evaluated as must the consequences of significant habitat fragmentation and the impacts to high value deer wintering yards. The vegetation management plan for riparian filter areas still requires significant clearing within the wire zone (within 15 feet, horizontally, of any conductor). For example, within the wire zone of riparian filter areas, all vegetation taller than 10 feet would be cut to ground level during initial clearing. This does not create a buffer or reduce NECEC adverse impacts to fisheries and other protected resources. Kirk E. Francis *Chief* Mark Sockbeson *Vice-Chief* Maulian Dana

Tribal Ambassador

Office of the Chief and Council



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The impacted streams are mostly cold, high-elevation, headwater streams that are highly productive of wild brook trout. CMP's proposed compensation for the adverse impacts to these resources appears woefully inadequate. The streams "protected" in the compensation parcels are mostly large main stem rivers that warm significantly in the summer, have a recreational fishery at least partially supported by stocking, and have limited or no potential to produce wild brook trout. This defies the purpose of compensation parcels i.e., replacing the functions and values of the adversely impacted natural resource.

Given these impacts, it simply is not possible for the Corps to issue a Finding of No Significant Impact ("FONSI"). The only way properly to address these environmental impacts and to determine the best course of action to protect the environment is through an Environmental Impact Study (EIS), as was done in both New Hampshire and Vermont.

2. Impacts on the INNU

The Corps has apparently been treating its review as limited to the part of the proposed transmission line that runs from inside the Canadian border to Lewiston, Maine. The Nation respectfully disagrees with that crabbed approach. The transnational nature of this project requires a Presidential Permit from the Department of Energy and that requires a review of impacts beyond the Maine border.

Section 102(2)(F) of NEPA demands that federal agencies "recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment." 43 U.S.C. § 4332(F). Furthermore, NEPA's legislative history further supports the requirement that agencies take into consideration the environmental impact of a proposed project on other countries. *See, e.g.*, H. Rep. No. 91-378, 91st Cong., 2d Sess. (1969) ("Implicit in [Section 101 of NEPA] is the understanding that the international implications of our current activities will also be considered, inseparable as

Kirk E. Francis Chief Mark Sockbeson Vice-Chief Maulian Dana

Office of the Chief and Council

Tribal Ambassador



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they are from the purely national consequences of our actions"); House Comm. on Merchant Marine and Fisheries, Administration of the National Environmental Policy Act, H.R. Rep. No. 92-316, 92d Cong., 1st Sess. (1971) ("The history of the Act makes it quite clear that the global effects of environmental decisions are inevitably a part of the decision-making process and must be considered in that context.") *See also Backcountry Against Dumps v. Chu*, 215 F. Supp. 3d 966, 972 (S.D. Cal. 2015).

For these reasons, the Corps in evaluating the impacts of NECEC must consider not only the Maine impacts, but also those in Canada. Of particular concern in that regard are the impacts of Hydro-Quebec's dams, especially how the enormous dam in Labrador affects the INNU. I attach a copy of the INNU's submission to the Maine Department of Environmental Protection to make you aware of this issue and urge you to include the impacts on the INNU in the EIS.

Thank you for your consideration of this request.

Sincerely,

Chief Kirk Francis

Cc: Jay Clement

STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

CENTRAL MAINE POWER COMPANY)Applications Pursuant to SLODA and NRPA for)the New England Clean Energy Connect)Consisting of the Construction of a 1,200 MW)HVDC Transmission Line from the Québec-Maine)Border to Lewiston (NECEC))And Related Network Upgrades)

COMMENTS OF THE INNU NATION

Innu Nation is the elected government of the Innu of Labrador, an Indigenous people of Canada with a population of approximately 3,200 (the "Innu"). The Nation, pursuant to Chapter 2, Section 18.B, submits comments on the March 13, 2020 Draft Order issued by the Maine Department of Environmental Protection (the "Department").

The stated project purpose considered by the Department is for Central Maine Power ("CMP") "to deliver up to 1,200 MW of Clean Energy Generation from Québec to the New England Control Area via a HVDC transmission line." Draft Order at p. 58; *see also id. at* p. 15. As will be explained further below, this project should not be permitted unless the Department imposes a condition that states: "Prior to the start of construction, the applicant must submit to the Department documentation of permission to use Innu Territory that includes the signature of a duly authorized representative of the Innu Nation."

I. Introduction

The Innu Nation submits these comments to dispel the multiple and continuing assertions of CMP, and by implication, Hydro-Québec, that the proposed New England Clean Energy Connect project (the "Project") is "clean energy generation" or "environmentally friendly." For the Innu-the aboriginal inhabitants of lands and waters indiscriminately destroyed by Hydro-Québec to generate the power that CMP wants to transmit through Maine by the Project—nothing could be further from the truth. This Project began as a lucrative partnership between CMP and Hydro-Québec. See Draft Order at PDF page 196 ("On July 27, 2017, CMP and Hydro Renewable Energy, Inc., an affiliate of Hydro-Québec, submitted to Massachusetts Electric Distribution Companies a joint bid proposal, New England Clean Energy Connect: 100% Hydro, in response to the Massachusetts RFP."). However, this Project and the economic returns it promises for CMP and Hydro-Québec are at the devastating expense of the Innu. The Project unquestionably proposes "use" of the Innu's territory, and will exacerbate unreasonable adverse impacts thereon. Neither CMP, nor Hydro-Québec, have sought, nor obtained, the necessary permissions from the Innu Nation for this "use." Unless or until they do so, under the plain language of Department's own rules, the Department must either deny CMP's application or condition any permit approval on CMP and Hydro-Québec obtaining the necessary permissions from the Innu Nation. In addition to the Department's rules, this result would be required by faithful adherence to the United Nations Declaration on the Rights of Indigenous Peoples, which has been endorsed by the State of Maine, the United States, and the Canadian Government. If CMP and Hydro-Québec fail to satisfy this condition, the stated project purpose of delivering clean energy generation from Québec to the New England Control Area is, by definition, impossible to accomplish.

II. Background

The Innu have lived on the Québec-Labrador Peninsula ("Nitassinan", in Innu-aimun) since time immemorial. As explained by Grand Chief Gregory Rich of Innu Nation in his Declaration signed April 9, 2020, attached hereto as **Exhibit 1**, the Innu are hunters who have travelled over these lands in family groups from time out of mind, using timeworn travelling routes

to hunt, fish, gather and trade. Travelling was central to the Innu identity, since through travel they maintained their social and ceremonial connections with other Innu, neighbouring peoples, and the land. Innu gatherings at central locations for trade and cultural events, including near Churchill Falls, have been integral to their way of life.

The traditional territory of the Innu is in the far northeast of mainland North America. It is shown in yellow in the map below (Figure 1).¹ They have lived here for thousands of years.



Figure 1: Map of the territory of the Innu of Labrador

The Innu were able to resist the forces of colonization and maintain their way of life until resource developers started looking in earnest at their lands starting in the 1950s, at which point they were forced into settled communities by the Government of Newfoundland and Labrador. The Innu now reside primarily in two communities, Sheshatshiu and Natuashish, marked by blue pins in Figure 1.

¹ Exhibit B to the Declaration of Grand Chief Rich.

The Innu's territory is a harsh environment for those not skilled in living on the land, which is why it was not until the mid-20th century that colonial powers realized that the resources on the Québec-Labrador Peninsula are rich and could be exploited for significant profit. Since then, resource developers have started creating projects on the Peninsula to exploit the many resources there. The huge hydroelectric dam at Churchill Falls, the Churchill Falls Generating Station, is one example of this exploitation.

A. Churchill Falls Generating Station

The Churchill Falls Generating Station ("CFGS") is a massive hydroelectric dam in western Labrador that is powered by an immense, man-made reservoir known as the Smallwood Reservoir. It was constructed by the Churchill Falls (Labrador) Co. ("CF(L) Co.") in the late 1960s and early 1970s. Hydro-Québec is one of two shareholders of CF(L) Co.

Before the reservoir was created by flooding, this area was a gathering place for the Innu from across the Québec-Labrador Peninsula. It was known to the Innu as the Meshikamau area, named for Lake Meshikamau. The area was rich in fish and wildlife and was on the migration path of two herds of caribou, which are integral to the Innu diet and cultural and spiritual identity. It was also the location of an important Innu spiritual site, Petshishkapushkau. Meshikamau was also a place where the Innu buried their dead. The importance and history of this area is outlined in Grand Chief Rich's Declaration (**Exhibit 1**), together with the Exhibits he has included in that document.² The Innu Nation incorporates **Exhibit 1** and the Exhibits attached thereto into these Comments by reference.

² See especially Exhibit C to the Declaration of Grand Chief Rich.

The river flowing through and from the Meshikamau Lake is called the Churchill River in English. It was an important travelling route for the Innu, and had a significant waterfall known in English as Churchill Falls.

B. Destruction to Innu Land and Way of Life

Meshikamau and countless lakes around it were flooded in 1971 to create the Smallwood Reservoir. The Churchill River was dammed at the Falls.

The Reservoir covers an immense area of approximately 2,566 square miles – larger than the state of Delaware. Figure 2 shows the flooded area, and Lake Meshikamau's situation in that area. ³ The flooded area was named the Smallwood Reservoir.





The image below (Figure 3) shows the flooded area, and where Innu travel routes and camps were located prior to the flooding.⁴

³ Exhibit G to the Declaration of Grand Chief Rich.

⁴ Exhibit E to the Declaration of Grand Chief Rich.



Figure 3 Map showing travel routes and camp locations overlaid by flooded lands

Damming the Falls and flooding the lakes above them had correspondingly immense impacts. The flooding destroyed the Meshikamau area's waters and lands. It destroyed the Innu's use of the area, and it also destroyed the habitats of animals living there. The Innu's hunting and trapping lands were inundated. Innu whose families had hunted in the region for generations lost their canoes, traps, caribou-hide scrapers, and other tools that they stored in caches along the river's edges. Beaver in the headwater ponds froze to death because of reduced water levels. Salmon spawning grounds were destroyed. Fish living in the Reservoir have been poisoned with methylmercury. Caribou calving grounds and waterfowl nesting areas were drowned.

Innu burial grounds surrounding the waterways were also destroyed. Bones have been washed away, and burial grounds have been eroded. The images below show this destruction.⁵

⁵ Exhibit H to the Declaration of Grand Chief Rich.



Figure 4 Skeletal remains from an Innu cemetery eroding due to flooding



Figure 5 The Late Daniel Ashini on the bank of an eroding Innu cemetery

The Innu were not consulted about the building of the CFGS, nor were they consulted about the flooding required to create the Smallwood Reservoir. Their consent to these profound, destructive alterations of their lands and waters was neither sought nor obtained. The Innu were also not told when the flooding would happen, and the scale of it was not explained to them.

Innu lands and waters, and the plants, animals and burial sites on those lands and waters, remain underwater to this day. The water level in the Smallwood Reservoir is controlled to maximize the profitability of Hydro-Québec's production, having no account for impact of the operation of the CFGS on the continued destruction of Innu lands.

III.CMP's Claims That the Project Delivers "Clean" Energy Fail to Account for The Destruction of the Innu Way of Life For The Project's Energy

Blind to the untold destruction of the Innu's land and resources caused by the Churchill

Falls Generating Station, CMP throughout these and related proceedings and in its advertising

campaigns, consistently asserts that the Project is generating "clean" energy from hydro-power

sources. Some examples:

- "Once the NECEC goes into service in late 2022, it will . . . significantly advance . . . the delivery of *clean energy* into the ISO-NE Control Area. . . . [through] the injection of 9.45 TWhs of *clean hydroelectric energy* into ISO-NE. Post-Hearing Brief of CMP, filed with the Maine Public Utilities Commission (Public Version), at 102-103 (Feb. 1, 2019) (emphasis added).
- "The NECEC provides Maine and this Commission with the opportunity to . . . facilitate a *clean* . . . *source of energy*. . . ." Reply Brief of CMP, filed with the Maine Public Utilities Commission (Public Version), at 7 (Feb. 13, 2019) (emphasis added).
- *"The incremental hydropower delivered to New England via NECEC is clean..."* Appellee Brief of CMP, filed with the Maine Supreme Judicial Court, at 22-23 (Sept. 23, 2019) (emphasis added).
- "[T]he NECEC is designed to . . . deliver the Clean Energy Generation sought by the Massachusetts RFP *from Québec-based sources* and will be capable of *delivering the entire annual quantity of clean energy sought.*" Post-Hearing Reply Brief of CMP, filed with the Maine Department of Environmental Protection, at 32 (June 28, 2019) (emphasis added).

These statements ignore the ecological and social harm that has been caused in order to create the energy Hydro-Québec is selling.

While Hydro-Québec is a minority shareholder in CF(L) Co., it is entitled to almost all the

output of CFGS, by virtue of a contract that will remain in place at least until 2041. CFGS's

generated energy is equal to about one-sixth of the Hydro-Québec system's total generated energy,

and equal to almost the entirety of the amount of energy that Hydro-Québec exports.⁶ The energy

⁶ This information and supporting Exhibits are outlined in the Declaration of Grand Chief Rich, paragraphs 26-29.

that Hydro-Québec proposes to sell through the NECEC is one-sixth derived from CFGS, which is not a Québec-based source of energy. Hydro-Québec should not be able to take the benefit of the CFGS energy without also being responsible for its burdens on the Innu of Labrador.

Figure 6 below, drawn from an Annual Report of Hydro-Québec shows the location of CFGS, the only source of generation for Hydro-Québec that is outside of the boundaries of the Province of Québec.⁷



OUR MAJOR FACILITIES



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Figure 6 Map of Hydro-Québec facilities

⁷ Exhibit I to the Declaration of Grand Chief Rich.

The Innu of Labrador have repeatedly sought reparations from Hydro-Québec for the cultural and ecological destruction caused by the CFGS and the flooding of the Smallwood Reservoir. Hydro-Québec has just as repeatedly and consistently refused to engage with the Innu. Hydro-Québec has shown itself to be utterly unrepentant for the destruction and violation of rights that it has participated in, and profited by, for over forty years. Hydro-Québec's refusal to seek permission from, and to compensate, the Innu of Labrador is in stark contrast with Nalcor Energy, the provincial utility in the province of Newfoundland and Labrador which co-owns the CFGS along with Hydro-Québec. Nalcor Energy agreed in 2011 to compensate the Innu of Labrador for its portion of the damages the project has caused.

IV. The Innu Nation's Experience Parallels that of the Penobscot Nation in Maine, But Maine, Unlike Québec, Has Recently Begun to Make Amends

The destruction of Indigenous lands and resources by large corporations backed by local governments is a story that repeats itself across this continent and throughout the world. Indeed, the experience of the Innu Nation is not dissimilar to that of the Penobscot Nation in Maine. The only difference is that Maine, unlike the Province of Québec and its corporate partner, Hydro-Québec, has finally begun to make amends to the Penobscot People.

The historical parallels of exploitation are stark and should not be ignored.⁸

The Penobscot Nation's aboriginal territory encompasses the Penobscot River watershed from the River's headwaters on the Canadian border to the mouth of the River over 100 miles to the south at Penobscot Bay. After ceding the uplands on either side of the River to Massachusetts and Maine in treaties that likely violated federal law in 1796 and 1818, the Penobscot became an entirely river-bound People. In 1950, a bridge was constructed to join their principal reservation at *Panawamskeag* ("Indian Island" to nontribal people) with the uplands that the Nation had ceded

⁸ The following is drawn from the Testimony of Kaighn Smith Jr., Esq., Counsel for the Penobscot Nation, on An Act to Implement the Recommendations of the Task Force on Changes to the Maine Indian Claims Settlement Implementing Act (L.D. 2094): Fish and Game and Land Use and Natural Resources (Task Force

Recommendations 7-10), Public Hearing, February 14, 2020 at 6-12 & Exhibits B through J attached thereto. A copy of this testimony (without exhibits) is attached hereto as **Exhibit 2**. The full testimony with exhibits is accessible at http://legislature.maine.gov/maine-indian-claims-tf

in the suspect treaties. From time immemorial, the River served as the principal food source for Penobscot tribal members. Their subsistence fishing, trapping, and hunting practices on the River define their culture and way of life. Throughout their history and continuing into the 1990s, when knowledge of the toxic effects of relying upon the River for food suppressed their subsistence practices, Penobscot families relied upon fish, eel, and other food sources from the River for up to four meals per week to the tune of two to three pounds per meal. But the River's resources have been devastated by dams for hydro-electric power and paper mills that have used the River to dump toxic waste, including dioxin. As the U.S. Environmental Protection Agency reports, as of 1968, "the Penobscot [River] . . . received the untreated industrial wastes discharged non-stop from seven pulp and paper mills," five of which flowed directly into the Main Stem of the River (from Indian Island to Medway) – the center of the Penobscots' remaining aboriginal homeland. In 1964, this was equivalent to "untreated domestic sewage load produced in one day by about 5,000,000 people," thereby depressing "dissolved oxygen levels . . . as low as zero."

Maine's support for industrial interests over those of the Penobscot People (just like Québec's support for Hydro-Québec over the Innu of Labrador) has marred tribal-state relations for a very long time. Since the Nation's land claims settlement in 1980, the Maine Attorney General's office consistently sided with corporations to fight the Penobscot Nation on water quality issues, taking the position that the Nation's treaty-based fishing rights did not carry any right to water quality to ensure the existence of healthy fish to eat.

In stark contrast to the relationship between the Innu Nation and Québec/Hydro-Québec, however, Maine recently has made efforts to improve tribal-state relations. For example, by forming the *Truth and Reconciliation Commission* to address the horrid taking of children from their Penobscot, Passamaquoddy, Maliseet, and Micmac families, see Beyond the Mandate Continuing the Conversation, Report of the Maine Wabanaki-State Child Welfare Truth & Reconciliation Commission (June 14, 2015),⁹ and by enacting legislation to set water quality

⁹Accessible at:

standard to protect sustenance fishing, *see* Maine Public, *New Measure Establishes Water Quality Standards for Sustenance Fishing in Maine's Tribal Waters* (June 21, 2019).¹⁰ Québec and its state enterprise, Hydro-Québec, have made no similar efforts with respect to the Innu Nation. And the claims that CMP makes to this Department - that the hydro-electric power source for this Project is "clean" - distort the truth and is a continuing affront to the Innu.

V. The Department's Rules and the UN Declaration on the Rights of Indigenous Peoples Each Require the Applicant to Obtain and Demonstrate Sufficient Permissions from the Indigenous Peoples Whose Territories Will Be Used to Accomplish the Project Purpose

As described above, the Project unquestionably proposes "use" of the Innu's territory, and will exacerbate unreasonable adverse impacts thereon, all without the necessary permissions for such use. Imposing a condition on CMP to consult with, and obtain permission from, the Innu Nation is the only way for the Department to ensure that the Project complies with the Department's rules and governing states. It is likewise the only way for Maine, and the Department, to faithfully adhere to the United Nations Declaration on the Rights of Indigenous Peoples, which has been endorsed by the State of Maine, the United States, and the Canadian Government. A copy of the UN Declaration is attached here as **Exhibit 3**.

A. The Department's Rules and Governing Statutes All Weigh in Favor of the Department Exercising Its Discretion to Impose the Requested Condition.

There are numerous portions of the Department's rules and governing statutes that give the Department the discretion to impose the requested condition. First, the Department's rules require CMP to demonstrate and maintain "sufficient title, right or interest in all of the property that is

https://d3n8a8pro7vhmx.cloudfront.net/mainewabanakireach/pages/17/attachments/original/146897404 7/TRC-Report-Expanded_July2015.pdf?1468974047 ¹⁰ Accessible at:

https://www.mainepublic.org/post/new-measure-establishes-water-quality-standards-sustenance-fishingmaines-tribal-waters

proposed for development or use" Department Rules Chapter 2, Section 11.D. (emphasis added). and this project will unquestionably use the Innu's territory. Second, the Department's rules expressly state that it "may as a term or condition of approval, establish any reasonable requirement to ensure that a proposed development will not adversely affect preservation of any historic site." Chapter 375 Section 11.D. As used in the Department's Rules, "historic site" means "any site, structure, district or archaeological site ... is established by qualified testimony as being of historic significance." Id. at § 11.B. The testimony of Grand Chief Rich unquestionably meets that definition. Third, the Department's rules provide that it "may, as a term or condition of approval, establish any reasonable requirement to ensure that the proposed development will have no unreasonable adverse effect on" among other things: "air quality," id. § 1.D, "alteration of climate," id. § 2.D, "natural drainage ways" id. § 3.C, "runoff/infiltration relationships," id. § 4.D, "erosion and sedimentation," id. § 5.D, "surface water quality," id. § 6.D, "groundwater quality," id. § 7.E, "preservation of natural areas," id. § 12.D, "access to direct sunlight," id. § 13.C, "scenic character," id. § 14.D, "wildlife and fisheries," id. § 15.D, "provision of a sufficient and healthful water supply," id. § 18.C. As described above, each of these issues is implicated with regard to the effect of this Project on the Innu territory.

Nor is the Department constrained to consider impacts only within the development site, or only on the people of Maine. Instead, the Department has discretion to consider the "potential primary, secondary, and cumulative impacts of the development on the character, quality, and uses of the land, air, and water on the development site <u>and on the area likely to be affected</u> by the proposed development." Chapter 372, § (1)(A). (emphasis added). The purpose of the statutes applied to this Project by the Department include: that "[i]t is the intention of the Legislature that ... the Department of Environmental Protection provide coordination and vigorous leadership to

develop programs to achieve" protection of natural resources that "have great scenic beauty and unique characteristics, unsurpassed recreational, cultural, historical and environmental value of present and future benefit to the citizens of the State," 38 M.R.S. § 480-A; and the "purpose of this subchapter is to provide a flexible and practical means by which the State, acting through the department, in consultation with appropriate state agencies, may exercise the police power of the State to control the location of those developments substantially affecting local environment in order to insure that such developments will be located in a manner which will have a minimal adverse impact on the natural environment within the development sites and of their surroundings and protect the health, safety and general welfare of the people," 38 M.R.S. § 481 (emphasis added). Accordingly, the Legislature has declared that CMP "may not construct or cause to be constructed or operate or cause to be operated ... any development of state or regional significance that may substantially affect the environment without first having obtained approval for this construction, operation, lease or sale from the department." 38 M.R.S. § 483-A(1). Here, CMP asks for such permission from the Department, and advances the supposed climate benefits of its Project as one of the factors that the Department should consider. In weighing such climate factors, the Legislature has also made clear that the Department should be cognizant of "[m]aximizing involvement in interstate and regional initiatives and programs" and "[p]ursuing actions that minimize deleterious effects, including those on persons of low income and moderate income, to public health and the environment" using strategies that "[e]ncourage diversity, inclusion and equity." 38 M.R.S. § 577(3)(B) and (7)(B)&(E). The Department should therefore exercise its discretion to condition any approval of this Project on CMP obtaining the necessary permissions from the Innu.

B. Faithful Application of the UN Declaration Requires the Same Result
In April 2008, Maine's state legislature passed a Joint Resolution in support of the UN Declaration on the Rights of Indigenous Peoples. See H.P. 1681, 123rd Leg., 1st Spec. Sess. (Me. 2008). In November of 2010, Canada similarly lent its support and in December of 2010, the United States fully endorsed the UN Declaration. The UN Declaration provides certain obligations for States and their administrative agencies, including:

- "States shall provide effective mechanisms for prevention of, and redress for ... [a]ny action which has the aim or effect of dispossessing [Indigenous peoples] of their lands, territories or resources," *id.* at Article 8;
- "States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them" *id.* at Article 19;
- "Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use, as well as those which they have otherwise acquired. States shall give legal recognition and protection to these lands, territories and resources." *Id.* at Article 26;
- "States shall undertake effective consultations with the indigenous peoples concerned, through appropriate procedures and in particular through their representative institutions, prior to using their lands or territories for military activities." *Id.* at Article 28;
- "States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources.3. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impacts." *Id.* at Article 32.

Separately and together, these provisions-each endorsed by the State of Maine-require that the

Department respect the rights of the Innu Nation and condition any project approval on CMP

obtaining such rights.

VI. The Department Should Condition Any Permit on CMP and Hydro-Québec Obtaining the Necessary Permissions From the Innu Nation

The Department has already shown a willingness to condition this proposed permit on CMP obtaining the necessary permissions from Indigenous peoples. When CMP presented its original project route to the Department, it included a lease over Passamaquoddy land that lacked the requisite signature from the United States Secretary of the Interior (the "Secretary"). As a matter of federal law, any lease over Indigenous territory in the United States is void without the approval of the United States government, as trustee. See 25 U.S.C. § 415; 25 U.S.C § 1724(g)(3)(A). That permission must be demonstrated by the signature of the Secretary. Recognizing that CMP had failed to obtain the necessary permissions to cross Indigenous lands, the Department imposed permit condition number 5 in its Draft Order, which states "Prior to the start of construction, the applicant must submit to the Department a copy of the lease that includes the signature of a duly authorized representative of the Bureau of Indian Affairs." Draft Order at 106. The Department should take the same approach with regard to the Innu Nation.

Thus, the Innu Nation respectfully requests that the Department impose a condition that states: "Prior to the start of construction, the applicant must submit to the Department documentation of permission to use Innu Territory that includes the signature of a duly authorized representative of the Innu Nation." Although CMP may argue that condition number 5 is now unnecessary as a result of their proposed reroute around Passamaquoddy land, this changes nothing about the above analysis—CMP and Hydro-Québec intend to use Innu territory to accomplish the proposed project purpose. Accordingly, this requested condition is not only warranted by the Department's rules and ordinary practice, but is required if Maine, through the Department, is to faithfully adhere to the requirements of the UN Declaration on the Rights of Indigenous Peoples. Moreover, as demonstrated by Nalcor Energy's engagement with the Innu —Nalcor Energy being

the provincial utility in the province of Newfoundland and Labrador which co-owns the CFGS along with Hydro-Québec who agreed in 2011 to compensate the Innu of Labrador for its portion of the damages the project has caused—the requested condition would bring CMP in line with the practice of at least some Canadian provincial utilities.

VII. Conclusion

The Project before the Department sources hydro-electric power derived from the devastating destruction of the aboriginal homelands of the Innu Nation and the resources upon which their livelihood and culture are based. The energy that would be passing through Maine to Massachusetts as a result of the NECEC would come from waters that flow over the drowned animals, destroyed lands, and disturbed burials of the Innu's homeland. It is not clean energy. To the contrary, it would flow at the cost of the Innu way of life. The Innu Nation therefore respectfully asks the Department to account for this harsh reality as it entertains whether to permit this Project, and to impose the condition of approval here requested by the Innu Nation.

Respectfully submitted this April 13, 2020 by

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In consultation with

Nancy J. Kleer Senwung Luk Matt McPherson Julia Brown Canadian Counsel for the Innu Nation *not admitted in Maine*

Exhibit 1

STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION and STATE OF MAINE LAND USE PLANNING COMMISSION

IN THE MATTER OF

CENTRAL MAINE POWER COMPANY Application for Site Location of Development Act permit and Natural Resources Protection Act permit for the New England Clean Energy Connect ("NECEC") L-27625-26- A-N L-27625-TB-B-N L-27625-TB-B-N L-27625-2C-C-N L-27625-VP-D-N L-27625-IW-E-N

DECLARATION OF GREGORY RICH

I, Gregory Rich, of Natuashish in the Province of Newfoundland and Labrador, Canada, declare and state as follows:

- 1. I am the Grand Chief of the Innu Nation Inc., which represents the interests of the Innu of Labrador (the "Innu Nation").
- 2. I have served in this capacity since 2017.
- 3. I submit this declaration in support of the public comments submitted by the Innu Nation in the above matters.
- 4. I have personal knowledge of the facts stated herein or I have information that I believe to be true upon which the facts stated herein are based.

The Innu of Labrador

- 5. The Innu of Labrador are an Indigenous people. In our language, Innu-aimun, the name for our land is "Nitassinan". Our people have lived in Nitassinan for thousands of years. The Innu know this about ourselves, but this presence is also reflected in the archaeological record of Nitassinan. Evidence of our ceremonies going back at least 6000 years has been found. Attached hereto as Exhibit A is one archaeological report that outlines evidence of these ceremonies.
- 6. Our territory is a large land area in the east of the Quebec-Labrador Peninsula. Currently our people are settled in the two communities of Sheshatshiu and Natuashish, now in the Canadian Province of Newfoundland and Labrador. Attached hereto as Exhibit B is a

map of Nitassinan, drawn from the Government of Canada's Aboriginal and Treaty Rights Information System.

- 7. The Innu of Labrador have never surrendered our Aboriginal rights in Nitassinan. We are currently negotiating a modern treaty with the Governments of Canada and Newfoundland and Labrador. The three parties reached an Agreement-in-Principle on November 18, 2011.
- 8. The Innu of Labrador and our ancestors have always lived, used and protected the lands and waters of our traditional and ancestral territories. We were and remain hunters with a deep connection to the land. Prior to our forced settlement into communities in Labrador in the 1950s, the Innu way of life involved travelling across Nitassinan in family groups to hunt, fish, gather, and trade. This travel was central to our identity, since through our travel we maintained our social and ceremonial connections with other Innu, neighbouring peoples, and the land.
- 9. Our people used to come together for trade and cultural events at important gathering places. One such gathering place was the Meshikamau Lake area, in the interior of Labrador.
- 10. Meshikamau Lake was a place where several Innu travel routes extending across Nitassinan converged. Innu families from different parts of the Quebec-Labrador peninsula gathered there. The area was rich in fish and wildlife and was on the migration path of two herds of Atiku (caribou), which are an integral part of our identity and culture. Exhibit C is an academic article by Stephen Loring and others that outlines some of this background.
- 11. Meshikamau is the location of Petshishkapushkau, an important spiritual site for my people. Petshishkapushkau is a rocky hill and is said to be the mystical place of residence of Anikapeu, the Toadman, an animal master of frogs and toads.
- 12. The Meshikamau area was also a place where we buried our dead.
- 13. Despite the forces of colonization, the Innu maintained our way of life in Nitassinan until settler resource developers realized the richness of our lands and the colonial government forced us to settle in communities, beginning in the 1950s. Since then, much of our land has been seized for resource development. Until recently, we were not consulted about this seizure of our land, nor were we compensated for the resource development projects' destructive impacts on Nitassinan and our way of life.
- 14. The development of the Churchill Falls Hydroelectric project was one of the most significant, destructive resource development projects to impact Nitassinan.

Impacts of Churchill Falls Generating Station

- 15. Mista-Shipu, known in English as the Churchill River, is the longest river in Labrador and was an important travel route for the Innu until the construction of the Churchill Falls Generating Station ("CFGS"). It is one of the travel routes that led to Meshikamau.
- 16. Mista-Shipu had a significant waterfall just past Meshikamau called Patshetshuna. It is known in English as Churchill Falls.
- 17. When the resource developers turned their attention to the riches of Nitassinan, they looked at these Falls and saw them as a potential source of power generation. They gave no consideration to whether the development of this power generation would impact the Innu.
- 18. The Churchill Falls (Labrador) Co. ("CF(L) Co.") began constructing CFGS in 1967. Hydro-Québec became, and remains, one of two shareholders of CF(L) Co.
- 19. In 1971, flooding of interconnected waterways above Patshetshuna created a reservoir to power CFGS. This flooding included Meshikamau and surrounding ecozones (highlands, bogs, islands, forest, tundra), and it turned these lakes and lands into one large water body, known as the Smallwood Reservoir.
- 20. The Innu were not consulted about this flooding, and we certainly did not consent to it. We were not even told when the flooding would begin, or the degree to which the water would rise. One of our elders, Pinute Ashini, has said that they expected the water level rise at most to be like that caused by a beaver damming a river, and did not expect anything of the scale or nature of the flooding that CFGS has caused. Attached as Exhibit D are pages excerpted from a report prepared by Peter Armitage in 2011 regarding a different hydroelectric project, which briefly outlines impacts of CFGS at pages 23-24.
- 21. The flooding was a terrible surprise to our people who found our land flooded, our trapping and gathering in our traditional lands wiped out, our gear lost, and the graves of our ancestors under water. Attached as Exhibit E is an inset of a map showing our travel routes and campsites, on which a map of the flooding caused by CFGS was overlaid. Attached as Exhibit F is an image of a small portion of the destruction caused by the flooding.
- 22. The impact of CFGS on Nitassinan is immense. Countless lakes were flooded to create the Smallwood Reservoir. The Reservoir covers an area of approximately 2,566 square miles larger than the state of Delaware. The catchment area of the CFGS is about the size of the State of Maine. The generating capacity of CFGS is almost three times that of the Hoover Dam. A map of the flooding drawn from Exhibit C is attached as Exhibit G.
- 23. The flooding destroyed the Meshikamau area's waters and lands. It destroyed our use of the area, and it also destroyed the habitats of animals living there. Our hunting and trapping lands were inundated. Innu whose families had hunted in the region for

generations lost their canoes, traps, Atiku-hide scrapers, and other tools that they stored in caches along the river's edges. Beaver in the headwater ponds froze to death because of reduced water levels. Salmon spawning grounds were destroyed. Fish living in the Reservoir have been poisoned with methylmercury. Atiku calving grounds and waterfowl nesting areas were drowned.

- 24. We also lost the bones of our ancestors. Their burial grounds are now underwater. Attached as Exhibit H are photos that show our burials disturbed and destroyed by the flooding.
- 25. It would be difficult to overstate the profound anger, dismay and sadness that the Innu feel about the flooding of the Meshikamau area, and the destruction CFGS has caused to the plants and animals with whom we shared the lands and waters.

Churchill Falls Generating Station, Hydro-Québec, and the New England Clean Energy Connect

- 26. Even though Hydro-Québec is only a minority shareholder in CF(L) Co., it is entitled to "almost all the output" of CFGS, by virtue of a power contract that will remain in place at least until 2041. Hydro-Quebec's annual report lists CFGS as part of its generation capacity. Attached as Exhibit I is Hydro-Québec's 2019 Annual Report, and the information I am citing can be found at pages 44, 93, 98, and 115.
- 27. Hydro-Québec's 2019 Annual Report states that its net electricity sales is 208.3 TWh, and that its exports amount to 33.7 TWh. This information can be found on page 2 of Exhibit I.
- 28. We understand that between 1969 and 2016, Hydro-Québec was contractually entitled to 31.5 TWh of energy from CFGS. The amount of energy it is entitled to since 2016 is not publicly available but it is likely to be a similar amount. This information can be found in an excerpt of a 2019 Quebec Court of Appeal court case which I attach as Exhibit J. The information is in note 53 at the end of the decision.
- 29. CFGS's generated energy is equal to about one-sixth of Hydro-Québec's total generated energy, and almost equal to the entirety of the amount that Hydro-Québec exports.
- 30. In 2018, the Supreme Court of Canada, the highest court in Canada, described Hydro-Québec's contractual relationship with CFGS, first signed in 1969, as follows: "Nearly 50 years after the Contract was signed, there have been changes in the electricity market whose effect is that the purchase price for electricity set in the Contract is well below market prices. As a result, Hydro-Québec sells electricity to third parties at current prices while continuing to pay CFLCo the price agreed on in the Contract in 1969. This generates substantial profits for Hydro-Québec." Attached as Exhibit K is an excerpt from the judgement of the Supreme Court of Canada where this statement is found.

31. The energy that would be passing through Maine and flowing to Massachusetts consumers as a result of the NECEC would come from waters that continue to wash away the bones of our ancestors, destroy our lands and the subsistence resources upon which we depend for our cultural identity and our livelihoods – our very way of life.

Our attempts to seek redress

- 32. In 2011, Nalcor Energy (the provincial utility for the Province of Newfoundland and Labador), and the Province of Newfoundland and Labrador entered into the Upper Churchill Redress Agreement with our people. They acknowledged the profound impact that the CFGS has had on our people and agreed to make reparations for the damage it has caused us. Nalcor Energy is, along with Hydro-Québec, a co-owner of CFGS. Attached as Exhibits L and M are press releases from the Province of Newfoundland and Labrador regarding the signing of the Upper Churchill Redress Agreement, and the ratification of this Agreement by our people.
- 33. Nalcor's conduct, when they finally agreed that they needed to make these reparations as they realized they needed to fundamentally change their relationship with the Innu Nation in Labador, is very different from the irresponsible attitude we have experienced from Hydro-Québec. Over the years, the Innu of Labrador have made repeated attempts to meet with Hydro-Québec to discuss the impacts of CFGS on our people. Hydro-Québec has only ignored us and treated us with disrespect. We have been extremely disappointed in Hydro-Québec's refusal to take responsibility for what they have done to our people and our land.
- 34. I understand that in a similar way to how Hydro-Québec built CFGS, Hydro-Québec is also working through a separate company to try to build the NECEC. As the people of Maine consider whether to work with NECEC project, I can only hope that they experience better treatment at the hands of Hydro-Québec than we have so far.

I declare under penalty of perjury that the foregoing is true and correct.

April 9, 2020

Gregory Rich, Grand Chief

EXHIBIT A



2014

Archaeology Review March 2015 Volume 13

Provincial Archaeology Office Department of Business, Tourism, Culture and Rural Development



Tshikapisk Archaeological Activities at Kamestastin, Spring 2014

Anthony Jenkinson & Jean-Pierre Ashini (co-author of Unkueiu section)



Figure 1. Map of Kamestastin with sites referenced in 2014 report.

ntroduction

The archaeological year began, as it usually does in the Kamestastin area, with our arrival in April at the Kamestastin outflow camp. Over the following weeks and until departure in mid-June the snow gradually receded from the land while the lake ice surface remained travel worthy until well after most of the surrounding land had lost its snow cover and winter frost.

Kamestastin activities in the spring of 2014 can be roughly divided into four areas: survey of one targeted area named Ianamaskum, further investigation of the Unkueiu site, an attempt to locate red unsurveyed until this spring. This lack of attention is

ochre or haematite sources along the Shanapeushipis and recording of fortuitous discoveries at the Atamanesesish Point on the east side of the spot where Mistanipishipis enters the lake on Kamestastin's north west side.

Survey ofthe Ianamaskum level (Tshumushumapeu Valley approach)

Although much of Kamestastin's shoreline and backing terraces have been well surveyed, an area of level sandy land beside the south side of Kamestastin outflow to the immediate west of the approach to the Tshumushumapeu Valley remained



Figure 2. Ianamaskum 6 with the Ianamaskum level visible in the background.

not unconnected to a thick cover of alders which overlies the roughly level triangular area of ground and which had previously discouraged a "proper look."

When the alders are in leaf even the caribou paths which thread their way across the point are largely obscured. Visitors to the archaeologically rich Tshumushumapeu Valley, tramping up from the Ianamaskum sandy point towards the approach slope to Tshumushumapeu had occasionally noted pieces of broken white quartz in the caribou paths but, beckoned by the more obvious wealth of what lay above, had essentially passed the Ianamaskum area by without further remark. This May during the critical period when most of the snow had withdrawn from Ianamaskum but the alders had not yet come into leaf, it was decided to take a closer look at the area in question. Some urgency was added to the decision to examine the area because sharply diminished caribou numbers are already having noticeable effects on the usefulness of caribou paths as natural "test pits" or "test trenches". During our initial Kamestastin surveys, fortuitously synchronized with some of the highest numbers of George River caribou, caribou paths were open and numerous and had often freshly exposed the ground to depths at which cultural materials lay. Work at Kamestastin in the spring and Mistanipi in the fall of 2014 revealed the extent to which alders and other scrub were already starting to grow back into the caribou paths, particularly those crossing high potential archaeological areas beside brooks and lakes. Some caribou paths now show growth of mosses in the path floors themselves. The caribou paths at Ianamaskum, though starting to grow over, are still plain to see, particularly before the deciduous scrub cover has releaved. All of these were carefully walked, in some cases several times, as residual ice and snow cleared in portions of the paths.

The soil at Ianamaskum is sand mixed with small gravel. Larger rocks are absent except where cultural activity has led to their placement and for geomorphological reasons where they occur as rockfall immediately below the section

adjoining the rise to the ridge above, the latter forming part of the westward flank of the Tshumushumapeu valley.

The Ianamaskum survey was almost entirely a surface inspection exercise with *minimal sub -surface* investigation. The area was not gridded nor systematically test pitted. As explained above, alder and other vegetation growth made it impossible to see clearly more than a small sample of the total area. Small patches of



Figure 3. Ianamaskum 6 exposure showing cryoturbated ground mixed with abundant small Ramah flakes.

ice remained in some sections of the caribou paths. Finally in those parts of the Ianamaskum level closest to the slope edge, a snow bank which had formed over winter on the lee facing side remained until June and the obscured area could not be included in the survey. *Ianamaskum results*

The constraints noted above notwithstanding, the exercise undertaken demonstrated the potential for further work in this area. It would be surprising if such a hunting and camping "hot spot" had not produced evidence of its use. Six cultural loci were identified. Three of these were aggregations of fire cracked rock but with no surface visible lithics. Three others showed scatters of Ramah Chert flaking debris. Curiously, the earlier noted white quartz was not found. Presumably it happened to lie under one of the few patches of remaining ice and snow or the place where it lay had become vegetated since it was first reported. Of the three loci with Ramah lithics one (Ianamaskum 6) is located not on the Ianamaskum level but on a small terrace halfway up the slope above.

Unlike the other loci, the small Ianamaskum 6 terrace is either lightly vegetated or actually bare ground. It showed evidence of severe recent cryoturbation and had by far the most abundant scatter of



Investigation of the Unkueiu site (GlCs-09)

The Unkueiu site is set atop a moraine on the north side of the Kamestastin outflow. It was noted during early surveys at Kamestastin but was not properly recognized or understood until 2013 when a wood charcoal sample from the most prominent part of the central combustion feature returned a date of 710 RCYBP +/-30 years (371644 Beta Analytic.) The remains of the *hearth* were much less than remarkable looking prior to their partial excavation and even once "cleaned up" could quite easily have been overlooked by a passerby.

Almost entirely defined by the presence of bone scattered around what subsequently came to be understood as a somewhat dispersed linear hearth, lithics were, apart from very isolated occurrences of broken white quartz, almost entirely absent from the hearth and its immediate surroundings. Set off to one side a single large boulder was surrounded by a scatter of small quartzite chips. These were not flakes from tool making or sharpening but small shatter of the sort to be expected if a quartzite tool struck the boulder in the course of performing some other task, perhaps the splitting and breaking open of caribou leg



bones.

The first step in the investigation of this site took place several years previously when a single meter square test unit was placed over an area from which pieces of caribou metatarsal and metacarpal bone in association with charcoal were noted protruding through grass tufts. The grass was stabilizing this part of what looked at the time like a modestly sized combustion feature. The unit produced abundant bone including well burned small bone mash fragments and generous deposits of charcoal. A sample of wood charcoal from this unit was collected and in 2013 produced the 710 +/-30 RCYBP AMS date which is referenced above.

In the spring of 2014, partly prompted by the new knowledge of the hearth date, an effort was made to better

Figure 4. Unkueiu site with linear hearth feature outlined with flags.

understand the Unkueiu site. As a first step, work began on defining the extent of the hearth, its charcoal and fire cracked rock spread and the position and nature of the associated bone. This was mainly accomplished by careful sweeping and trowelling away of the small, loose gravel and sand which obscured the feature and its surrounds. This exercise revealed a better defined linear hearth about 6 meters in length, composed of fire cracked rock, charcoal stained sand, wood charcoal, bone mash fragments, and larger pieces of caribou metacarpals and metatarsals, the diaphyses of which had been cracked laterally. The spread of fire cracked rock and other materials was lozenge shaped with the greatest width close to the mid-point. The combustion feature tapered towards the ends where fire cracked rock stopped altogether but charcoal stained ground continued for about another meter at both the western and eastern termini.

Atikupmin and Innu rules governing disposal of caribou bones: implications for the Unkueiu site

There are fairly uniform Innu rules which dictate the procedures for treatment of caribou leg bones. They are in summary: the major long bones, (humerus, radio-ulna, tibia and femur) are subject to strict rules governing their ritual treatment and disposal. The listed long leg bones must be scraped clean of meat and underlying membranes, until they are almost whitened. The oil bearing nubs (epiphyses) from these bones are broken off crushed into a paste and boiled in water to extract oil. The bone mash fragments are drained and put into the fire. If the quantities are so great as to make it impractical to place all of the fragments into the fire they may be placed in the water or even in a designated spot on land. Sometimes if food shortages occur later, such deposits may be recollected and boiled again to extract any remaining oil. The shafts (diaphyses) between the nubs are cracked open, the marrow removed, cut into small pieces and then mixed with the rendered oil, the mixture being placed in a container, covered and put aside to set. The bone broth from the boiling of the crushed bone ends is served with the ritual meal or mukushan, which in addition to the atikupimin, whose preparation has been explained above, will also feature the boiled tendon rich muscle bundles attached to the lower leg bones. The long bone shaft fragments from the process of cracking open the sacred long bones to obtain place. Finally it was commonplace until recently to

the marrow are placed in the waters of a lake, pond or river. The metacarpal and metatarsal bones, those long bones attached to the hooves, are exempt from the ritual treatment described above. They can be broken open outside of the ritual governing the other long bones and the oily marrow eaten either alone or chopped up and rolled in powdered dry meat. Disposal of the nubs and shaft fragments from the metacarpals and metatarsals is casual: they may be put in the fire or disposed of elsewhere with other caribou bones (such as ribs) which are considered less imbued with power. This description has been offered so as to place the bone assemblage in and around the Unkueiu hearth in cultural context.

By far the largest stone in proximity to the Unkueiu hearth is a single boulder just to the north of its western end. It was surrounded by quartzite chips or shatter at the sort of distance one would expect if the boulder had been used as an anvil for splitting caribou long bones with a quartzite implement (a band of *about* 30 cms around the rock where this debris had fallen.) The only piece of Ramah noted anywhere on site (a small flake) occurred amongst this quartzite debris on the boulder's hearthward facing side.

By all appearances what seems to have occurred on the boulder is preparation of leg bones for both immediate marrow consumption from the metacarpals and metatarsals and for the *atikupimin* (derived from the marrow and oil of the other leg bones) for serving at a mukushan, the ritual communal meal of thanksgiving to the caribou god. Apart from bone mash fragments left over from crushing long bone ends and which appear as dense deposits inside the hearth, some possible ribs and a few teeth, all the readily identifiable bone comes from the uncrushed ends and split shafts of caribou metatarsal and metacarpal bones. As one would expect in an Innu context, there are no identifiable whole ends of humerus, tibia, radioulnar and femur all of which should, according to Innu protocols still followed today, be crushed and boiled for atikupimin. Absent are identifiable fragments from the larger upper leg bone shafts whose treatment is governed by rules stipulating proper disposal in water and of course from the oil bearing epiphyses of these same bones which would have to be crushed and, following boiling to extract oil, disposed of in the fire-



Figure 5. Penute Pukue Jr preparing caribou long bones for mukushan, Border Beacon 2008.



Figure 6. Possible anvil stone adjacent to Unkueiu hearth and surrounded by quartzite chips (the small white objects in this photo).



Figure 7. Unkueiu site with linear hearth limits marked with flags. Grid string corners are also marked with red flagging tape.

also crush the vertebra for the same oil rendering purposes. The absence of caribou vertebra as recognizable elements in the bone assemblage is noteworthy and corresponds to established Innu practise with regard to these bones.

Conclusions - nature and significance of caribou bone remains and distribution.

Preliminary though these conclusions are (the hearth itself is not yet excavated to sterile), it is remarkable to this author how sharply the Unkueiu bone assemblage seems to conform to patterns observable in much more recent Innu sites and indeed to those from contemporary Innu camps where caribou bone handling practises are governed by the same prescriptions. Put another way, the protocols governing treatment of the different categories of caribou bones and caribou bone products (i.e. bone mash) seem to have been followed by the occupants of this site in a man-

ner not appreciably different from that observed at late 19th century Innu sites and during preparation of the sacred meal of atikupimin and tshisheuana by contemporary Innu practitioners of these rites.

These preliminary findings are strongly suggestive of the site being occupied by a group with elaborate practises around ritual disposal of caribou bones, from all appearances identical to present day Innu. Accordingly it is not too much of a stretch to infer that the occupants of Unkueiu would very likely have spoken an Innu dialect and have practised an Innu culture recognizable to the generation of Mushuauinnu who grew up before sedentarization.

The faunal remains at Scott Neilsen's FeDn-01 site at *Ashuanipi* (Results of Faunal Analysis from Two Sites on Ashuanipi Lake, Eliza Brandy, June 2009 – unpublished report) though sparse when it comes to recognizable fragments of caribou bone seem to echo

(or at least do not contradict) the impression given by Unkueiu that suggest practices around the disposition and handling of leg bones consistent with the cultural norms of more recent Innu, including the practises of today. Scott has two dates from FeDn-01 from different levels representing what is probably a reoccupation of the same site. The earlier one places that occupation sometime between 780 and 670 BP, the later sometime between 680 and 540 BP, both calibrated date ranges. These dates make FeDn-01 a close contemporary of Unkueiu. Only four caribou bones retained the epiphyses and all four were metacarpals or metatarsals in conformity with what one would expect from occupants belonging to a people with the rules governing handling of caribou leg bones familiar to contemporary Innu. Apart from minute fragments, no epiphyses belonging to leg bones other than metacarpals and metatarsals were identified and the hearth contained bone mash fragments which one assumes are either from bone nubs from the upper long bones or from vertebrae which up until recently were also crushed for oil extraction.

Work at Mistanipi (a large lake to the west and north west of Kamestastin) in the fall of 2014 investigated sites at a major caribou crossing there. Most of these appeared to be late 19th century and early 20th century Innu camps and the bone disposal pattern again echoed that at Unkueiu. Hearths contained deposits of bone mash fragments and the only intact caribou epiphyses seemed to be those from metacarpals and metatarsals.

It's worth mentioning that much older Innu ancestral sites at Kamestastin dating up to 6000 years BP also show ritual disposal of bone mash fragments either in the hearth or in immediate association with it (e.g. Tshetshuk, Tuamish, Uitshitshemushish Loci 1 and 3, Tshumushumapeu Nashapetamit, Natakameimupan).

Lithics at Unkueiu

The very sparse lithic debitage at Unkueiu is noteworthy both for its extreme paucity and the near total absence of Ramah chert. The meaning of this is not immediately clear though the date returned on wood charcoal for the Unkueiu site places it around



Figure 8. Mistanipi-07 c 1900 Mushuauinnu caribou crossing site on the south side of Mistanipi East Arm. Bone deposit in situ outside Innu house possibly from a hearth clearing event.



Figure 9. Assemblage from caribou bone deposit outside Mistanipi-07 house; although dominated by metacarpal and metatarsal epiphyses and shaft fragments, it also contains a hip bone fragment, two mandible fragments and assorted bones from the hoof structure.

the time that newly arrived Inuit were establishing themselves on a coast previously the preserve of Innu ancestors, Innu and Tunit/Dorset. It is also possible that the Innu caribou hunters associated with the site were using lances tipped with bone points. All the same one would have expected at least some sharpening flakes of Ramah associated with tool maintenance and butchering activities.

Final remarks (for now.)

Paradoxically, perhaps the chief notable characteristic of Unkueiu is its low visibility. For an apparent structure with a linear hearth within of at least 6 meters, it was, admittedly partly on account of the absence of lithics, not immediately recognized for what it was. The hearth did not rise prominently above the surrounding surface and it is possible that some of the material and fire cracked rock had been scattered by

passing caribou companies. If it were not for the scattering of metatarsal and metacarpal fragments and the probable anthropogenic grasses growing sparsely in the center of the bone distribution, it is possible that the feature may have gone unrecognized for even longer. At each end of the hearth, charcoal stains spilled over from the combustion feature proper. All this begs the question as to whether the near invisibility of the sizeable hearth feature at Unkueiu is exceptional or conversely a not uncommon phenomenon. It goes without saying that had the feature been liberally scattered with Ramah chert flakes or other lithics, we would probably not be pondering this "low archaeological visibility." Investigation and further analysis of the Unkueiu site and its (mainly) faunal assemblage continues.



Figure 10. Atamanasesish Matshateu site. Sticks with flagging tape mark surface visible elements (fire cracked rock aggregations, flake concentrations, tools, quartz scatters etc).

The preparation of oil from long bone epiphyses and vertebra is a practise that has a worldwide distribution and has been especially employed as a way to extract extra fat in environments where conditions militate against easy access to them (for example in interior Quebec-Labrador.) Where cold climates are harsh enough fats so extracted can sometimes play an essential nutritional role. But it is not simply the dietary function of oil rendered from bone that is at play at the Unkueiu site and other recognizably Innu sites where caribou had been killed and consumed. The social and cultural elements of practises around oil rendering from caribou bones had, amongst the Innu, a socially affirming function, not only amongst the members of human communities but between the Innu society and the animal one represented by caribou and its deity. In the reading of the arrangement and disposal patterns of bone remains at Unkueiu and similar sites we can see practises and the operation of bone handling protocols which play major roles in defining and reaffirming the identity of the Innu. Pivotal to that identity is a relationship of respect and awe towards the caribou and their governing deity.

Atamanasessish Matshateu

The Atamanasessish Matshateu site is a clustering of cultural features, lithic scatters and stone tools discovered fortuitously during a visit to an ice fishing spot at a point on the north western shore of Kamestastin in the spring of 2014. For reasons unexplained, these cultural remains were missed during earlier archaeological surveys. It is just possible that active wind erosion may have only exposed them recently. Eight separate loci were identified including quartz scatters, concentrations of fire cracked rock, tools and flaking debitage of Ramah Chert. The visit, in the course of which the cultural elements were noted, was brief. Deteriorating ice conditions meant that the site could not be revisited during that season because of a rapidly widening lead of open water which threatened the remaining snow ramps used by skidoos to gain access to the adjacent shore.

Shanapeushipis Red Ochre Sources

Skidoo borne parties from Kamestastin have previously reported what appeared to be exposures of red *haematite* in the cut made by Shanapeushipis, the main river which flows into the south side of Kamestastin. The largest of these on the south bank of the river shows as a wide swathe of strikingly red



Figure 11. Haematite exposure in bank of Shanapeushipis visible just above the skidoo windshield. The location is a little more than a 1000 meters from where the river enters Kamestastin.

material cutting obliquely across the rock face which forms a bank in thespot where it appears. On the opposite side but a short distance downstream, another occurrence appears of what may be a continuation of the same geology. At the time of first discovery, this latter deposit was the only one which could be approached safely and we climbed up the bank and looked at (and felt the texture of) the red mineral material. The material examined at the deposit we could reach was pasty in texture when rubbed between fin-

ger and thumb. The visit was a hurried one as it was made in the course of a trip to the group of lakes that lie midway between Kamestastin and Border Beacon. Unfortunately no G.P.S. readings were taken at the time.

On May 1st, 2014, another attempt was made to reach the main deposit noted earlier. Unfortunately, snow drifts obscured the sections of river bank where the large haematite showings had been noted. However two smaller occurrences were *spotted* further downstream, GPS coordinates taken and a sample from the larger of the two collected. This latter deposit was only a short distance from the river outflow into Kamestastin and the crumbling rusty material sat in a small shallow concavity. It was of a coarser grained consistency than the material examined on the earlier trip. Whether or not any of the haematite occurrences noted along the Shanapeushipis watercourse were used by Innu ancestors cannot at this point be demonstrated. Ochre does occur in many of pre-contact sites at Kamestastin, often merely as dramatic red stains on occupation floors but sometimes as actual nodules associated with these stains. Chemical analysis of these nodules may answer the question as to whether their source is somewhere along the Shanapeushipis.

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Figure 12. Shanapeushipis Unamen B. "ochre" exposure in western bank of the river.

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EXHIBIT B



EXHIBIT C



THE ARCHAEOLOGY AND ETHNOHISTORY OF A DROWNED LAND: INNU NATION RESEARCH ALONG THE FORMER MICHIKAMATS LAKE SHORE IN NITASSINAN (INTERIOR LABRADOR) Author(s): Stephen Loring, Moira T. McCaffrey, Peter Armitage and Daniel Ashini

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THE ARCHAEOLOGY AND ETHNOHISTORY OF A DROWNED LAND: INNU NATION RESEARCH ALONG THE FORMER MICHIKAMATS LAKE SHORE IN NITASSINAN (INTERIOR LABRADOR)

Stephen Loring, Moira T. McCaffrey, Peter Armitage and Daniel Ashini

During the last decade the practice of archaeology in the boreal forest of the eastern Canadian Subarctic has undergone profound change. Most significantly much of the research conducted in the region is now characterized by the active participation, guidance, and involvement of First Nations' communities in the whole spectrum of archaeological research from research design through field work and analysis. The resulting "community archaeology" often has a significant ethnohistorical and ethnological component reflecting both community interests in the recent past and a strong humanist paradigm that blurs the distinction between archaeology and history. Research sponsored by the Innu Nation in the Smallwood Reservoir region of central Labrador is an example of such collaborative research and resulted in significantly expanding the knowledge of recent and former land-use in the region prior to its inundation by a massive hydroelectric project in the 1970s.

Anthropological research in the North has a long history of collaboration between researchers and Aboriginal peoples; but until recently this collaboration, for the most part, has been directed by the visiting scientists. While Aboriginal communities have affected the outcome of research through their cooperation and insight, their direct involvement in defining the scope of work and directing its progress is a relatively recent phenomenon. Now new collaborative approaches to research are occurring in the broader context of the struggle by indigenous peoples for their rights to land and self-determination (Davidson et al. 1995; Lee 1992; Nicholas and Andrews 1997). Perhaps the most important direction in northern anthropology has been the incorporation of a multi-vocal view of the past, and a realization that the past is in part a construction of the contemporary social and political climate (Wylie 1993).

In northern Quebec, archaeological practice and aboriginal consciousness about archaeological resources were affected in a major way by the onset of massive hydroelectric development projects in the early 1970s. Although "southern" archaeologists planned and managed most of the research and fieldwork linked to these projects, Native people, in particular the Cree, have been important collaborators. At first Cree families and archaeologists spent summers living and excavating together, a situation that encouraged meaningful exchanges and enhanced archaeological interpretations. Over the past few years the Cree have played an ever-increasing role in defining archaeological research orientations in their territory (Denton 1996; Martijn 1998:176-177). In Labrador, the advent of collaborative work is much more recent (Loring 1998; Loring and Ashini 2000). This report documents a collaborative research project conceived and sponsored by the Innu Nation¹ out of curiosity about whether any archaeological sites survived flooding by the Churchill Falls Hydroelectric Project (completed 1971) and concern about the invisibility of Innu history in interior Labrador.

PROJECT INSPIRATION AND GOALS

The project was designed as a preliminary survey of a part of *Nitassinan* (interior Quebec- Labrador) that has, to date, received little archaeological attention (Figure 1). The research was initiated by the Innu

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Figure 1. Map of central Nitassinan (interior Labrador, Canada), area of the Smallwood Reservoir overlain on the previous Lake Michikamau shoreline. Area of Innu Nation sponsored archaeological research August 1995.

Nation in order to acquire ethnohistorical and archaeological data to document evidence of Innu land use in the former Lake Michikamau and Lake Michikamats (*Mishikamau* and *Mishikamass* in *Innu-aimun*²) region of the central Labrador plateau. Prior to its inundation the area was a hub of Innu trading and travel routes that spread throughout a large portion of Labrador and northern Quebec. The project sought to assess the consequences of the construction of the Smallwood Reservoir on cultural resources and to determine the potential for future research in the region.

Impetus for the project was in part a result of interest by Innu elders in Sheshatshit who had identified the region as an important gathering place, a rendezvous and a nexus of interior Labrador travel. Located near the geographical center of Nitassinan, the Michikamau/Michikamats region has long figured significantly in the lives of Innu. It was an important meeting place for Innu families scattered across northern Quebec-Labrador, bringing together family bands hunting to the north in the Ungava Bay drainage, to the east in regions draining into Lake Melville and the northern Labrador coast, and to the south on the Quebec North Shore (see André 1984:103). An Innu elder, Sylvestre MacKenzie, interviewed by Frank Speck in 1924, told how his band would leave Sept-Îles early in August to arrive at Michikamau in early October from where the families would disperse to hunt and trap (Speck and Eisley 1942:234-235). The ability to travel quickly across Nitassinan is an integral feature of Innu life. In fact, it has been suggested that the Innu's remarkable skill in traveling across the interior forests and barrenlands has figured significantly in the maintenance of

their social identity (Mailhot 1997; Loring 1992). Epic journeys and the ability to travel far and fast were one source of prestige in traditional Innu society (Henriksen 1973).

The former Michikamau region, especially its northern portion about Michikamats Lake and the height-ofland, were important locations for caribou hunting. Atiku (caribou) are an integral component of Innu identity, especially for the Mushuaunnut (Barren-Ground Innu), and figure significantly not only in their settlementsubsistence strategies (Loring 1997) and their material culture (Burnham 1992; Van Stone 1982, 1985; Webber 1983, 1988), but also in their oral histories and cosmology (Speck 1935). The most sacred features of Innu life, respect for the spirits of the slain animals (Armitage 1984, 1990:131-133, 1991:78-79), and the spiritual aspects of the mokoshan (Henriksen 1973) and the shaking-tent ceremony, are all intimately linked to caribou. As life in northern Nitassinan is tenuous at best and has always revolved around the movements of caribou herds, it is not surprising that important caribou hunting locales figure significantly in Innu land-use strategies.

For the most part, the intimacy and focus of the relationship between Innu bands and caribou, sequestered by



Figure 2. Innu log-walled cache on the headwaters of the George just north of Michikamats, photograph by Mina Hubbard (Hubbard 1908).

the formidable geography of the Quebec-Labrador peninsula, has escaped the notice of Western observers. The anecdotal accounts of a few explorers only hint at the central significance of caribou, and the places where caribou could be obtained, to the success of Innu life in the interior. For example, the American explorer Mina Hubbard provides a dramatic account of the caribou migration which she experienced in the Michikamats region during early August 1905 (Hubbard 1908:161-166). William Brooks Cabot (1912), Boston "brahmin" and avocational ethnologist, provides a brief but poignant description of Innu life at the turn of the century when caribou were plentiful. On their separate expeditions to map the George River in 1905 both Mina Hubbard (1908:180-181) and Dillon Wallace (1907:129) describe large log-walled caches containing equipment and supplies that the Innu built at their camps near Michikamats (Figure 2). Such carefully prepared structures testify to the seasonal significance of such localities in Innu scheduling and decision making.

In consideration of conducting research in the northern Michikamau area, the Innu Nation was anxious to determine if any cultural resources had survived inundation caused by the Churchill Falls Hydroelectric



Figure 3. Location of Innu bands in the 1920s according to Frank Speck and Loren Eiseley (1942: 216).

project in the early 1970s. The Innu expressed concern that archaeologists have payed too little attention to research in the interior of northern Labrador, leaving the impression that this vast territory was only lightly or sporadically occupied, this despite ample evidence of prehistoric occupation of long duration in nearby parts of Quebec (ARC 1985; Cérane Inc 1995; Chevrier 1986; Denton 1988, 1989, 1994; Denton and McCaffrey 1988; McCaffrey 1987a, 1989; Samson 1975, 1978, 1983).

INNU HISTORY IN THE MICHIKAMAU-MICHIKAMATS REGION

The available ethnographic and ethnohistorical evidence, augmented by Innu oral testimony, demonstrates that the Michikamau-Michikamats region, located near the geographical center of Innu

territory, has long figured significantly in the lives of Innu people. The region was an important meeting place for Innu families who resided throughout the territory, and the hub of a complex web of travel routes (Mailhot 1997:138). Innu Nation land use mapping reveals numerous travel routes converging in the Michikamau Lake area. According to the late Sylvestre Andrew from Sheshatshit:

This was a good land, and truly Innu land. It's where the Innu were raised and survived by fishing and hunting. It was a good area for trapping....The Innu from Sept-Îles, Sheshatshit, Fort Chimo, Davis Inlet, and the Quebec North Shore all used to meet at Michikamau. When all the people met together, there was always a big feast called the *mukushan*. It was *mukushan* because all the Innu ate together and enjoyed each other's company.... Michikamau was located right at the centre of a hunting area. The Innut used to hunt ducks there, in particular a duck called *apishtiss* [Brant]. It's said a lot of those were killed. (Antane and Kanikuen 1984:29-32)³



Figure 4. Sylvester MacKenzie (Michikamau Innu), photographed by Frank Speck at Sept-Îles, Quebec in 1924. Photograph courtesy, National Museum of the American Indian, Smithsonian Institution, Neg. #N12038.

During the 1800s, the Michikamau-Michikamats area was the home of a distinct grouping of Innu people referred to at the time as the *Mishikamaunnuat*, or the "Great Lake People" (Mailhot 1997:172; see also Speck and Eiseley 1942:234). This grouping was one "band," a group of closely related families that identified with a particular part of the territory, among many such Innu groups spread across the Labrador-Quebec peninsula. Band members were also closely related to people in other bands, marriage was mostly exogamous, and a great deal of immigration and emigration occurred, particularly after European diseases seriously disrupted Innu demographic patterns in the 1800s (Mailhot 1997:122-123). Figure 3 shows the approximate location of Innu bands in Labrador and eastern Quebec in the 1920s as envisaged by anthropologists Frank Speck and Loren Eiseley (Figure 3).

Speck interviewed Sylvestre MacKenzie, "chief" of the Michikamau band, at Sept-Îles in the 1920s (Figure 4). From his description, Speck and Eiseley (1924:234) prepared the following account of the band:

The area of land usage traditionally preempted by its members in support of life centers around this immense body of water which lies considerably north of the Height of Land. The Michikamau horde is apparently the most integrated of the groups living in the central interior of the peninsula. The isolation of their habitat and the recency of their emergence from solitude into the confusing *milieu* of life at the Hudson's Bay Company's post at Seven Islands have tended to preserve their social independence....Sickness introduced by contact with the coastal populations has also begun to have its effects. The cohesion of the band depending largely upon caribou for food is nevertheless noticeable by contrast with others who hunt in segregated family fashion over a larger part of the year. The authority of its chief, Sylvestre Mackenzie, a leader by nature of his personality, authoritative and practical-minded, is pronounced, and may be a contributing factor to the unification of the horde....The Michikamau Indians live and hunt almost continually as a

community of grouped families. Only when pressed by famine do they separate and live upon small game. At other times it is the caribou that supports them....Until recent years this band went to Northwest River for trading purposes. Now its members in one large company make the long and dangerous descent from their distant lake to the post at Seven Islands by way of Menihek Lake, Ashwanipi Lake, and Moisie River each year.

A decade or so after Speck spoke with MacKenzie, the Finnish geographer, Vaino Tanner, visited the Michikamau Innu at the head of Grand Lake, near North West River, Labrador. Tanner refers to these Innu as "Grand Lake or Mishikamau Indians or Mishikamau band" (1944:608, 615-616; Mailhot 1997:44). He reports (1944:627) that when freeze-up came to Lake Michikamau these Innu would:

lay up and cover their canoes, take to their snowshoes and tabanasks [toboggans] and lay out traps for the fur-bearing animals. These Indians, too, get their food chiefly by hunting and ice-fishing. Then, already after a month or two, they go down to North West River to exchange their furs for food and other necessities, and then, dragging their heavily loaded tabanasks, they return to Mishikamau where the younger ones have been watching the traps.

The testimony of Innu elders, as well as ethnohistorical data derived from the account books of Hudson's Bay Company (HBC) traders, indicates that the Michikamau/Michikamats area was a cross-roads for Innu traveling to various parts of the Labrador-Quebec peninsula to trade. A number of Innu who traded at North West River, Mingan, Sept-Îles, Fort Chimo and Davis Inlet traveled through the area and harvested various wildlife species while there. Mailhot reports that an HBC post was opened at Lake Winokapau in 1865 "to supply those Mingan Innu who hunted higher up the Churchill basin, as far as Lake Michikamau" (1997: 23). Many years later, in the winter of 1945, the last Innu shaman associated with the Davis Inlet Post, Meshkana (a.k.a. Sam Rich), traveled to Michikamats by foot via Lac aux Goelands with his sons Raphael, George and David. The group camped on the eastern shore of the lake for two weeks before heading back in the direction of Davis Inlet (Raphael Rich interview by B. Sakauye and G. Gregoire, 18/4/1979).

In 1937, V. Tanner interviewed Pierre Gabriel who was associated with the Moisie (formerly Petitsikapau) band. Gabriel reported that upon leaving Sandgirt Lake in the fall, members of his group spread out in different directions: "away to Mishikamau Lake and even to the Notaquanon River or the Hamilton River. While waiting for winter to set in Pierre himself generally paddles away to the mysterious hunting-grounds around the sources of the George River...but sometimes he goes trapping to Mishikamau Lake or down the Hamilton River" (1947:617-618).

Sandgirt Lake may well have been an important gathering site for the Innu people; a place for a "spring rendezvous, preparatory to the journey to Seven Islands [Sept-Îles]" (Harper 1964: 59). A second location, at the northwest corner of Michikamau, was also a significant rendezvous site for Innu families and is discussed at greater length below.

Testimony from Innu elders in the context of several land use and occupancy studies conducted by the Innu Nation supports the idea that the Michikamau region was significant in the lives of many Innu people until quite recently. Unfortunately, map biographies that were generated as part of these studies were intended to document the "extent" of Innu land use in the Labrador-Quebec peninsula and were prepared at a scale of 1:250,000. As a result, useful details such as the locations of camps, caches, grave and birth sites were not recorded with consistency or accurate geo-referencing.

A mapping project conducted in 1980 by Innu students at 1:50,000 scale did generate travel route, camp location, place name, birth and grave site data; but the Michikamats area was not included as 1:50,000 NTS maps for this area prior to flooding by the Smallwood Reservoir were not available. The 1980 researchers did identify the location of a large Innu cemetery at the eastern outlet of Michikamau, where it flows into the former MacKenzie Lake, in addition to the birth place of Pien Joseph Selma just south of *Petshikapush*-

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kau on the way from Michikamau to Lobstick Lake (Sakauye et al. 1980).

While the spatial data generated by the above mentioned studies would not address many questions of interest to archaeologists, such as accurate geo-references for camps, graves and portages, they are accompanied with testimony that helps to put twentieth-century Innu history in the region into its cultural context. The following accounts are derived from oral histories recorded as part of the Innu Nation land use and occupancy data base concerning Innu life in the Michikamats/ Michikamau region (Sakauye et al. 1980). This testimony deals with travel through the region, the type of economic activity conducted there, times of hardship, and spiritual or cosmological associations with the land.

Madeleine Michelin (interview by Peter Armitage and Bart Jack Jr., 6/7/1993, translation by Daniel Ashini)

We used to go there [Michikamau] in the winter by sled. And also at George River...We met Mushuau-Innuat [Barrenground Innu] there, traveling to the coast...We used the George River to go there...We traveled to the coast, to Davis Inlet...Then in the spring, we went back into the country. We arrived back to Michikamau, later in the spring. Later on, we traveled by canoe. And then we made it to Michikamau...that's where our father used to set his traps...he trapped anything, like otters, beavers, and muskrats...He also went after the fish. And we used to dry the fish there, those we would eat. There wasn't anything else to eat, like flour...I remember very well because we were always there at Michikamau in the winter...we would leave from Sept-Îles and we would arrive there at the end of October...the travel route to Sept-Îles was very beaten down.

Mary-Adele Andrew (interview by Peter Armitage and Pien Gregoire, 21/9/1993, translation by Daniel Ashini)

I remember a long time ago. We were very hungry when we were in Michikamau...I was small but I remember when some people went for supplies to Davis Inlet. There were old people present. We stayed in a big tent at Michikamau. People were very hungry...It was winter. The ice would have been too thick for fishing in that lake. People went for supplies to Davis Inlet. The *shaputuan* which was made and lived in by the Innu was totally covered in snow. When people ran out of food...everyone stayed in one tent.

Simon Michel (interview by Alexander Andrew and Brenda Sakauye, 12/2/1979)

The route we used in those times from Seven Islands to Ashuanipi along that river to Menihek where we turned to the Michikamau direction.... And along here (Nascaupi River) we traveled down all the way to Grand Lake. We encountered many rapids so we had to use portages many times. It was summer when we started off from Seven Islands and then it was winter in Michikamau (stayed there) until they decided to move to Northwest River. And then we went back again in the spring and we would stay in the Michikamau region. Again where we set out traps....Some Indians took other routes to the Michikamau region depending on the year.

Joseph Nuna Sr. (interview by Alexander Andrew, 5/3/1979)

At Michikamau in spring time there were a lot of geese and ducks, and the same at Minipi Lake. We used to get ducks and geese in the spring time....At Michikamau Lake was the place where fish of all kinds were very plentiful, and at Park Lake, at Mealy Mountains.

Jean-Baptiste Penunsi (interview by Alexander Andrew, 1979)

I was born at Sept-Îles and hunted there when I was young. When we came from Sept-Îles to Northwest River, we started off in the fall. The travel route we used was through Ashuanipi, Menihek, and Nekanikau [Sandgirt Lake]. We then went across Michikamau Lake to where the Nascaupi River starts....A few detours were made because of frequent encounters with big rapids.

Michel Pasteen (interview by Raphael Gregoire, 23 /3/1975)

I've been to Michikamau once. We found out while there that there had been a store there. That place is called Petitsikapau. I would like to mention that there was a store above the [Churchill] falls and at Winokapau. This is the story of the very old people. These were some of the people who helped to transport goods from Northwest River. Usually two big boats and some five to ten canoes were used. Portages were used most often. After the delivery of goods, then they went trapping and the Hudson's Bay Company manager stayed to manage.

Daniel Pone (interview by Mathieu Rich, 24/3/1975)

All the headwaters of the Nascaupi River have been our common hunting and trapping grounds – my father and grandfather used to always occupy this territory. As for myself, I trapped all around it. We didn't trap beyond Michikamau. All Michikamau was caribou country in the summer.

The most prominent geographic feature in the Michikamau area is *Petshikapushkau*, a tall rounded hill that appears as an isolated peak along the western shore of the lake. In marked contrast to the surrounding low forested lake shore and open water expanses, the barren, glacially-scoured summit of *Petshikapushkau* makes a prominent landmark visible for many miles in all directions. It is not surprising that *Petshikapushkau* figures in the cosmology of the Innu people, as the following account by Madeline Micheline attests.

Madeline Michelin (interview by Peter Armitage and Bart Jack Jr., 6 July 1998, translated by Daniel Ashini)

They say the Frogman is still there...there's a mountain there, right...It looks like it has a porch...it's very beautiful...They say he claims this is his house...Those old men who performed the shaking tent. They must have used their powers. They say that's when he disclosed that he lives there [during a shaking tent ceremony]. And to throw an offering into the lake when it's windy. Then it clears up. Then it stops blowing. It would have to be something like...new cloth...It is said that he claims to sew this cloth to make more cloth or make it larger...so that his children would have clothing. It is said that he could still be heard when our grandfather, the late Meshkana was still alive...it is said that this is not a legend. It is the story of the Innuat from a long time ago....

HISTORY OF EXPLORATION AND TRADE

It is from a melding of archaeology, ethnohistory and Innu oral traditions that the history of land use and tenure in the interior of Labrador and northern Quebec will eventually be derived. For the present, the written, constructed past is the domain of the *akaneshau* and the *mishtikushu* (the "non-Innu", in particular anglophones and francophones), who by dint of archival resources and academic traditions have recorded

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their version of Innu history. A brief synopsis of the history of non-Innu exploration in the Michikamau/Michikamats region follows. We should be mindful that the observations of many of these explorers and travelers were predicated on the skills of their Innu guides, who brought them into the country, and brought them back out.

Perhaps the first Europeans to travel over the now flooded region were a pair of Hudson's Bay Company employees charged with finding overland supply routes for the new trading post at Fort Chimo in Ungava Bay (est. 1830). In 1834 Erland Erlandson passed through the Michikamau region traveling to and from North West River (Davies and Johnson 1963). Erlandson was impressed with the fur potential of the central interior, although in comparison to the canoe routes in western Canada, the obstacles to establishing interior posts were daunting. John McLean hurriedly passed through the region in February 1838 during a midwinter trip from Fort Chimo to North West River (McLean 1932). The following year, while exploring travel routes to Hamilton Inlet, McLean became the first European to "discover" the Grand Falls on the Hamilton (now Churchill) River (Cooke 1969).

During the summer of 1838, Erlandson established Fort Nascopie on Petitsikapau Lake to attract trade in the interior. Problems finding a supply route to the post kept it from operating until 1842, when the Hudson's Bay Company accepted McLean's suggestion to use a supply route he had explored from Hamilton Inlet (Mattox 1964:7). Subsequently Fort Chimo was closed, forcing the Innu to become "attached" to the post on Petitsikapau Lake.

Fort Nascopie proved to be a difficult and unprofitable post to operate, and post journals abound in descriptions of the misery and privation caused by the maintenance of this isolated station (Mattox 1964; McCaffrey 1987a, 1987b). In particular, communications, first with Fort Chimo then via North West River, required arduous undertakings that were at times impossible. As a result, tremendous problems were encountered both taking out furs and bringing in supplies and trade goods. In consideration of these problems and after numerous periods of temporary shut-down, the Hudson's Bay Company finally decided to close Fort Nascopie in about 1870. They had reopened Fort Chimo in the meantime (Mattox 1964:13).

The vagaries of post administration would have had serious consequences for Innu families had they chosen to rely exclusively on food supplies and ammunition obtained in the interior trade. This resistence to adopting a formal trading relationship and economy by the Innu was a great source of frustration to post officials (Cooke 1979), but it figured significantly in the maintenance of long-distance social networks (Mailhot 1997:19) and band mobility integral to the viability of Innu lifestyles.

A. P. Low of the Geological Survey of Canada criss-crossed the Quebec-Labrador peninsula making the first detailed maps and surveys of the region (Low 1896). During the spring and summer of 1894 Low's party made a rapid survey of the southern and central portions of Michikamau. He does not describe any specific Innu camps encountered in the course of his geological survey work, but it is apparent that he is familiar with the Innu use of the region. In particular, Low (1896:158-163) refers to Lake Michikamau as "the Great Lake of the Indians" and describes the three portages beyond the northern end of Lake Michikamats that "lead to a branch of the George River, where Indians of the region assemble in September to spear the caribou, which then cross the river in immense herds in the course of their annual migration."

In 1903 Leonidas Hubbard, an American sportsman and outdoor writer, attempted to traverse the Labrador peninsula from North West River on Hamilton Inlet to the mouth of the George River on Ungava Bay (Wallace 1905). Hubbard had hoped to rendezvous with the Innu at Michikamau but tragically he went astray of the Innu route, spent several months floundering about in the wilds of Labrador and ultimately died of starvation and exposure. His companion Dillon Wallace only survived by dint of the extraordinary efforts of their Cree guide George Elson. In one of the more bizarre annals of northern exploration, two years later, a pair of canoe expeditions set out to finish the work that Hubbard had left undone. One was led by Dillon Wallace (1907) and the other by Hubbard's bereaved widow Mina Hubbard (1908) who was accompanied by George Elson.

On August 2nd 1905, Mina Hubbard and her companions (George Elson, Job Chapies, Gilbert Blake,
Joseph Iserhoff) reached Lake Michikamau. Fearful of being detained by unfavorable winds the party quickly paddled north. They reached Michikamats on the 5th where they were delayed for two days by inclement weather. Underway again on the 8th they encountered a major caribou migration in progress. They reached the north end of the lake on the 9th from which they proceeded by canoe and portage into the headwater lakes of the George River. A month later, on September 7th, Dillon Wallace finally arrived at Michikamats. Three days prior, on the 4th, Wallace had reached Michikamau where he sent all of his party except a single companion back to Northwest River. Gambling all, he was racing the winter to Ungava (Davidson and Rugge 1988). Wallace saw no caribou, although signs of their passing were everywhere.

By 1920 much of the topography of Labrador had been described by European, Canadian and American fur-traders, missionaries and explorers, and although the natural resources (principally fur and fish) and the mineral and hydroelectric potential of the region were recognized, the logistical difficulties imposed by the country meant that the land remained primarily under Innu purview.

From the late nineteenth century until the beginning of the Second World War, Labrador Settlers (of European and Inuit descent) from scattered homesteads along the central Labrador coast and Lake Melville participated in an intrepid winter fur-trapping regimen that increasingly brought them into country that had hitherto been the exclusive hunting territory of the Innu (Mailhot 1997:27; Tanner 1944:705-706). In spite of these incursions, Innu families continued to utilize the land and its resources. For the most part Canadian federal and provincial administrators appear to have viewed the region as a wasteland whose potential resources could only be exploited pending future development of industry and infrastructure.

THE SMALLWOOD RESERVOIR

The construction of the Churchill Falls Hydroelectric Project was officially completed in July, 1971, when the Premier of Newfoundland, Joey Smallwood, pushed a button to close the gates of the Lobstick control structure. With this act completed, the flooding of Lobstick, Michikamau, Michikamats, Ossokamanuan and other lakes commenced resulting in the formation of the Smallwood Reservoir. Reaching its maximum level on August 8, 1974, the reservoir covered an area of approximately 6,645 square kilometers (2,566 square miles) (Haynes 1995).⁴ Eighty-eight dykes were built to impound the reservoir waters, thereby cutting off the headwaters of the Naskaupi and Kanairiktok rivers. The 75-meter-high Churchill Falls, known to the Innu as *Patshetshuna*, was reduced to a trickle, by-passed by massive penstocks used to feed water to the 5.4 megawatt power station. To supply power to consumers in central Canada and the United States, a 735 Kv transmission line was erected to the "Montagnais" station just across the Quebec border, a distance of over 200 km (ibid.; see Smith 1975).

As a result of the reservoir flooding, Innu people lost access to valuable territory. According to Innu elders, many canoes, traps and other harvesting equipment were lost, and two, possibly three, cemeteries flooded. Moreover, an important caribou calving ground north of the former Kasheshibaw Lake was inundated.⁵ Unforseen ecological consequences of the flooding of the Michikamau basin marshlands, forests and other terrain has been the resulting mercury contamination of fish and the loss of important nesting areas for ducks and geese (Goudie and Whitman 1987).

The Michikamau region received only limited archaeological attention prior to the construction of the Smallwood Reservoir. During the summers of 1967 and 1968, Donald MacLeod, working for the National Museum of Canada, carried out a brief reconnaissance of the area (MacLeod 1967, 1968). MacLeod's fieldwork was plagued by problems: poor equipment (leaky tents, inadequate rain gear, a 160 lb canoe, bulky suitcases), inaccurate maps, bad weather and Labrador's legendary insect hordes. The survey work was non-systematic and opportunistic, and it is not surprising that little was recovered. Nevertheless, based on discussions with Innu elders in Sheshatshit who were knowledgeable about travel routes and land use, MacLeod was able to locate several traditional Innu camping places (Heidenreich, pers. comm.).



MacLeod identified two sites on Kanekuanikau (Sandgirt Lake): Sandgirt Lake (FlDh-1) and Esker Island (FlDh-2). At FlDh-1, MacLeod collected large flakes and cobbles of a dark grey siliceous shale from the shoreline in an area "dotted with recent Innu camps." The collection is problematic as many of the objects appear to be unaltered stones. During a recent inspection of this collection, however, McCaffrey identified two flakes of Ramah chert and a retouched flake of jasper, confirming the presence of a prehistoric component. On a nearby island (FlDh-2) MacLeod noted more evidence of recent occupations. He recovered an old copper kettle similar to specimens found on the abandoned site of Fort Nascopie on nearby Lake Petitsikapau (Mattox 1964: plate 6).

On Kainipassua kamat (Lobstick Lake) at FlDe-1 MacLeod recovered artifacts attributable to a Maritime Archaic occupation (older than 3400 years). The assemblage includes a pecked and ground stone adze and a ground stone point with a triangular cross-section and four grooves across the base to facilitate hafting (Figure 5).

The largest site recorded during MacLeod's survey was located in the northernmost part of Michikamau just south of the narrows at the mouth of Lake Michikamats. The site (GcDc-1) was described as "probably the famous meeting place." MacLeod's field notes state that the site was close to the shore of a protected



Figure 6. Beamers or hide scrapers from GcDc-1, GcDc-1.21, 30, 31, collected by MacLeod.

embayment between two streams where at least eight old Innu habitation remains (both round and rectangular raised earthen-wall tent rings) were observed. Nearby, on a low terrace overlooking a stream, were five wooden tent frames.

MacLeod's surface collection from GcDc-1, stored at the Canadian Museum of Civilization, includes ceramic dish fragments, wooden stakes, iron objects, bird, fish and caribou bone, children's toys such as a small wooden bow and a porcelain doll fragment, wooden skin stretchers, and hide scraper made from a caribou leg bone (Figure 6). Unfortunately, no further archaeological work was carried out prior to the flooding of

the vast Michikamau region, despite MacLeod's urging that technical and logistical problems had greatly reduced the effectiveness of the survey.

1995 FIELDWORK NARRATIVE

The Michikamats reconnaissance took place between August 22-28, 1995. Archaeologists Moira McCaffrey and Stephen Loring joined anthropologist Peter Armitage, Daniel Ashini (Director of Innu Rights and Environment for the Innu Nation), and Innu elder Dominique Pokue and his son Charlie. From Churchill Falls the party traveled by pick-up truck to a dike on Lobstick Lake, and was then ferried by helicopter to the western shore of former Lake Michikamats.

Base camp was established on the north shore of a deep, sheltered cove in the southwest corner of the former lake. The camp locality provided the first high dry ground north of the stream at the former lake's outlet. Our Innu tent was perhaps the only inhabited structure within a hundred kilometer radius, yet almost instantly it transformed an imposing wilderness landscape into a familiar one. In this respect Innu archaeology, like Innu camp-life, is erected on cooperation and negotiation, with participants bringing their skills and resources to a common task. Invariably our evenings were long ones spent lounging on the spruce bough floor while our words and conversation sought out the intersections of archaeological practice and traditional Innu pathways. Our discussions included the use of oral history and place-names in constructing Innu identity and land-use. We talked about lithic tool manufacture and analysis techniques, about Innu burial practices, the nature of interregional exchange networks, about the power of shamans and the ways of animals, and about the practical side of archaeology, its funding, care and proprietary responsibilities towards collection management.

The country about the camp typified the region as a whole – a moderately dense boreal forest and lichen woodland. The Michikamats region is close to the tree line. With even a moderate elevation gain above lake level the trees give way to open moss-covered tundra. The damage caused by reservoir construction was readily apparent in the presence of timber "rafts," barriers of downed and dead trees, that marked at least two major reservoir stand-stills. Between the timber rafts and the 1995 reservoir shoreline was an open denuded strip of sand and rocks that would normally be covered by reservoir waters. It was soon apparent that 1995 reservoir levels corresponded *very* closely to pre-reservoir lake levels. Inundation of the near lake shore had resulted in the destruction of the lichen-moss forest floor and the thick organic component of the forest soils

to reveal the underlying glacial sands and gravel. A prominent wave-etched shoreline along the base of the Ptarmigan Point esker on the lake's eastern shore evidenced the high water stand of ca. 1981, approximately 2.2 meters above 1995 reservoir levels. There was an approximate 2.1 meter difference between the prereservoir level of Michikamau and Michikamats, which implies that when the reservoir is full the former Michikamau shoreline would be under approximately 4.3 meters of water.

As time did not allow an intensive survey of the region, 1995 fieldwork sought to target high-probability localities in order to get some impression of the potential for future, systematic, survey and documentation. For the most part the survey consisted of close inspection of the exposed near-shore strip left by the receded reservoir waters. Higher localities back from the waters edge, including knolls and eskers, were visited and tested, as were possible portage travel routes. As discussed below, cobblestone-lined hearths from nineteenth-century Innu tents were the most conspicuous archaeological feature identified by the survey party, although we did discover traces of pre-Contact occupations. Systematic survey work and rigorous testing strategies would be necessary to determine the full extent of prehistoric occupations in the region.

The 1995 Michikamats survey discovered traces of four prehistoric sites and seven historic sites (most, if not all, dating from the nineteenth and early twentieth centuries).

SITE DESCRIPTIONS

Michikamats-1 (GdDc-3)

Along the west shore of Michikamats, approximately 4 km north of the now drowned discharge of the lake, we discovered the remains of a deflated cobblestone hearth associated with a scatter of lithic artifacts and debitage lying on the exposed sandy beach. It is doubtful that the hearth would have been recognized without the associated lithic assemblage, since the hearth stones had "slumped" to their present position as the organic forest soils had been inundated and gradually washed away by reservoir waters.

That traces of the site remain at all is perhaps attributable to its original location on the lake shore immediately behind a prominent ice-rafted boulder barricade (Figure 7). From Mina Hubbard's account we know that she landed on the shore of Michikamats opposite GdDc-3. Hubbard commented on the boulder wall phenomena: "Here we found a peculiar mound of rocks along the edge of the water, which proved to be characteristic of the whole shore-line of the lake. The rocks had been pushed out by the ice, and formed a sort of wall, while over the wall moss and willows grew, with here and there a few stunted ever-greens" (Hubbard 1908:151).

Small flakes of quartzite and a few scattered tools were collected from a narrow band about 25 meters long that ran parallel to the beach. Scattered rocks, which seemed anomalous to the otherwise sandy beach, may be the remains of several hearths. The entire assemblage consisted of two preforms, two biface fragments and a utilized flake of fine-grained white quartzite, two chunks of battered fine-grained quartz, and 23 small flakes (Figure 8). At least four distinct lithic raw materials are represented in the flake assemblage: there is a single, transparent grey flake of Labrador Trough chert (McCaffrey 1987a, 1989), two flakes of Ramah chert from the Ramah quarries north of Saglek, and several pieces of probably locally-derived quartz. The remainder of the assemblage is a very fine-grained milky-white to smokey-grey quartzite that bears a superficial resemblance to both Ramah chert and Mistassini quartzite, but which is almost certainly derived from a third unknown source.

Due to the absence of clearly diagnostic tools, it is difficult to assign the site to a specific pre-Contact culture period. Square-based bifaces occur in both Intermediate Indian (ca. 3500 to 2800 B.P. [Nagle 1978]) and Late pre-Contact period (ca. 1800 to 900 B.P [Loring 1992]) assemblages. The debitage collection is of particular interest in that it contains at least four different lithic raw materials. The Labrador Trough chert flake, as well as the quartz and possibly the white quartzite are probably derived from local sources. The Ramah chert, on the other hand, is far from its point of origin on the northern Labrador coast.



Figure 7. Michikamats-1 (GdDc-3), view to south along west shore of Michikamats. The axe is placed near the center of the deflated hearth which was surrounded by the chipped stone assemblage. The prominent boulder-wall marks the former Lake Michikamats shore-line that is usually covered by Smallwood Reservoir waters.

Ptarmigan Point

Ptarmigan Point forms the western terminus of a conspicuous esker system which is over 10 km in length. It is a prominent sandy peninsula that juts out nearly a kilometer from the western shore of former Lake Michikamats (Figure 9). Situated approximately 8 kms north of the drowned discharge of the lake, the peninsula was once a popular camping place for Innu families. Today, the peninsula is completely submerged when the reservoir is full.

Cemetery Knoll (Ptarmigan Point-1, GdDc-2)

In 1905, Mina Hubbard and her party spent three days camped in the vicinity of the Michikamats eskerpeninsula. She described the locale in her book (1908:159):

To the south of the point was a beautiful little bay, and at its head a high sand mound which we found to be an Indian burying-place. There were four graves, one large one with three little ones at its foot, each surrounded by a neatly made paling, while a wooden cross, bearing an inscription in Montagnais, was planted at the head of each moss-covered mound. The inscriptions were worn and old except that on one of the little graves. Here the cross was a new one, and the palings freshly made. Some distance out on the point stood a skeleton wigwam carpeted with boughs that were still green, and lying about outside were the fresh cut shavings telling where the Indian had fashioned the new cross and the enclosure about the grave of his little one.



Figure 8. Michikamats-1 (GdDc-3) assemblage. 1-3: bifaces, 4: flakes of Ramah chert, 5: flake of Labrador Trough chert, 6: utilized flake scraper, 7:quartzite debitage.

The cemetery knoll is the western terminus of the Ptarmigan Point esker. Fluctuating reservoir levels have created an active erosional face on the slope overlooking the lake. At first glance we could find no evidence of the features noted by Hubbard. While walking along the foot of the knoll, however, Dominique Pokue noticed some small, weathered fragments of mammalian rib bones and a whittled piece of wood. Recognizing that the bones were neither caribou nor bear, Pokue called the discovery to our attention. Careful examination revealed a human cranium eroding out of the sand bank, about three quarters of the way up to the top. It was apparent that the entire post-cranial skeleton, except for the few fragments we recovered, had already eroded into the reservoir.

We gently exposed the cranium, noting that the body had once been aligned in a north-south position. Underneath the skull lay a "pillow" of matted material that Pokue identified as duck feathers. Also recovered in the general vicinity were fragments of cut wood with square-headed nails, possibly the remnants of a grave marker. In deference to Pokue's wishes, the human remains were carefully gathered and reinterred in the knoll some distance back from the eroding edge.

Ptarmigan Point-2 (GdDc-1)

Walking along the shore of Ptarmigan Point Mina Hubbard had noticed "a number of old camps" including the remains of one communal structure that was "a large oblong, sixteen feet in length, with two fireplaces in it, each marked by a ring of small rocks, and a doorway at either end" (Hubbard 1908:160). In walking over the devegetated landscape, the survey team located the remains of four cobblestone hearths and a tent ring on the south side of the peninsula overlooking the sheltered bay. Also noted was the remains of a "recent" camp, perhaps attributable to mineral or hydro survey parties sometime prior to reservoir



Figure 9. Ptarmigan Point esker and former Innu camping grounds, view to east from Innu cemetery on knoll. The exceptional low-water conditions of 1995 had lowered the Smallwood Reservoir levels to those approximating the former lake levels prior inundation in 1970. Figures in upper center are investigating the remains of Innu tentrings and hearths at Ptarmigan Point-2 (GdDc-1).

construction. A single flake of Ramah chert and a rusted iron knife were found adjacent to one of the hearths. On the north side, another stone hearth was identified associated with a scattering of quartz debitage (Figure 10).

The Ptarmigan Point hearth features are the most substantial archaeological traces recorded by the survey team. Another passage from Mina Hubbard's (1908:160) account of her visit to Ptarmigan Point is a poignant reminder of the ephemeral nature of Innu land-use, in this case epitomized by camps lacking even the faintest of architectural residues that might be perceived by archaeologists:

Near where we landed, close in the shelter of a thicket of dwarf spruce, was a deep bed of boughs, still green, where some wandering aboriginal had spent the night without taking time or trouble to erect his wigwam, and who in passing on had set up three poles pointing northward to tell his message to whoever might come after.

Michikamats-2 (GdDc-4)

The broad sandy point of land on the north side of the little inlet north of Ptarmigan Point was found to contain a number of cultural features. Wave action had created a stone cobble beach approximately 10 meters wide behind which a nearly level, now exposed shore extended approximately 40 meters to the edge of the driftwood raft marking the high reservoir level. Except for a few isolated "islands" of vegetation the whole point had been denuded and consisted of wind-deflated and now exposed sand and gravel. Along the shoreline we located four raised circular stone hearths, three of which remained *in situ* having been preserved



Figure10. Ptarmigan Point-2 (GdDc-1) hearth.

as part of a partially eroded vegetation mat (Figure 11). The largest feature (Feature 1) was an oval hearth 170 cms by 120 cms in diameter, while the smaller features were circular stone hearths between 80-90 cms in diameter.

The cobblestones comprising the hearths were raised about 20 cms above the level of the surrounding vegetation. The hearth rocks were heavily fire-burned and formed a tightly compacted "nest" of ash, charcoal and fire-burned bone that had created an enriched environment for the growth of mosses, which had in turn "cemented" the vegetation mat (sod, turf, peat) into place. Eroding out onto the beach adjacent to these hearths were historic late nineteenth to early twentieth century artifacts, splintered caribou bone (broken in the process of extracting fat and marrow) and a small collection of quartz and grey chert flakes.

Excavation of the Feature 1 hearth produced a small assemblage of late-nineteenth or early-twentieth century debris in addition to charcoal and calcined bones (fish, bird and mammal). The assemblage, much damaged by heat exposure, included a small lid for a tin container (percussion caps?), a dark glass snow-goggle lens, a heart-shaped tin tobacco tag, several buttons, three very small blue seed beads, sherds from two different ceramic containers, numerous small melted bottle glass fragments (all from a single relish or pickle container [Loring 1992:519]), a tin strap, a piece of a clock mechanism and the remains of a rosary (Figure 12). Given the Innu propensity for ritually disposing of animal remains in the hearth it is interesting to observe that the broken rosary was similarly consumed by fire, presumably in a propitiatory act.

Additional evidence of pre-Contact period activity at GdDc-4 consisted of a single large flake of a finegrained dark grey chert and, some distance away, a small side-notched projectile point of Ramah chert (Figure 13). Based on stylistic attributes and raw material preference the projectile point is attributable to a "Recent pre-Contact period" (ca. 2000 B.P. to the seventeenth century) component as defined by David Denton's (1989) work in the Lac Caniapiscau region, nearly 400 kms to the west of Michikamats. The



Figure 11. Michikamats-2 (GdDc-4) hearth.

Michikamats projectile point has broad shallow side notches and a slightly indented base which are typologically identical to specimens recovered at GcEg-1 on Lac Clairambault and GaEj-1B on Lac Caniapiscau (Denton 1989:71). This latter site produced a suite of seven radiocarbon dates between 220 and 520 B.P (avg.= 370 B.P.)

One characteristic of the Recent pre-Contact period sites in the Caniapiscau region is that they contain a varied lithic signature demonstrating that the site occupants had access to Ramah chert (700 kms to the northeast as the raven flies but

doubtless much farther by canoe and on foot), Mistassini quartzite (400 kms to the south), fine-grained cherts from the Labrador Trough region (McCaffrey 1989) of north-central Quebec (between 150 and 300+kms to the east), as well as locally available quartz. The Michikamats projectile point is quite distinct from contemporary points recovered at late pre-Contact period Point Revenge sites on the Labrador coast (Fitzhugh 1978; Loring 1989, 1992) and on the Strait of Belle Isle (Loring 1985:152; Pintal 1989:41-43) that tend to have more sharply defined narrow corner notches. While archaeologists have yet to firmly date late pre-Contact habitation sites in the interior of Labrador, their presence in adjacent Quebec, in the Caniapiscau and Laforge regions to the west (Denton 1989; Cérane Inc. 1995:414-415) and the Lac de la Hutte Sauvage (Indian House Lake) region to the north (Samson 1978), and the traffic in lithic raw materials (and presumably other materials less likely to be preserved in the archaeological record) suggest that this is merely a function of the lack of systematic and intensive survey.

Opposite Ptarmigan Point is a small wooded island where Mina Hubbard had camped from August 5-7 in 1905. She reported (1908:152) that:

...the Indians had found it too, and evidently had appreciated its beauty. There were the remains of many old camps there, well-worn paths leading from one to the other. It was the first place we had come upon which gave evidence of having been an abiding place of some permanence. There must have been quite a little community there at one time.

Our survey of this island located the descendants of the ptarmigan that the Hubbard party had found so prevalent and a single old tin bucket perhaps 30 to 50 years old. We found no traces of the old Innu camps. However, the broad sloping western shore of the island, probably the most favorable residential locality both because of the view of the lake and the breezes that might keep insects at bay, had been inundated and heavily eroded by fluctuating reservoir levels.

Michikamats-3 (GdDc-5)

There is a small knoll and point on the northwest shore of Michikamats, the first point 2.5 km south of the large cove and stream at the northwest corner of the lake. The knoll would have provided an excellent

vantage point overlooking the northern portion of the lake. While no structural remains were identified, the survey party did locate a single flake of Ramah chert lying on an exposed caribou trail.

Michikamats-4 (GeDc-1)

At the extreme northern end of Lake Michikamats, at the jumping off point for the portage trail leading over the height-of-land to the George River drainage, there is a conspicuous land form of higher relief situated on the east side of a small stream. Prior to reservoir construction this hillock would have provided dry ground, excellent shelter and accessibility for passing parties. Two badly eroded hearths were found tucked into the

southern side of the hillock (Figure 14). North of this old camping place the ground rises gradually to the summit of a broad knoll that provides a commanding view over the region about the northern end of Michikamats. A linear rock construction, possibly a hunter's blind, was found near the summit (Figure 15).

Michikamats-5 (GdDc--6)

Just prior to departure we hurriedly surveyed an island off the west shore of Michikamats, beyond the point where the lake bends towards the northwest. Here migrating caribou "formed a broad unbroken bridge from mainland to island" when Mina Hubbard passed



Figure 13. Michikamats-2 (GdDc-4): Ramah chert projectile point.

by on August 8th (Hubbard 1908:162-163). Traces of major caribou trails are still very evident on the island. At least three raised cobble hearths were noted on the southern and western shore of the island; however, no artifacts were recovered.

On the opposite side of the lake was another island, which most likely is the one on which Dillon Wallace camped in 1905 (1907:124-135):

During two days that we spent here in a thorough exploration of the lake, our camp was pitched on an island at the bottom of a bay that, half way up the lake, ran six miles to the northward. This was selected as the most likely place for the portage trail to leave the lake, as the island had apparently, for a long period, been the regular rendezvous of Indians not only in summer, but also in winter. Tepee poles of all ages, ranging from those that were old and decayed to freshly cut ones,



Figure 12. Michikamats-2 (GdDc-4): Artifacts from the Feature-1 hearth. From left-to-right, top-to-bottom: tin lid from small container (perhaps for percussion caps?); snow-goggle glass lens; heart-shaped tobacco tin tag ("PRINCE OF WALES"); porcelain button; 2 metal buttons (for suspenders?); carved rosary beads; 3 melted glass sherds from a relish or pickle jar; porcelain rim from a tea saucer with three turquoise seed beads; sherd from an ironstone teacup; 3 porcelain holloware sherds; small tin strap; part of a regulator mechanism for clock.



Figure 14. Eroded hearth at GeDc-1.

were numerous. They were much longer and thicker than those used by the Indians south of Michikamau. Here, also, was a well-built log cache, a permanent structure, which was, no doubt, regularly used by hunting parties. Some new snowshoes frames were hanging on the trees to season before being netted with babiche. On the lake shore were some other camping places that had been used within a few months, and at one of them a newly made "sweat hole," where the medicine man had treated the sick.

Unfortunately high winds prevented a visit to this island.

"Signal Hill"

From their island camp, Wallace and his companion ascended the high hill north of the lake. At the summit they found a small stone cairn and evidence of old signal fires: "Signal Hill,' as we called it, is the highest elevation for many miles around and a noticeable landmark" (Wallace 1907:125). This hill is correctly labeled on the 1:250,000 scale map (23-I: formerly Michikamau Lake, now Smallwood Reservoir). However the 1:50,000 scale map (23-I/9) assigns the name to a much smaller knoll (above GeDc-1) east of the small stream draining Adelaide Lake on the north shore of Michikamats. From the summits of both hills, the portage route from Michikamats across to Lake Adelaide and the headwaters of the George River is clearly visible.

GcDc-1

A site we planned to visit from the project's onset was the large, historic "meeting place" at the northern end of Michikamau that Don MacLeod visited in the 1960s and which is referred to earlier in this paper.



Figure 15. Enigmatic stone structure, the "Hunters blind" on top of "Signal Hill".

Although we were unable to reach the site by boat, we were eventually able to stop there thanks to the cooperation of the helicopter pilot who flew us out of the region. To our dismay, absolutely no evidence of Innu or any human occupation had survived the flooding. Apparently due to the low-lying landscape in this sector, the former shoreline and terrain well beyond were completely devastated, leaving a sterile, boulder-strewn field where Innu families had once camped, sharing news and provisions.

While the devastation caused by ice-scouring and erosion at GcDc-1 is disturbing, we are not in a position to make any statement about the condition of other potential sites in the area affected by the Smallwood Reservoir. There are many kilometers of shoreline to check before we can accurately assess how much damage occurred to historic resources.

Rendezvous places such as GcDc-1, set at the intersection of major travel routes and at places with predicable local resource abundance, were critical to the success of the Innu's interior-based settlement-subsistence strategy. Access to social and material resources that could buffer times of regional scarcity was a central tenet of the loosely organized band structure that characterized Innu social organization prior to their adoption of village life after 1960. Situated near the center of the Quebec-Labrador peninsula, Michikamau was a "central-place" where dispersed Innu families could meet and camp together. The combination of its exceptional fishery resources, seasonal migratory bird concentrations and proximity to prime caribou country contributed to the region's importance.

Another important historic rendezvous site on Michikamau was situated along the northeastern shore adjacent to where the lake discharges into the Naskaupi River. This locale was the beginning of an alternative travel route to the north, through a series of small sheltered lakes and ponds, when windy weather inhibited travel on the big lake (the route partially followed by Dillon Wallace in 1905).

It was a beautiful place, and had evidently been a favourite with the Indians. There were the remains of many old camps there. (Hubbard 1908:142)

Edward Montague, survey geologist with the Newfoundland Department of Mines and Energy, also observed many signs of previous Innu encampments here prior to the flooding of the lake (Montague, pers. com.). Some indication that the area was important to pre-Contact aboriginal groups as well is attested to by Montague's report of a large cache of Fleming chert nodules found eroding out of the bank. Fleming chert is found within the Proterozoic sediments of the Labrador Trough, in particular, in the region north of Schefferville (McCaffrey 1989:105) approximately 200 kilometers or more from Michikamau. Seasonal caching of supplies and raw materials for future needs was a common practice among Innu groups and likewise may have figured significantly in past interior land-use.

DISCUSSION

For the most part the pre-Contact history of the Labrador peninsula is derived from archaeological research conducted on, or near, the coast where the long sequence of alternating, and sometimes overlapping, Indian and Inuit occupations has been shown to span more than 7200 years (cf. Jordan 1977, 1978; Fitzhugh 1977, 1980). However, the aforementioned research in adjacent interior Quebec has demonstrated a long and complex history of land-tenure for a succession of Aboriginal groups, both in pre and post-Contact times. Other than brief late summer-autumnal forays by Inuit hunters after caribou (Taylor 1969), little evidence of Inuit utilization of the interior has been recognized by archaeologists (Samson 1978:204). Apparently the strong predilection of historic Inuit and their predecessors for the security provided by a maritime-based economy restricted their utilization of the peninsula to its littoral margin. In fact all of the recognized pre-Contact Indian groups in Labrador also shared a pronounced maritime component to their economy: Maritime Archaic Indians (ca. 7100 -3800 B.P.), Intermediate Indian (3500 -2800 B.P.) and the Late Pre-Contact-Proto-historic Indian groups (1800 to 500 B.P.). It is only with the intense social turmoil and disruption resulting from the territorial realignment of Inuit groups in response to their intensification of interaction with European whalers, fishermen and traders that ancestral Innu groups were displaced from their former coastal abodes (Loring 1992, 1997; Mailhot 1986). The intensive occupation and residence of the Innu in the Labrador interior and their recognition as North America's pre-eminent caribou-hunting peoples appears to be a late post-Contact cultural development (Loring 1988, 1992).

The demonstration of a long record of pre-Contact ancestral Innu land-use in the central Labrador peninsula is an important result of this research. Although tenuous, when combined with the evidence from MacLeod's survey and McCaffrey's (1987a, 1989) work in western Labrador, the prehistoric components at Ptarmigan Point and Michikamats-1 demonstrate that the plateau-lakes region of central Labrador supported small bands of hunting-fishing peoples, as has been clearly documented in the adjacent regions of northern Quebec.

The recovery of the small side-notched projectile point at Ptarmigan Point raises some interesting considerations about the movement of Indian peoples in the Quebec-Labrador peninsula during the late pre-Contact period. As previously discussed, the specimen shows striking stylistic affinities with sites in the Caniapiscau basin approximately 400 km to the west, and is made of Ramah chert (as are many of the Caniapiscau points), derived from quarries situated an equal distance to the north. Ramah chert is the raw material that late pre-Contact Aboriginal people on the Labrador coast used almost exclusively, so it seems likely that there would have been opportunities for interaction between the primarily coastal-oriented Pt. Revenge groups of the central Labrador coast and Strait of Belle Isle with the more interior-oriented Recent Prehistoric period groups of the central Quebec plateau country.

Given the brevity of the surveys presented herein (MacLeod's in 1967-1968, Innu Nation project in 1995), it is unwarranted to speculate about the nature of previous land-use of the region beyond the observation that additional work seems mandated given the demonstration that sites of some antiquity have been documented. It is especially significant to note the apparent paucity of pre-Contact sites in opposition

to the prolific extent of late nineteenth and early twentieth century Innu sites throughout the region, a situation that is mirrored at Lac de la Hutte Sauvage as well (Samson 1975, 1978). While there is unequivocal evidence that the Michikamau landscape has been exploited by small hunting parties throughout the entire sequence of prehistoric occupation in Labrador, these remains are dramatically impoverished when compared with the size and visibility of Maritime Archaic, Intermediate Indian and Late pre-Contact Indian sites situated on the central Labrador coast. The extent to which this impression is a sampling problem remains for subsequent investigations to determine.

The small size and sparse nature of the prehistoric components discovered in the Michikamau/Michikamats survey are in line with what might be expected from small, mobile groups traversing the region. Mobility is a central tenet of the historic nineteenth and twentieth century specialized caribou-hunting economy of the Innu in the northern Labrador-Quebec barrenlands, and has resulted in a palimpsest of hearths and raised earthen-walled tent-rings scattered across the barrenlands. No comparable evidence for such an intensive land-use pattern resulting from a specialized caribou hunting economy has been recognized in interior Labrador for the earlier cultural groups. It is, however, important to stress that this may be a sampling problem, that the major seasonal aggregations at fall caribou crossing sites and at summer fishing localities have not yet been identified.

Compounding this apparent lack of large prehistoric sites is the degree of damage that has been inflicted by reservoir construction and the resulting inundation of the lakeshore environs. Visits to known important Innu camping places, Mina Hubbard's "woody island" on Michikamats and the GcDc-1 rendezvous camp on Michikamau, were expected to have produced a rich inventory of artifactual remains: stove parts, caribou bone crushing pestles, ceramic sherds and bullets that we thought would be left behind by receding reservoir waters. Typically at eroding sites along the Labrador coast similar artifacts can be recovered from between rocks at the erosional interface. Their absence, for the most part, suggests that the fluctuating reservoir levels have been far more destructive than had been anticipated.

While the potential of Michikamau research is evident from the 1995 survey, subsequent research in the portions of the reservoir basin with high historic resource potential (including areas identified in Innu land use and occupancy interviews)⁶ should be conducted coincidental with a period of low reservoir water levels.⁷

Discussion of the Partridge Point Burial Knoll

The destruction through erosion brought on by reservoir construction of the traditional Innu burial ground at Ptarmigan Point seems an apt metaphor for the threats to Innu society brought on by the continued specter of the economic development of lands that they have long held tenure to. Dominique Pokue's simple elegy, on the occasion of our reburial of the partial skeleton of an Innu ancestor, "We have taken care of you, we ask you to please take care of us," served as a poignant reminder of the central, abiding tenet of Innu culture and identity: the land. This sense of the land is conveyed in oral traditions. The tool assemblages and the stone hearths long cold are faint testimony to the drama of Innu life in *nutshimit* (the country).

CONCLUSION

In conclusion, it was a source of amazement to the field party as a whole to observe how Dominique and a hand-held Global Positioning System (GPS) device simultaneously were able to situate our precise location and determine the distance and route to and from base camp. The Innu are no less Innu by employing new technologies and non-traditional knowledge (as that provided by archaeologists) to help them determine where they are presently and where they plan to head in the future. And archaeologists are no less archaeologists and scientists by acknowledging the political implications of their work and recognizing the importance and validity of Innu knowledge, traditions, practices and perspectives.

ENDNOTES

¹ The Innu Nation represents 1,700 Innu people residing in Labrador. Formerly referred to as Montagnais-Naskapi Indians, the Labrador Innu are part of a larger nation of Innu people most of whom reside in Quebec. The Innu refer to their territory in Labrador and Quebec as "Nitassinan."

² The word Michikamau comes from the Innu work *Mishikamau*, meaning "large lake." Michikamats comes from *Mishikamass*, the diminutive form of *Mishikamau*, meaning "little large lake."

³ Sylvestre Andrew, himself, was too young to witness feasting on *apishtiss*; his account most probably refers to the time of his parent's generation prior to 1931. Historically, most of the eastern North American Brant (*Branta bernicla*) population migrated north from New Jersey, through the Maritimes, to the Sept-Îles region, and hence to Ungava Bay. Biologists do not know the exact migration route of the Brant on their way to Ungava. Innu testimony about harvesting this species at Michikamau provides useful historical information on this route. The Brant population that followed this route virtually disappeared when, between 1931 and 1934, a parasite known as the "wasting disease" resulted in the destruction of approximately 90% of the eelgrass meadows throughout its range on the Atlantic seaboard. Brant are dependent on eelgrass, which is available at a limited number of key sites (Bruce Turner, Canadian Wildlife Service, personal communication; Tutin 1942: 223).

⁴ This includes the Ossokmanuan Reservoir and forebays. Total drainage of the Smallwood and Ossokmanuan Reservoirs is 69,267 km² (26,756 mi²). The total amount of land flooded amounted to 3,676 km² (1,419 mi²) (Jim Haynes, NFLD Hydro, personal communication).

⁵ Deceased Innu elder, Jean-Baptiste Penunsi, identified a caribou calving area north of Kasheshibaw Lake active during the time period 1920-1950 (interview with Alexander Andrew, 1 Feb. 1979). Folinsbee et al. (1973: 3) noted that the "bogs around Michikamau Lake were at one time a major caribou calving ground and waterfowl nesting area, but now are largely under water" (see also Bergerud 1994:11-16).

⁶ Some important areas of consideration would include the traditional hunting and trapping camps in the southwest corner of Michikamau Lake that had been occupied by deceased Innu hunters, Simon Gregoire, Pien-Joseph Selma and their families; an Innu cemetery site on an island at the outlet of Michikamau Lake on the way to the former MacKenzie Lake; the birth place of Pien-Joseph Selma on the way to Lobstick Lake; and what appears to have been an Innu gathering place at Sandgirt Lake (apparently visited by MacLeod in 1967, 1968). Future research should also attempt to relocate the former HBC post on the route from Michikamau to Lobstick Lake. Innu Nation land use mapping work by Sakauye et al. (1980) shows travel routes and camps parallel to the eastern shore of Michikamau.

⁷ There is some imperative to this proposed research as construction of new dams on the St-Jean and Romaine rivers, whose waters will be diverted into the Smallwood Reservoir, will further impact historic resources along the former shorelines of Michikamau and other lakes that were swallowed by the reservoir.

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EXHIBIT D

An Assessment of Lower Churchill Project Effects on

Labrador Innu Land Use and Occupancy

Peter Armitage (Wolverine & Associates Inc.)

5 April 2011



Report to Innu Nation

Sheshatshiu and Natuashish Nitassinan (Labrador)

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This report is the property of Innu Nation. Innu Nation has submitted this report to the Joint Review Panel for the environmental assessment of the Lower Churchill Hydroelectric Generation Project and the Labrador-Island Transmission Link Project. The report may be used for any environmental or regulatory proceedings related to these two proposed projects, or for the environmental assessment or regulatory proceedings of any other proposed generation or transmission developments related to these two proposed projects within the Study Area described in this report.

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Churchill Falls Project and the Smallwood Reservoir

The Labrador Innu themselves have direct experience with the effects of large hydroelectric developments, in particular the Churchill Falls Project and its Smallwood Reservoir. Constructed over several years in the late 1960s and early 1970s, the Churchill Falls Project inundated Kapakuashu (MacKenzie Lake), Meshikamass (Michikamats Lake), Meshikamau (Michikamau Lake), Ushiku-manauan (Ossokmanuan Lake), Menutinau-nipi (Windbound Lake) and other lakes on the central Labrador plateau.²⁵ Sheshatshiu Innu including the late Pinute Ashini, Shushep Abraham, and Matiu-Ben Andrew spoke of the following project impacts (Tanner, 1977:128-131):

- hunting and trapping lands inundated;
- canoes, traps, snowshoes, caribou-hide scrapers, beaming tools, ice chisels, axes and other tools lost due to flooding;
- decline in animal populations due to drowning;
- high mortality of beaver in headwater ponds that experienced deep freezing (below beaver lodge entrances) due to reduced water levels;
- lower water levels in Meshikamau-shipu (Naskaupi River) with impacts on salmon and lake trout migration and spawning.

The late Shapatish Penunsi conducted a map biography interview with researcher Alex Andrew during which he identified a caribou calving ground north of Kasheshibaw Lake that was flooded as a result of Smallwood Reservoir impoundment.²⁶ Penunsi's information is supported by Folinsbee, et al. (1973:3) who noted that the "bogs around Michikamau Lake were at one time a major caribou calving ground and waterfowl nesting area, but now are largely under water" (see also Bergerud, 1994:11-16).

The effects of the Churchill Falls Project and the fact that the Innu were never consulted or compensated became a festering sore point for that generation of Innu who knew the Meshikamau region and settled with their families in the government-built village of Sheshatshiu (Armitage, 1990). According to the late Pinute Ashini,

[w]e knew that there was going to be damming of the river, but we did not know what it would mean. We had no idea of what the level of the water would be. At most, we compared it to a beaver damming a river. I was still there during the

²⁵See Griffiths (2001) and Nalcor (2009, V3, p.5-4). For a discussion of the effects of the flooding on historic resources in the Meshikamau/ Meshikamass area (i.e. archaeology), see Loring, et al. (2003).

²⁶ Conducted under the supervision of geographer, Brenda Sakauye, the map biography interviews asked Innu respondents to describe their LUO during three time periods. The caribou calving ground in the Meshikamau area was identified on a 1:250,000 scale NTS map by Shapatish Penunsi for the time period 1920-1950. "Q: Were there many caribou in Michikamau region? A: Yes, to the north, the caribou was plentiful and up further north at the barrens the caribou were many. [Q:] And where do the caribou calve? [A:] One area would be a marshy area close by the Michikimau Lake before it was flooded" (Shapatish Penunsi interview with Alexander Andrew, 1 Feb. 1979; see also Loring, et al., 2003:68).

construction that summer. When I went back the next year, everything was water .Indians were not consulted at all about what was going to happen. I was very bitter after I found out that the lands were flooded. There wasn't much that could be done (Tanner, 1977:128).

More recently, the issue of the flooding of Meshikamau and neighbouring lakes arose at various points in discussions with the members of the ITKC. Examples of their observations and propositions concerning the impacts of the Churchill Falls Project are presented in the report of the work of the ITKC (Armitage, 2007b:83-84).

Access roads and other linear transportation corridors

One of the most significant effects of hydroelectric development on Indigenous LUO is the building of access roads to support the construction and maintenance of dams, dikes, reservoirs, generating facilities, transmission lines, and other infrastructure. However, such effects are also associated with forest access roads, mine access roads and other linear transportation corridors. New roads can lead quickly to competition with non-Indigenous hunters and fishers, and various biophysical effects that damage fish and game populations. But they can also improve access to traditional territory by Indigenous people for whom travel to distant camps by charter aircraft can be extremely expensive (Hayeur, 2001:73; Hydro-Québec Production, 2007:39-115-118; Penn, 2003:2).

Several years ago in conjunction with Dr. Marianne Stopp, I undertook a survey of the comparative literature concerning the effects of roads on Indigenous LUO in relation to the environmental assessment of TLH Phase 3 between Cartwright and Happy Valley-Goose Bay (see Armitage and Stopp, 2003). This literature survey is reproduced in Appendix 1 below because of its usefulness for the LCP environmental assessment and because the original report may not be easily accessible to the JRP and interveners.²⁷ Furthermore, careful attention to comparative data concerning road impacts elsewhere

²⁷ In addition to the comparative literature reviewed in Appendix 1, see Berkes (1981:168-169;1988), Charest (1982:423), Hydro-Québec (2007:39-115-118), Rosenberg, et al. (1997:46) and Warner (1999:107-110) in relation to road networks built for hydroelectric projects, Staples and Poushinsky (1997:73-77) in relation to mine access roads, and Kneeshaw, et al. (2010) and Tanner (2009) in relation to forest access roads. Hydro-Québec (1993b) predicted competition between Cree/Inuit and southern sport hunters and fishers in relation to roads associated with the proposed Great Whale hydroelectric project. "The new road system (totalling about 685 km in main roads) will constitute one of the largest sources of impact on Native land use" (ibid.:1993:15). However, note Simard et al.'s contention that sports hunting and fishing in the area covered by the James Bay and Northern Quebec Agreement during the period 1970-1990 did not threaten "traditional Cree activities" because tourists did not penetrate very far into the territory and they were not interested in the same species that the Cree were" (1996:140-141, my translation).

EXHIBIT E



Map 2. Showing affect of flooding in relation to travel routes and camp location in the Meshikamau area.

EXHIBIT F



Figure 2. Moira MacCaffrey takes fieldnotes on Ptarmigan Point. Note damage caused by flooding (photo P. Armitage, 1995).

EXHIBIT G



Figure 1. Map of central Nitassinan (interior Labrador, Canada), area of the Smallwood Reservoir overlain on the previous Lake Michikamau shoreline. Area of Innu Nation sponsored archaeological research August 1995.

EXHIBIT H



Figure 5. Daniel Ashini on the bank of the eroding Innu cemetery at Meshikamass. Skull on left (photo S. Loring, 1995).



Figure 4. Skeletal remains from an Innu cemetery eroding into Meshikamass due to flooding (photo S.Loring, 1995).

EXHIBIT I

Setting new sights with our clean energy

Annual Report 2019




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COVER The storm that began on November 1, 2019, with wind gusts of over 120 km/h, brought down an impressive number of trees and branches, causing outages in several regions of Québec. At the height of the storm, more than 4,000 outages were reported, leaving close to one million customers without electricity. The coordinated efforts of some 1,500 employees—line workers, control center experts and customer relations staff, not to mention the social media, community relations and media relations teams—helped restore power to 95% of affected customers

within 70 hours.

HYDRO-QUÉBEC IN FIGURES



208.3 TWh

Net electricity sales, including 33.7 TWh in exports



Residential rate, the lowest in North America



Public satisfaction index



\$7.01 million

Total donations raised for Centraide

in the 2019 Hydro-Québec employees' and pensioners' fundraising campaign, an amount that has grown steadily over the past five years

Segmented Results

Operating segments

and Construction, as well as activities grouped under Corporate and Other Activities namely Generation, Transmission, Distribution are divided into four operating segments, Hydro-Québec's business activities

the company's four divisions and its principal first-tier interests: The organization chart on the right presents



Corporate and Other Activities

*Hydro-Québec IndusTech inc. owns 100% of the outstanding shares of Services Hilo inc., which operates under the Hilo brand.

Hydro-Québec

IndusTech inc.*

Hydro-Québec International inc.

Generation

in northeastern North America. Hydro-Québec Production power to wholesale markets for the Québec market and exports facilities. It generates electricity Hydro-Québec's generating operates and develops

Transmission

system capacity and manages power flows throughout Québec transmission system. It markets Hydro-Québec's power operates and develops Hydro-Québec TransEnergie

Distribution

energy efficiency. of electricity to the Québec system and ensures the supply services and promotes in Québec, provides customer market. It also carries on activities operates and develops Hydro-Québec Distribution related to electricity sales Hydro-Québec's distribution

Construction

and Hydro-Québec TransEnergie for Hydro-Québec Production transmission facilities, mainly and refurbish generating and and build construction projects de la Baie James (SEBJ) design partagés and Société d'énergie équipement et services Hydro-Québec Innovation,

Note 19 Commitments and Contingencies

Commitments

Electricity purchases On May 12, 1969, Hydro-Québec signed a contract with Churchill Falls (Labrador) Corporation Limited ["CF(L)Co"] whereby Hydro-Québec undertook to purchase substantially all the output from Churchill Falls generating station, which has a rated capacity of 5,428 MW. In 2016, this contract was automatically renewed for a further 25 years in accordance with the contract provisions. On June 18, 1999, Hydro-Québec and CF(L)Co entered into a contract to guarantee the availability of 682 MW of additional power until 2041 for the November 1 to March 31 winter period.

As at December 31, 2019, Hydro-Québec was also committed under contracts to purchase electricity from other power producers. Based on the renewal clauses, the terms of these contracts extend through 2062. Hydro-Québec had also undertaken to purchase power transmission rights.

On the basis of all these commitments, Hydro-Québec expects to make the following payments over the coming years:

the following payments over the coming years:	ŝ
2020	1,891
2021	1,903
2022	1,928
2023	1,937
2024	2,065
2025 and thereafter	23,950

Investments

As part of its development projects and activities aimed at maintaining or improving the quality of its assets, Hydro-Québec plans to invest approximately \$4.0 billion in property, plant and equipment and intangible assets per year in Québec over the period from 2020 to 2024.

Contingencies

Guarantees

In accordance with the terms and conditions of certain debt securities issued outside Canada, Hydro-Québec has undertaken to increase the amount of interest paid to non-residents in the event of changes to Canadian tax legislation governing the taxation of non-residents' income. Hydro-Québec cannot estimate the maximum amount it might have to pay under such circumstances. Should an amount become payable, Hydro-Québec has the option of redeeming most of the securities in question. As at December 31, 2019, the amortized cost of the long-term debts concerned was \$3,303 million (\$3,314 million as at December 31, 2018).

Litigation

In the normal course of its development and operating activities, Hydro-Québec is sometimes party to claims and legal proceedings. Management is of the opinion that an adequate provision has been made for these legal actions. Consequently, it does not foresee any significant adverse effect of such contingent liabilities on Hydro-Québec's consolidated results or financial position.

Among other ongoing actions, some Indigenous communities have instituted proceedings against the governments of Canada and Québec, as well as against Hydro-Québec, based on demands concerning their ancestral rights. In particular, the Innus of Uashat mak Mani-Utenam are demanding \$1.5 billion in damages resulting from various activities carried out on land they claim as their own. Hydro-Québec is challenging the legitimacy of this claim.

As well, in November 2006 the Innus of Pessamit reactivated an action brought in 1998, aimed at obtaining, among other things, the recognition of ancestral rights related to Québec lands on which certain hydroelectric generating facilities of the Manic–Outardes complex are located. This community is claiming \$500 million. Hydro-Québec is challenging the legitimacy of this claim.

REVIEW FIVE-YEAR

a) In addition to the generating capacity of its own facilities, Hydro-Québec has access to almost al	Total lines (overhead and underground)	Distribution	Transmission	Lines (overhead and underground)	km	Peak power demand in Québec°	WW	Total energy requirements ^b	GWh	Total installed capacity	Thermal	Hydroelectric	Installed capacity	WW	
ll the output from Ch	260,106	225,304	34,802 ^d			36,159		229,959		37,243°	543	36,700			2019
urchill Falls generatin	259,020	224,659	34,361			38,319		230,795		37,310	543	36,767			2018
g station (5,428 MW)	258,512	224,033	34,479			38,204		226,824		37,309	542	36,767			2017
under a contract wi	256,135	221,843	34,292			36,797		223,143		36,908	542	36,366			2016
th Churchill	255,192	220,920	34,272			37,349		222,172		36,912	542	36,370			2015

Falls (Labrador) Corporation Limited that will remain in effect until 2041. It also purchases all the output from 41 wind farms (3,876 MW) and 7 small hydropower plants (107 MW) and almost all the output from 9 biomass and 4 biogas cogeneration plants (303 MW) operated by independent power producers. Moreover, 969 MW are available under long-term contracts with other suppliers.

Total energy requirements consist of kilowatthours delivered within Québec and to neighboring systems.

ා ව The 2019 figure was valid on February 14, 2020. The values indicated reflect demand at the annual domestic peak for the winter beginning in December, including interruptible power. The 2019-2020 winter peak occurred at 7:00 p.m. on December 19, 2019.

g 34,530 km of lines operated by Hydro-Québec TransÉnergie and 272 km by Hydro-Québec Distribution.

Other Information

ate increase as at April 1° s at December 31 stal number of employees ^b Permanent Temporary	2019 0.9 16,977 2,500 19,477	2018 0.3 16,960 2,944 19,904	2017 0.7 17,338 2,448 19,786	2016 0.7 17,282 2,270 19,552	2015 2.9 17,475 2,319 19,794
epresentation of target groups Women Other°	29.2 10.4	28.8 8.9	28.9 8.1	28.7 7.7	29.0 7.4
Other ^c	10.4	8.9	8.1	7.7	7.4

a) Excluding Rate L.b) Excluding employees of subsidiaries and joint ventures.c) Self-reported members (men and women) of the following the following statement of the following stateme

Self-reported members (men and women) of the following groups: Indigenous peoples, ethnic minorities, visible minorities and people with disabilities.

Since - Kinggue final	Generation						Transmission		
Style Structure Style	Installed capacity				37,243 N	N W	Voltage	Lines (km)	Substations (number)
bit den reburne 5.46 Same Magneting, 3.82 Period Main 14 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.21 4.00000 1.01 4.00000 1.01 4.00000 1.01 4.00000 1.01 4.00000 1.01 4.00000 1.01 4.00000 1.01 4.00000 1.01 4.00000 1.01 4.000000 1.01 4.000000 1.01 4.000000 1.01 4.0000000 1.01 1.000000000000000000000000000000000000	62 hydroelectric generating stations°				36,700 /	V V	765 and 735 kV	12,319ª	41
La Ganade-L La Ganode-X La Ganode-X La Ganode-X La Ganode-X La Ganode-X La Ganode-X 	Robert-Bourassa 5,616 Sainte-Marguerite	9-3 882	Péribonka	385	Manic-1	184	450 kV DC	1,218	2
La Ganda2,47Benine21Chalene152Chalene152Chalene152La Ganda3,00Benarducaria7,63Benarian270La Gabalia1,71Chalene1,71Beninia-11,750Carillen7,53Benarian7,70Penariae-Chane1,71Chalene1,73Beninia-11,750Carillen7,53Benarian7,70Penariae-Chane1,71Chalene1,73Beninia-11,750Carillen7,53Benarian7,70Penariae-Chane1,73Chalene7,7002,700Beninia-11,70Benarian7,90Benarian7,70Penariae-Chane1,70Penariae-Chane1,70Penariae-Chane1,70Beninia-11,70Benarian3,90Schleine-Grade7,7002,702,7002,700Beninia-11,700Benarian3,90Schleine-Grade7,7002,702,700Benaria-11,700Benarian3,90Schleine-France7,7002,7002,700Benaria-11,700Benarian1,700Schleine-France1,7001,7002,7002,700Benaria-11,700Benaria-10Mero-Galabe France1,7001,7002,7002,700Benaria-11,7001,7001,700Benaria-11,7001,7002,7002,700Benaria-11,7001,7001,7001,7001,7002,7002,700Bena	La Grande-4 2,779 Laforge-1	878	Laforge-2	319	Rapides-des-Îles	176	315 kV	5,498	81
$ \label{eq:conder_2A} & 2,06 & Quincles-4 & 7,05 & La Tuque 24 & Screele 15 \\ Beauhanni 1,09 & Genmine-1,and 7,09 & Beamane-1,199 & Genmine-1,200 & Panniker-Chue 131 \\ Beauhanni 1,99 & Genmine-2 & 640 & McConnick 235 & Beauhan-1,200 & Panniker-Chue 131 \\ Beauhanni 2,20 & Gradinatouc 540 & Roben-de-Genmik-Miee 236 & Rapide-Beauhane 109 \\ Beah-Leage 1,220 & Outrates-2 & 542 & Rapide-Beachance 109 \\ Beah-Leage 1,220 & Outrates-2 & 542 & Rapide-Beachance 109 \\ Beah-Leage 1,220 & Outrates-2 & 542 & Rapide-Beachance 109 \\ Mnic-S-PA & 1,04 & Biskov 3,95 & Stanningon-2 & 240 & McConnick 236 & Rapide-Beachance 100 \\ Mnic-S-PA & 1,04 & Biskov 3,95 & Stanningon-2 & 200 & McConnick 220 & McConnick 200 &$	La Grande-3 2,417 Bersimis-2	845	Trenche	302	Chelsea	152	230 kV	3,252 ^b	53
Beachmain Index Sec Beammain Total Beammain Calibation Total Beammain Sec	La Grande-2-A 2,106 Outardes-4	785	La Tuque	294	Sarcelle	150	141 kV	2 140	£Δ
Marbie-F 1,390 Carlinon 763 Beaumont 270 Penality colume 131 Penality colume 132 Penality colume 133 Penality colume 134 Penality colum 134	Beauharnois 1,900 Bernard-Landry	768	Romaine-1	270	La Gabelle	131		1 1 - 0 0 0	
Lig Grande-1 1,45 Remaines 6,40 McConnick 235 Les Clears 1,13 Remaines 1,23 Total mustation 525 Respice Scatter Total State	Manic-5 1,596 Carillon	753	Beaumont	270	Première-Chute	131	120 KV	800,7	220
Pené-Lévacque Les nelses1,326Tulnustoic Les neuerlas526Pechér-Gand-Mère Paugan200Repides-Ges-Guine Paugan100Totel536Stand Paugan100Benemis-11,176Estamain-1400Repides-Blanc Stand204Pendes-Firman 	La Grande-1 1,436 Romaine-2	640	McCormick	235	Les Cèdres	113	69 kV or less	3,367°	76
lach-lessage1,220.04rade-2523Pargan226Rapide-Famer1040.1	René-Lévesque 1,326 Toulnustouc	526	Rocher-de-Grand-Mèr	e 230	Rapides-des-Quinze	109	Total	34,802	534
$ \begin{array}{ c c c c } \hline \end{tabular} & 1.76 \\ \hline \en$	Jean-Lesage 1,229 Outardes-2	523	Paugan	226	Rapides-Farmer	104	a) Including 160 km of	F735-KV lines one	vinited at 315 KV
Manic-5-PA Ourades 3 1,04 1026 Brisky bencine 3 1,04 1026 Brisky bencine 3 460 36 Shuwingon 2 Shuwingon 3 200 194 Stributisk rule bencing stribution 0.3056 km of time covered by hydro-Quèbe Durades autono 0.3056 km of time covered by hydro-Quèbe D	Bersimis-1 1,178 Eastmain-1	480	Rapide-Blanc	204	Other (17 generating		b) Including 33 km of 2	230-kV lines oper	ated at 120 kV.
Ourders-3 1,026 Romaine-3 395 Showingon-3 194 Image: Construction of the state	Manic-5-PA 1,064 Brisay	469	Shawinigan-2	200	stations rated	704	c) 3,095 km of lines op	perated by Hydro	-Québec
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Other suppliers ^d Sector Se	7 small hydropower plants operated by independent	107					Total		118,522
Hydroelectric generating station under construction 245 Total 225,304	Other suppliers ^d	696					Low voltage		106,782
Hydroelectric generating station under construction245 MWRomaine-4245	:						Total		225,304
Romaine-4 245	Hydroelectric generating static	n under	construction		245	MW			
	Romaine-4	245							

ransmission

a) Including 469 km of	Total	69 kV or less	120 kV	161 kV	230 kV	315 kV	450 kV DC	765 and 735 kV	Voltage	
735-kV lines op	34,802	3,367°	7,008	2,140	3,252 ^b	5,498	1,218	12,319ª	Lines (km)	
erated at 315 kV.	534	94 ^d	220	43	53	81	2	41	Substations (number)	

Distribution

225,304	Total
106,782	Low voltage
118,522	Total
187	4 kV or less
4,662	12 kV
112,916	25 kV
757	34 kV
Lines (km)	Medium voltage

OUR GENERATING, TRANSMISSION AND DISTRIBUTION FACILITIES



OUR MAJOR FACILITIES

Generating stations rated 245 MW or more

- Hydro
- Thermal

0

Other facilities

Generating station under construction

0

735-kV substation

735-kV substation under construction

- 735-kV line
- 735-kV line under construction
- ---- 450-kV direct-current line
- Interconnection
- Neighboring system (simplified)

EXHIBIT J

Churchill Falls (Labrador) Corporation Limited v. Hydro-Québec, [2019] Q.J. No. 5085

Jugements du Québec

Quebec Court of Appeal

Registry of Montreal

The Honourables Jacques Chamberland J.A., Allan R. Hilton J.A. and Patrick Healy J.A.

Heard: December 4, 2018.

Judgment: June 20, 2019.

No.: 500-09-026327-163 (500-17-078217-133)

[2019] Q.J. No. 5085 | [2019] J.Q. no 5085 | 2019 QCCA 1072 | EYB 2019-312942

Between CHURCHILL FALLS (LABRADOR) CORPORATION LIMITED, Appellant -- Defendant, and HYDRO-QUÉBEC, Respondent -- Plaintiff

(175 paras.)

Counsel

Éric Mongeau, Patrick Girard, Romy Proulx, STIKEMAN ELLIOTT, Douglas Mitchell, IMK, for the appellant.

Pierre Bienvenu, Sophie Melchers, Horia Bundaru, Andres Garin, Vincent Rochette, NORTON ROSE FULBRIGHT CANADA, Lucie Lalonde, HYDRO-QUÉBEC GANESAN FRASER, for the respondent.

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THE TRIAL JUDGMENT

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The concepts of power and energy

The standard of review

The characterization of the contract

The ambiguity of the contract

A. HQ's right to all the power and energy Energy **63** Second, it appears that the trial judge's examination focused on a single paradigm, namely, that operational flexibility⁵² is meaningless unless HQ has access to <u>all</u> the energy produced by the plant, as it did before September 1, 2016. In doing so, the judge distorted the meaning and scope of the concepts of *Annual Energy Base* and *Continuous Energy*, while also obscuring, without an explanation, certain significant differences between the terms and conditions applicable to the first 40-year period and those applicable to the subsequent 25-year period.

64 He could have done otherwise, however, by recognizing that, contrary to the situation that existed during the first 40 years of the agreement, HQ's right to the energy produced by the Churchill Falls plant is now limited, while at the same time recognizing that, contrary to CFLCo's position, HQ still has an operational flexibility very similar to the operational flexibility both parties acknowledged it had prior to September 1, 2016.

65 For a better understanding of the reasons that follow, I have chosen to reproduce certain portions of the Initial Contract and Schedule III.

66 They are presented as a table, side by side, to highlight the differences between the two periods, one running until August 31, 2016 and the other, a subsequent period, running until August 31, 2041:

Agreement up to August 31, 2016 (May 12, 1969 contract, excluding Schedule III)

2.1 Object

[...] Hydro-Quebec agrees to purchase from CFLCo and CFLCo agrees to sell to Hydro-Quebec each month (i) [...] (ii) from and after the Effective Date, the **Energy Payable** and the **Firm Capacity;** all at the prices, on the terms and conditions, and in accordance with the provisions, set forth herein.

1.1 Definitions

"Energy Payable" means

[...]

(b) in respect of any month commencing on or after the Effective Date, (i) the amount of energy which is taken by Hydro-Quebec during such month plus (ii) the amount of energy equivalent to water spilled during such month, as determined pursuant to Sections 4.2.6 and 4.6 and after excluding spillages attributable to the fact that CFLCo has, during the 12 months preceding the spillage, either incurred any penalty under Article X or avoided such penalty only by virtue of Sections 10.3.4 or 10.3.6. Such spillage shall not cause the total Energy Payable for the 12 month period which terminates with the cessation of spilling to exceed the amount obtained when the total amount of all prior recaptures is deducted from 35.4 billion kilowatthours.

"*Annual Energy Base*" means 31.50 billion kilowatthours per year or, in the event of an adjustment [...], the number of kilowatthours per year established as a result of such adjustment, [...]

8.4 Price after the Effective Date⁵³

[...] the monthly price for power and energy shall be:

- (i) the product of the Basic Contract Demand multiplied by 66.67% of the Applicable Rate (earned whether or not taken or made available), plus
- (ii) the product of Energy Payable as calculated for the month then ended multiplied by 33.33% of the Applicable Rate.

Such price shall be subject to adjustment as provided in Section 8.5.

1.1 Definitions

"*Basic Contract Demand*" means, in respect of any month, the number of kilowatthours obtainable, [...], when the

Churchill Falls (Labrador) Corporation Limited v. Hydro-Québec, [2019] Q.J. No. 5085

Annual Energy Base is multiplied by the number which corresponds to the number of days in the month concerned and the result is then divided by the number which corresponds to the number of days in the year concerned.

6.2 Sale and Purchase of Power and Energy

CFLCo shall deliver to Hydro-Quebec at the Delivery Point such power and energy as Hydro Quebec may request, subject to the provisions of Sections 4.2 and 4.3.

[...]

Agreement as of September 1, 2016 (Schedule III)

2.1 Object

[...] Hydro-Quebec agrees to purchase from CFLCo and CFLCo agrees to sell to Hydro-Quebec each month the **Continuous Energy** and the **Firm Capacity**, at the price, on the terms and conditions, and in accordance with the provisions, set forth herein.

1.1 Definitions

"*Continuous Energy*" means, in respect of any month, the number of kilowatthours obtainable, [...], when the Annual Energy Base is multiplied by the number which corresponds to the number of days in the month concerned and the result is then divided by the number of days in the year concerned.

[...]

"*Annual Energy Base*" means the number of kilowatthours per year represented by the Annual Energy Base in effect at the time of expiry of the Power Contract which is hereby renewed.⁵⁴

7.1 (Article VII -- Price and Price Adjustment) For all **Continuous Energy**, Hydro-Quebec shall pay CFLCo 2.0 mills per kilowatthour.

In the event that in any month CFLCo is unable due to Plant deficiencies to make available at least 90% of the **Continuous Energy**, the price payable by Hydro-Quebec for such month shall be 2.0 mills per kilowatthour for that part only of the **Continuous Energy** which is made available.

[Emphasis added]

67 What can one learn from this comparative table?

68 First, the wording of the object of the contract for the 40-year period is very different from the wording of that object for the subsequent 25-year period. The expression *Energy Payable* does not appear in Schedule III, while the term *Continuous Energy*, which does appear, was not included in the terms and conditions applicable from September 1, 1976 to August 31, 2016. As for the definition of *Continuous Energy*, it is identical to the definition of *Basic Contract Demand*, which appears in the Contract, but not in Schedule III.

69 The manner in which the power and energy purchased by HQ are billed differs from one period to the other. I will return to this later, but, for now, suffice it to note that monthly billing based on two components,⁵⁵ one fixed (a predetermined quantity of energy billed at 66.67% of the applicable rate) and the other, variable (another quantity of energy billed at 33.33% of the applicable rate), during the first 40 years of the agreement, was abandoned in favour of a more straightforward and linear formula of 2.0 mills per kilowatt-hour until the end of the agreement.

70 Last, it should be noted that section 6.2 (*Sale and Purchase of Power and Energy*), which was in effect until August 31, 2016, does not appear in Schedule III.

71 In my view, the table itself illustrates the difference between the two periods (40 years, 25 years) as regards the quantity of energy to which HQ is entitled.

- **39** *Ibid.*
- **40** *Ibid*, para. 75.
- 41 Ibid, para. 44.
- 42 For ease of reference, in these reasons I will use the expression "Contract" or "Initial Contract" when referring to the terms and conditions applicable to the initial 40-year period (ending on August 31, 2016) and "Schedule III" when referring to the terms and conditions applicable to the additional 25-year period (ending on August 31, 2041).
- 43 To reflect the fact that 40 years after the commissioning of the Churchill Falls hydroelectric complex, the construction of the plant, the project financing and the repayment of CFLCo's debt would be completed, and the plant's energy potential would be better known. For example, sections 4.1 (*Construction*), 4.2.6 (*Spinning Reserve*), 4.6 (*Method of Calculating Spillage and Inventory*), 5.1 (*Provision for Additional Funds Required*), 5.2 (*General Provisions Applicable to Debentures*), 5.3 (*Dividend Restrictions*), 5.4 (*Right of Hydro-Quebec to cure events of default under certain Debts Obligations of CFLCo*), 6.2 (*Sale and Purchases of Power and Energy*) and 8.5.2 (*Resulting from Variations between Annual Energy Base and the Annual Average Energy Payable*), as well as the definitions (section 1.1) of "Basic Contract Demand", "Applicable Rate" and "Base Rate".
- 44 For example, sections 2.1 (Object) and 7.1 (Price and Price Adjustment), as well as the definition of "*Continuous Energy*".
- 45 Trial Judgment, para. 891.
- 46 Ibid, para. 873-876.
- 47 Didier Lluelles and Benoît Moore, *Droits des obligations*, 3rd ed. (Montreal: Thémis, 2018) p. 876 and ff., para. 1570-1575.
- **48** *Immeubles Régime XV inc. c. Indigo Books & Music Inc.*, <u>2012 QCCA 239</u>, para. 9. Cited by the Supreme Court in: *Uniprix inc. v. Gestion Gosselin et Bérubé inc.*, <u>2017 SCC 43</u>, [2017] 2 S.C.R. 59, para. 41.
- **49** Éolectric inc. c. Kruger, groupe Énergie, une division de Kruger inc., <u>2015 QCCA 365</u>, para. 16. Cited by the Supreme Court in: Uniprix inc. c. Gestion Gosselin et Bérubé inc., <u>2017 SCC 43</u>, [2017] 2 S.C.R. 59, para. 41.
- 50 Exhibit P-1, "Power Contract" between Hydro-Québec and Churchill Falls (Labrador) Corporation Limited (CF(L)Co) dated May 12, 1969, p. P-1/12.
- 51 Trial Judgment, para. 1150, as well as, on this subject, para. 1153-1154.
- **52** Arising from sections 4.2.1 (*Operational Flexibility*) and 6.5 (*Firm Capacity Schedules*) of the Initial Contract and sections 4.1.1 (*Operational Flexibility*) and 5.3 (*Firm Capacity Schedules*) of Schedule III.
- **53** At the hearing, the parties told the Court that they were in disagreement regarding the value of the *Annual Energy Base* as of September 1, 2016, although they had agreed, in May 1969, to set it at 31.5 billion kilowatthours (31.5 TWh) at the start of the first 40-year period. This is a dispute we are not required to rule on within the scope of the case presently before us and which we hope the parties will be able to settle amicably.
- 54 It is accepted that this date is September 1, 1976, the date on which the Churchill Falls plant was fully commissioned, i.e. 11 turbine-generator units, the eleventh to be used as a spare during maintenance.
- 55 Referred to by the parties as the "Split Tariff".
- 56 It should be noted that, given the billing structure in place during the initial 40-year term, the energy HQ received over and above the Basic Contract Demand/Annual Energy Base (i.e., excess energy) was billed, in accordance with section 8.4(ii) of the Contract, at "33.33% of the Applicable Rate".
- 57 Or [TRANSLATION] "all of the plant's production", Trial Judgment, para. 977.
- **58** *Ibid*, para. 942-944 and 988. See also paragraphs 234-235 and 239-241, in the section of the Trial Judgment in which the judge describes the circumstances that led to the signing of the May 12, 1969 contract.
- 59 Exhibit D-81.
- 60 See the definition of "Annual Energy Base", section 1.1 (II) of Schedule III.

EXHIBIT K

Churchill Falls (Labrador) Corporation Limited *Appellant*

v.

Hydro-Québec Respondent

INDEXED AS: CHURCHILL FALLS (LABRADOR) Corp. v. Hydro-Québec

2018 SCC 46

File No.: 37238.

2017: December 5; 2018: November 2.

Present: McLachlin C.J.* and Abella, Moldaver, Karakatsanis, Wagner, Gascon, Côté, Brown and Rowe JJ.

ON APPEAL FROM THE COURT OF APPEAL FOR QUEBEC

Contracts — Performance — Good faith and equity — Duty to renegotiate — Doctrine of unforeseeability — Contract between company and Hydro-Québec respecting construction and operation of hydroelectric plant — Take-or-pay undertaking by Hydro-Québec to buy fixed quantity of electricity produced by plant at fixed prices for 65 years — Hydro-Québec reaping substantial profits from resale of electricity as result of changes in market — Company bringing action for order that Hydro-Québec renegotiate contract and agree to reallocation of benefits — Whether party to contract can require other party to renegotiate contract because of allegedly unforeseeable changes in market since it was signed — Civil Code of Québec, arts. 1375, 1431, 1434.

In 1969, the Churchill Falls (Labrador) Corporation Limited and Hydro-Québec signed a contract that set out a legal and financial framework for the construction and operation of a hydroelectric plant on the Churchill River in Labrador. In the contract, Hydro-Québec undertook to purchase, over a 65-year period, most of the electricity produced by the plant, whether it needed it or not, which allowed Churchill Falls to use debt financing for the construction of the plant. In exchange, Hydro-Québec obtained the right to purchase electricity at fixed prices for the entire term of the contract. After the contract was signed, there were changes in the electricity market, and

Churchill Falls (Labrador) Corporation Limited *Appelante*

С.

Hydro-Québec Intimée

Répertorié : Churchill Falls (Labrador) Corp. *c*. Hydro-Québec

2018 CSC 46

Nº du greffe : 37238.

2017 : 5 décembre; 2018 : 2 novembre.

Présents : La juge en chef McLachlin^{*} et les juges Abella, Moldaver, Karakatsanis, Wagner, Gascon, Côté, Brown et Rowe.

EN APPEL DE LA COUR D'APPEL DU QUÉBEC

Contrats — Exécution — Bonne foi et équité — Obligation de renégociation — Théorie de l'imprévision — Contrat entre une compagnie et Hydro-Québec relatif à la construction et à l'exploitation d'une centrale hydroélectrique — Engagement ferme d'Hydro-Québec pour l'achat à prix fixes pendant 65 ans d'une quantité fixe d'électricité produite par la centrale — Profits substantiels au bénéfice d'Hydro-Québec à la suite de changements survenus sur le marché lors de la revente de l'électricité par celle-ci — Recours de la compagnie visant à imposer à Hydro-Québec la renégociation du contrat et une nouvelle répartition des bénéfices — Une partie à un contrat peut-elle exiger de son cocontractant qu'il renégocie le contrat en raison de changements dits imprévisibles survenus sur le marché depuis sa conclusion? — Code civil du Québec, art. 1375, 1431, 1434.

En 1969, la compagnie Churchill Falls (Labrador) Corporation Limited et Hydro-Québec signent un contrat fixant le cadre juridique et financier relatif à la construction et à l'exploitation d'une centrale hydroélectrique sur le fleuve Churchill au Labrador. En vertu du contrat, Hydro-Québec s'engage à acheter, sur une période de 65 ans, la majeure partie de l'électricité qui sera produite par la centrale, et ce, indépendamment de ses besoins, ce qui permet à Churchill Falls de financer par voie d'emprunts la construction de la centrale. En échange, Hydro-Québec obtient le droit d'acheter l'électricité à prix fixes pendant toute la durée du contrat. Suivant la conclusion

^{*} McLachlin C.J. took no part in the judgment.

^{*} La juge en chef McLachlin n'a pas participé au jugement.

a hydroelectric plant ("Plant") on the river. It was a huge project involving a substantial amount of money. The parties chose to allocate the risks and benefits of the Contract over a 65-year period.

[2] The Power Contract signed by the parties made the project viable and attractive for each of them. On the one hand, Hydro-Québec undertook to purchase most of the electricity produced by the Plant, whether it needed it or not, and to protect CFLCo from any cost overruns incurred in the construction of the Plant. This assured CFLCo of a stable return on its investment and allowed it to use debt financing for the construction of the Plant, which is now estimated to be worth \$20 billion. On the other hand, Hydro-Québec sought and obtained the right to purchase electricity at fixed prices for the entire term of the Contract. This protected it from inflation and assured it that it would benefit from low prices in the event of an increase in market prices for electricity.

[3] Nearly 50 years after the Contract was signed, there have been changes in the electricity market whose effect is that the purchase price for electricity set in the Contract is well below market prices. As a result, Hydro-Québec sells electricity to third parties at current prices while continuing to pay CFLCo the price agreed on in the Contract in 1969. This generates substantial profits for Hydro-Québec.

CFLCo argues that given this reality, which [4] in its view was unforeseen, Hydro-Québec can no longer avail itself of the benefits conferred on it by the words of the Contract. In CFLCo's opinion, these circumstances, which it characterizes as new and unforeseeable, mean that for Hydro-Québec to do so is contrary to the equilibrium established by the initial agreement and to the principle of good faith in contracting. CFLCo argues that, because the possibility that Hydro-Québec would within the space of a few years find itself in so advantageous a position for the sale of electricity at very high prices was unthinkable in the late 1960s, the Contract as initially contemplated cannot be found to apply in such circumstances. CFLCo submits that because the parties'

potentiel en construisant une centrale hydroélectrique (« Centrale ») sur le fleuve. Le projet est monumental et implique des sommes considérables. Les parties choisissent de répartir les risques et bénéfices du Contrat sur une période de 65 ans.

[2] Le Contrat d'électricité que signent les parties rend le projet viable et avantageux pour chacune d'elles. D'une part, Hydro-Québec s'engage à acheter la majeure partie de l'électricité qui sera produite par la Centrale, et ce, indépendamment de ses besoins. Elle s'engage aussi à prémunir CFLCo contre tout dépassement des coûts de construction de la Centrale. Cela assure à CFLCo un rendement stable sur son investissement et lui permet de financer par voie d'emprunts la construction de sa Centrale, dont la valeur est aujourd'hui estimée à 20 milliards de dollars. D'autre part, Hydro-Québec revendique et obtient le droit d'acheter l'électricité à prix fixes pendant toute la durée du Contrat. Cette mesure la protège contre l'inflation et lui assure la certitude de profiter de bas prix en cas de hausse des prix de l'électricité sur le marché.

[3] Près de 50 ans après la conclusion du Contrat, certains changements sont survenus sur le marché de l'électricité, si bien que le prix d'achat de l'électricité fixé dans celui-ci est bien en deçà des prix payables sur le marché. Hydro-Québec vend ainsi de l'électricité à des tiers aux prix actuels, tout en continuant de payer à CFLCo le prix convenu dans le Contrat en 1969. Elle en tire des profits substantiels.

Compte tenu de cette réalité qu'elle estime [4] imprévue, CFLCo soutient qu'Hydro-Québec ne peut plus se prévaloir des avantages qui lui échoient suivant la lettre du Contrat. Au regard de ces circonstances qu'elle qualifie de nouvelles et d'imprévisibles, CFLCo considère qu'un tel comportement va à l'encontre de l'équilibre de l'entente initiale et heurte la bonne foi contractuelle. Selon elle, puisqu'il était impensable, à la fin des années 1960, qu'Hydro-Québec puisse, en l'espace de quelques années, se retrouver en position aussi avantageuse pour vendre de l'électricité à très forts prix, l'on ne peut conclure que le Contrat s'applique tel qu'il était initialement envisagé dans de telles conditions. À ses yeux, comme l'entente entre les parties visait

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Executive Council November 18, 2011

A New Dawn for the Labrador Innu Canada, Newfoundiand and Labrador and the Innu of Labrador participated today in a signing ceremony for a trio of agreements which hold the potential to profoundly and positively impact the future of the Innu of Labrador and the Lower Churchill Project.

Innu Nation's Grand Chief, Joseph Riche, and Deputy Grand Chief, George Rich, Joined Deputy Chief of the Mushuau Innu First Nation, Simon Poixee, and Chief of the Sheshatshu Jinu First Nation, Sebastian Benuen to welcome guests to Naturashish.

Gests included the Honorable Note Newslove, Minister of Intergovernmental Alfains and President of the Quaeth' Nivy Council for Canada; the Honorable Kathy Dunderdale, Premier of Newfoundiand and Labrador; and Ed Martin, CEO of Nalcer Energy. They were also joned by the newsy applications thomarable NEX McGrath, provincial Minister of Intergovernmental and Aboriginal Alfains and Networker Responsible Labrador.

The Innu of Labrador have been waiting for this moment for a long time," said Minister Pensishua, the former Innu leader who now serves as the first Innu in the foderal Cabinet. "I am have today to congratulate all the leaders in the communities who, throughout the yater, have believed in this accomplishment which is so significant for the fource of Natashiha and Sheakabhui."

The three documents signed during the ceremony included the Land Claim and Self-Government Agreement in-Principle, the Upper Chardrill Bedress Agreement and the Lower Chardrill Imru Impact and Benefits Agreement which, collectively, have became known as Tabain Neapon or the New Dam Agreements.

Invu Nation Grand Child Joseph Richer receptional the controllutions of adams and past leaders. Today as we celebrate this moment in or history, lawar to receptize and advantage the courses and windown of the defare and the leaders of them. If and the leaders have the server set to the set of the leaders of the le

Chief Sebastian Benuen of Sheahashiu Innu First Nation expressed the appreciation of the Innu people to the federal and provinci governments and to Nation: "This beam a long road for us to get to this day and many times we questioned withher it would very happen. But we are here and I want to thank Minister Duncan, Premier Dunderstein and Mr. Ef Martin for their kadenthip and their confidence in the Innu people. We load forward to working with you as an implement the appenents being isgued today."

"These agreements will change the corrse of Innu history," said Mushuau Innu Deputy Chief Simon Pokus. "We can see a future where Ionu once again will control our lives and our communities. The benefits from these agreements will be full in our comm for Iteratily hundred of years."

Innu control over their lives and their communities is taking a giant step forward with the signing of the Tahash Petapen Agreement Today the Jonu of Labrador have enhanced their ability to take responsibility for their own future, to provide for the health and well-being of their scotes, and to contribute to the broader provide) and Cantadin societies.

This sector is a sector of the sector provided and Candidan socialities. This sector is a provide social mean sector is a sector of the sect

We are produid to be part of this historic event for the Jonu of Labrador," stated the historicable John Duncan, Historia of Aborignial Affairs and thorthern Development. This Agreement-in-Principle provides the basis for su to pursue negotiations tometical a Final Agreement and high solar 18 donation for exercising comh of the Talun couple, for the Invirce, and for this importance region of Canada. All his labelses, part and prevents, in Sheahashiha and Katualahih have combined to this accompliament that will alwape the fations of the Interpret and Interpret and Taluna and the Interpret and Interpret and

The settlement of land claims brings claimly to onenethy of land and management of resources, creating a more stable environment for the occome, social and cubral development of Lahodor's and Ministe McGraft. This government adverselings the weight of responsibility that results with hore as the provide historic land claims agreements that will have be factor of the relation of participation of the stability of the line historic and encoding on the decomposition of the stability relation and adjournment agreement with the line historic and the approximation of the decomposition of the approximation of the approximation of the stability of . The signing of the three agreements is another important step towards the development of the Lower Churchill Project

"Nalcor Energy is focused on building partnerships that will provide long-term benefits for the people of the province. The company's commitment to a productive partnership with the Irnu Nalcio will provide great benefit to all parties involved," and Ed Metrin. "We are developing reliabionships with or new partners as we may come formad with Phase One of the Leven Chundi Project. "Musicat Fails". On June 30, 2011, the Innu of Labrador voted in a referendum on the Agreement-in-Principle. A strong majority of the eligible mimiters (70 per cart) of the two Innu communities voted. Of those who participated, 88 per cert voted in favour of the Agreement in-Principle.

The Innu of Labrador have a population of approximately 2,400 members living in the communities of Sheshatshiu and Nati located respectively 55 kilometers outside of Happy Walley-Goose Bay and 300 kilometres north of Happy Valley-Goose Bay

- 30 -Plunia 1: Premier Kathy Dunderdale signs New Dawn Agreements in Naturathish. To the Premier's left are Innu elders Sebastien Per and Ponia Nuka. - November 18, 2011

Findin 2: Holding signed documents of the New Dawn Agreements are left to right: Gilbert Bennett, Nakor; Premier Kathy Dunderdal Peter Penashue, Minister of Intergovernmental Aflairs and President of the Queen's Privy Council for Canada; and Joseph Riche, Innu Nation Crand Chiefe - November 19, 2011

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BACKGROUNDER Highlights: Land Claims and Self-Government Agreement-in-Principle with the Innu of Labrador

The Labeador Fona assert Aboriginal rights and tible throughout a large area of central Labrador and Esstern Québac including the Nort Shore of the Culif of St. Lawrence. No treaty has ever been signed with the Innu of Labrador. The Land Claims and Self-Government Agreement-In-Principle been signing of today only adverses their claim labrador.

Overview of the Agreement-In-Principle and Lands The Agreement-In-Principle (AIP) sets out jurisdictions, rights, benefits and limitations for the Labordor Innu in a variety of subject awas. These include the harvestimp of fronts resources and plants; finity, migratory briels; and wildlife. All rights and benefits are directly ties to specify equipationally defined lands.

There are four types of lands referenced in the AIP:

- There are for types of land in referenced in the APP.
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Other Key Asperts of the ATP

- The AIP is not legally binding and does not define, create, recognize, abrogate, derogate, deny or amend any of the rights of the partisis;
- parties; It preserves the time document of Cauda and to the Government of Newfoundard and Lakador all Isenaking authorities in relation to Caudain national interest parenes and provincial interest parenes respectively; It suits call edition (such and frame) will be interediated as abanding of the Agreement and addites the procedures for extrements by application; It suits call edition resources reveaux altering for the Volary's Bay mining project as well as the status of the lands in the Volary's and the status of the lands in process detailing the status to baker, how and whan.

Federal Financial Package and Financing Arrangements The proposed agreement includes a financial package which is subject to the following conditions:

- \$118 million to be paid and once the Appendent comes into force (the partial of time over which this payment is to occur is to be negatived with the Labordor how);
 \$110 million for account eventopment fact. (I to builtion for headpoint good and \$100 million for acquirity building fund, all of which are one time payments to be provided orcs the Appendent receives Royal Assent.

BACKGROUNDER Execution of Agreements with the Innu Nation November 18, 2011

Neptrations have been ongoing between the Ionu Nation and the Province of Newfoundiand and Labrador in separate forums for many years. On September 25, 2008, Nation: Energy, the Government of Newfoundiand and Labrador and Ionu Nation signed the Tibash Phagano (New Dawa), Appenetric, This agreement neisolikely constanting issues in relation to land claims, the Lower Churchill Ionu Impacts and Benefits Agreement (IBA) and Upper Churchill referess.

Since that time, the parties have worked to complete three agreements:

- A tripantie Innu Land Rights Agreement-in-Phrinciple bitween Canada, Newfoundiand and Labrador and Innu Nation (AIP)
 The Lower Churchill Project Innu Ingest Beenits Agreement (IBA)
 The Upper Churchill Redress Agreement (UCRA)

These three agreements were ratified by the Innu on June 30, 2011, and signed by the parties on November 18, 2011. The IBA and the UCRA come into effect immediately upon signing. The AIP will form the basis for orgoing treaty negotiations between the Innu, Canada and Neefforciandand and talacted.

- HIGHLIGHTS
- Lower Churchill Project Impacts and Benefits Agreement

- Leave Charactile Physics Impacts and Benefits Agreement Phononal benefits Phononal Bene
- Upper Churchill Redress Agreement
- Upper Chardfill Retries Agreement Werk and Section comparations to the Lichsdor from for impacts associated with the Upper Chardfill Retries. In the Agreement provides comparations to the Lichsdor from for impacts associated with the Upper Chardfill Retries. The Comparation for controls is an annual additional paration of the Chardfill Retries and annually of 2.5 per cent) upper and the Upper card of Maker's research in the Section Section of Test Section and Section and Section and of these practice diversity of the Upper Chardfield Retries and Section Section 2.5 and Section 2.5 and of these practice diversity of the Agreement of the Section Section 2.5 and Section 2.5 and Section 2.5 and of these practice diversity of the Agreement of the Section 2.5 and Section 2.5 and Section 2.5 and here a Crasted Linker Chardfield Retries and Chardfield Retries and Linker Section 2.5 and Section 2.5 and here a Crasted Linker Chardfield Retries and Chardfield Retries and Linker Section 2.5 and Section 2.5 and here a Crasted Linker Chardfield Retries and Linker Section 2.5 and Section 2.5 and here a Crasted Linker Chardfield Retries and Linker Section 2.5 and Section 2.5 and Section 2.5 and here a Crasted Linker Chardfield Retries and Linker Section 2.5 and Section 2.5 and Section 2.5 and here a Crasted Linker Section 2.5 and Linker Section 2.5 and Section 2.5 and Section 2.5 and here a Crasted Linker Section 2.5 and here a Crasted Linker Section 2.5 and Section 2.5 and Section 2.5 and Section 2.5 and here a Crasted Linker Alexandre Linker Alexandre Linker Alexandre Linker Alexandre Linker Alexandre Linker here a Crasted Linker Alexandre Li

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Last Updated: December 5, 2018

EXHIBIT M

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News Releases



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Executive Council Natural Resources Labrador and Aboriginal Affairs July 1, 2011

Provincial Government Applauds Acceptance of Tshash Petapen (New Dawn) Agreements

Acceptance of the New Dawn Agreements by the Labrador Innu Nation will introduce tremendous benefits to the Innu people of Labrador, and represents a major step forward for the development of Muskrat Falls, said the Honourable Kathy Dunderdale, Premier of Newfoundland and Labrador.

"The ratification is a proud moment in our province's history, and a wonderful achievement which will bring new opportunities to the Labrador Innu," said Premier Dunderdale. "Our government's partnership with the Innu Nation has been a successful one and we will continue to work together to ensure that the interests of the Innu are respected. Muskrat Falls is an exciting development for the province and with this ratification, important benefits are secured for the Innu."

"The positive vote is an important step in support of the development of the Lower Churchill," said the Honourable Shawn Skinner, Minister of Natural Resources. "The Lower Churchill Impacts and Benefits Agreement provides significant benefits to the Innu Nation, and ensures that the Labrador Innu will have priority for employment and business opportunities associated with the development."

The New Dawn Agreement includes three elements: the Upper Churchill Redress Agreement, the land claims agreement-in-principle, and the Lower Churchill Impacts and Benefits Agreement (IBA). The Upper Churchill Redress Agreement will provide compensation to the Labrador Innu for impacts associated with the Upper Churchill Falls development, and settles the outstanding grievances of the Innu Nation with respect to damages suffered to Innu lands and properties as a result of the flooding caused by this development in the 1960s. Key elements of the IBA include a structured royalty regime and implementation funding to support the Innu Nation's involvement in the project during construction.

"I congratulate the Innu people and welcome their endorsement of these agreements," said the Honourable Patty Pottle, Minister of Aboriginal Affairs. "I also acknowledge the dedicated efforts of the negotiators who worked hard to achieve the terms. This successful ratification vote is a reflection of what is a fair and honourable settlement for the Innu."

The land claims agreement-in-principle is a non-binding agreement that will form the basis for negotiating a final land claims agreement or treaty. Upon signing it will be released to the public. It will define Innu treaty rights and where those rights will apply in Labrador.

- 30 -

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2011 07 01

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Exhibit 2

TESTIMONY OF KAIGHN SMITH JR., ESQ., COUNSEL FOR THE PENOBSCOT NATION ON AN ACT TO IMPLEMENT THE RECOMMENDATIONS OF THE TASK FORCE ON CHANGES TO THE MAINE INDIAN CLAIMS SETTLEMENT IMPLEMENTING ACT (L.D. 2094)

FISH AND GAME AND LAND USE AND NATURAL RESOURCES (TASK FORCE CONSENSUS RECOMMENDATIONS 7-10)

Public Hearing, February 14, 2020

Good afternoon, my name is Kaighn Smith Jr. I am a shareholder at Drummond Woodsum & MacMahon, and I have served as litigation counsel for the Penobscot Nation for over 25 years. I teach *Federal Indian Law* at the University of Maine School of Law, and I serve as an Associate Reporter for drafting the American Law Institute's *Restatement of the Law of American Indians*.

I have been asked by Penobscot Nation Chief, Kirk Francis, to speak to you today in support the implementation of Task Force Recommendations 7-10 through L.D. 2094. I provide this testimony solely on behalf of the Penobscot Nation.

The Penobscot Nation believes that in order to place this opportunity to improve tribal-state relations in context, it is very important to look at some painful history. The Nation appreciates the Committee's consideration of this context and looks forward to better relations with the State of Maine through L.D. 2094.¹

¹ Consensus Recommendations 7-10 are to amend the Maine Implementing Act to:

[[]R]ecognize federal law regarding the exclusive jurisdiction of Tribes to regulate fishing and hunting by Tribal citizens of all federally recognized Tribes on Tribal lands. . . [R]estore and affirm the exclusive jurisdiction of Tribes to regulate fishing and hunting by non-Tribal citizens on Tribal lands, but . . . not cede any of the Maine Indian Tribal-State Commission's authority to regulate hunting and fishing under current law to the State.

[[]R]elinquish the State of Maine's jurisdiction with respect to the regulation of fishing and hunting by both Tribal and non-Tribal citizens on Tribal lands, except that, solely for conservation purposes, the State of Maine . . . under general principles of federal Indian law and in a manner consistent with reserved Tribal treaty rights.

[[]R]estore and affirm the Tribes' rights to exercise regulation of natural resources and land use on Tribal land to the fullest extent under federal Indian law.

The Restoration Of Inherent Sovereignty And What That Means In Historical Context

At the time of the Maine Indian Land Claims Settlement, Congress explained that "[t]he aboriginal territory of the Penobscot Nation is centered on the Penobscot River." H. R. REP. No. 96-1353 at 11, *reprinted in* 1980 U.S.C.C.A.N. 3786, 3787 ("H.R. REP."); S. REP. NO. 96-957 ("S. REP") at 14 REP. at 11. Congress further explained:

When the Revolutionary War broke out, General George Washington requested assistance of [the Penobscot Nation, the Passamaquoddy Tribe, and the Houlton Band of Maliseet Indians] and, on June 23, 1777, Colonel John Allan, of the Massachusetts militia . . . negotiated a treaty with these Indians, pursuant to which the Indians were to assist the Revolutionary War in return for protection of their lands by the United States . . . Allan's journals indicate that the Indians played a crucial role in the Revolutionary War.

Despite requests from the Maine Indians, the federal government did not protect the tribes following the Revolutionary War. In 1794, the Passamaquoddy Tribe . . . relinquished all but 23,000 acres of its aboriginal territory. Subsequent sales and leases by the State of Maine reduced this territory to approximately 17,000 acres. The Penobscot Nation lost the bulk of its aboriginal territory in treaties consummated in 1796 and 1818. A sale to the State of Maine in 1833 resulted in the loss of four townships by the Penobscot Nation.

H.R.REP. at 11-12; S.REP. at 12.

These lands cessions failed to comply with one of the first acts of Congress, the Indian Nonintercourse Act. H.R.REP. at 12; S.REP. at 12. Enacted in 1790, and presently codified at 25 U.S.C. § 177, this Act renders void any land transaction with an Indian tribe that lacks federal approval. *See* 25 U.S.C. § 177.

In the landmark decision of 1975, *Joint Tribal Council of Passamaquoddy Tribe v. Morton*, 388 F. Supp. 649 (D. Me.), Judge Edward T. Gignoux, held that the United States had a trust responsibility to the Passamaquoddy Tribe (and concomitantly to the Penobscot Nation) to investigate claims against Maine for violations of the Nonintercourse Act. The First Circuit affirmed his decision, *see Joint Tribal Council of the Passamaquoddy Tribe v. Morton*, 528 F.2d 370 (1st Cir. 1975), and the United States commenced federal court actions against Maine on behalf of the Penobscot Nation and the Passamaquoddy Tribe to recover the ceded lands. *See* 25 U.S.C. § 1731 (referring to Civil Action Nos. 1966-ND and 1969-ND, hereinafter "*U.S. v. Maine*" or the "land claims"). Together, these claims covered "12.5 million acres, or 60 percent of the State." H.R.REP. at 14; S.REP. at 13.²

In 1979, the United States, through the U.S. Department of the Interior ("DOI" or "Interior Department"), Bureau of Indian Affairs formally recognized the Penobscot Nation and the Passamaquoddy Tribe as Tribal Nations with government-to-government relationships with the United States. 44 Fed.Reg. 7,235-7,236 (Jan. 31, 1979). The U.S. Court of Appeals for the First Circuit has explained what this means:

Federal recognition is just that: recognition of a previously existing status. The purpose of the procedure is to "acknowledg[e] that certain American Indian tribes exist." 25 C.F.R. § 83.2 (1993). *The Tribe[s'] retained sovereignty predates federal recognition—indeed, it predates the birth of the Republic, see Santa Clara Pueblo v. Martinez*, 436 U.S. 49, 56, 98 S.Ct. 1670, 1675, 56 L.Ed.2d 106 (1978)—*and it may be altered only by an act of Congress, see Morton,* 417 U.S. at 551–52, 94 S.Ct. at 2483.7

² Contrary to certain testimony presented at the Public Hearings on L.D. 2094, the Tribes never sued Maine; the United States sued Maine as the Tribes' trustee. Also contrary to certain testimony presented at the Public Hearings, the United States carefully assessed the merits of the claims and was fully prepared to proceed with these actions; these were very serious claims. For example, the United States reported to Judge Gignoux in 1977:

We have concluded that a valid cause of action on behalf of the Penobscot Tribe encompasses all those lands lying in the Penobscot River watershed above the ancient head of the tide, a point north of Eddington, Maine, to the head of the river. Based on the outcome of further study this cause of action may also include those portions, if any, of the eastern shore of Moosehead Lake and the St. John River watershed west of Houlton, Presque Isle and Caribou which the tribe actually used and occupied in 1790, excluding, however, those lands in the St. John River watershed under treaty deeds confirmed pursuant to- Article 4 of the Webster-Ashburton Act of 1842.

Memorandum in Support of [United States'] Motion for Further Time to Report to the Court, *United States v. Maine* (Civil Nos. 1966-ND and 1969-ND) (D. Me.) at 4, copy attached hereto as **Exhibit A**.

State of R.I. v. Narragansett Indian Tribe, 19 F.3d 685, 694 (1st Cir. 1994) (emphasis added).³

That same year, the United States Court of Appeals for First Circuit held "in *Bottomly v. Passamaquoddy Tribe*, 599 F.2d 1061 (1st Cir. 1979) (Coffin, J.) that the Maine Tribes still possess[ed] inherent sovereign authority to the same extent as other tribes in the United States [and] [t]he Maine Supreme Judicial Court . . . adopted the same view in *State v. Dana*, 404 A.2d 551 (Me. 1979)." H.R.REP. at 14; S.REP. at 14. *See Bottomly*, 599 F.2d at 1066; *Dana*, 404 A.2d at 560-563. The final Senate Committee Report on MISCA refers to *Bottomly* as "holding that Maine Tribes are entitled to *protection under federal Indian common law doctrines*." S.REP. at 13 (emphasis added). *See Bottomly*, 599 F.2d at 1066; *Dana*, 404 A.2d at 560-563.

⁴ All parties to the land claims settlement in 1980 understood this. The following are just a few examples:

• On April 2, 1980, in his opening remarks to introduce what became Maine Act to Implement the Indian Land Claims Settlement, 30 M.R.S.A. §§ 6206-6212 ("MIA") to the Maine Legislature, Maine Senator Samuel W. Collins, Jr., Chairman of Maine's Joint Select Committee on Indian Land Claims, stated that "the premise of this bill and the entire settlement agreement is that the Indians are Federal Indians." He continued:

This means that the Indians and their lands are within the exclusive jurisdiction of the Federal Government, and its Indian Laws. Under this premise, the State has no jurisdiction at all, but the Federal Government has that authority and can presumably delegate it to the State, or, in this instance, ratify and incorporate into Federal Law an agreement between the State and the Indians.

Maine Legislative Record -- Maine Senate, April 2, 1980 at 717-18.

On March 28, 1980 at the public hearings held on MIA, Maine's Deputy Attorney General, John Paterson, testified that in the absence of attaining Congress's ratification of MIA, "State laws would generally have no applicability [to the Tribes] as exists in most states." *Transcript of March 28, 1980 Public Hearing before the Joint Select Committee of the Maine Legislature on Indian Land Claims* (1980) ("*Public Hearing*") at 42.

³ Contrary to testimony presented at the Public Hearings, the Penobscot Nation and the Passamaquoddy Tribe did not attain federal recognition in 1980; they attained formal recognition in 1979. Further, they were never "granted" governmental authority by the federal government or by Maine. The sovereign authorities that Tribal Nations possess are inherent, not "granted" by the United States or any state government, and they are "retained" absent express abrogation by Congress. *See United States v. Wheeler*, 435 U.S. 313, 322-23 (1978); *Bottomly v. Passamaquoddy Tribe*, 599 F.2d 1061, 1066 (1st Cir. 1979). Because tribal sovereignty is subject to the exclusive authority of Congress, a state's assertion of authority over a tribe's affairs or its territory cannot operate to divest the tribe of its inherent sovereign powers. *See State of R.I.*, 19 F3d. at 694 n.7; *Bottomly*, 599 F.2d at 1066.

Thus, going into the land claims settlement, the Penobscot Nation and the Passamaquoddy Tribe retained and exercised the same inherent sovereign authorities over their existing reservations (those lands and related natural resources that they did not cede in the suspect treaties with Massachusetts and Maine) that other Tribal Nations exercised across the country in accord with established "federal Indian common law doctrines." Further, they were poised to exercise those authorities over their aboriginal lands and resources that United States would recover for them in the land claims actions brought on their behalf in the federal court.

In 1980, Congress settled *U.S. v. Maine* with the enactment of the Maine Indian Claims Settlement Act of 1980, Pub. L. No. 96-420, 94 Stat. 1785 (1980) ("MICSA") and thereby ratified and rendered effective MIA (collectively the "Settlement Acts"). *See* 25 U.S.C. § 1721(b)(3); 30 M.R.S.A. § 6201 (Historical and Statutory Notes, referencing Sec. 31, "Effective date" as that of MICSA).⁵

⁵ MICSA was formerly codified at 25 U.S.C. §§ 1721-1735, but it was removed from Title 25 in 2016. This testimony cites MICSA using the former Title 25 section numbers.

[•] At the same hearings, Thomas N. Tureen, counsel for the Penobscot Nation and the Passamaquoddy Tribe testified that as a result of *Dana*, "the lands of the Maine Indian Tribes constitute Indian Country as the term is used in Federal Law. As such, Indians residing on Tribal Land in Maine are not subject to the civil or criminal jurisdiction of the Courts of Maine." *Public Hearing* at 24.

On July 1, 1980, Senator Collins confirmed, under questioning from Senator George Mitchell before the Senate Committee on Indian Affairs, that the Penobscot Nation and the Passamaquoddy Tribe "were not now subject to the jurisdiction of the State of Maine," but that the Tribes could agree "to return that jurisdiction to the State" if confirmed by Congress. *Maine Indian Land Claims: Hearings on S. 2829 Before the S. Select Comm. on Indian Affairs,* 96th Cong. 38 (1980) ("*Senate Hearings*") at 343-44. *See also id.* at 337 (testimony of Maine Representative, Bonnie Post, co-chair of the Maine's Joint Select Committee, (the proposed settlement "accepts the concept that the Penobscot Nation and the Passamaquoddy Tribe are Federal Indians").

At the same hearings, Andrew Akins, Chairman of the Penobscot Negotiating Committee, testified that the *Dana* and *Bottomly* decisions "confirm[ed]... the existence of our inherent tribal sovereignty, and 'Indian country' status of our lands" pursuant to principles of federal Indian law. *Senate Hearings* at 175-176. *See also Settlement of Indian Land Claims in the State of Maine: Hearing Before the Committee on Interior and Insular Affairs, House of Representatives*, 96th Congress Second Session (Aug. 25, 1980) (same, testimony of Penobscot Negotiating Representative, Rubin ("Butch") Phillips); id. at 235-236 (same, testimony of Andrew Akins).

The MIA generally subjects the Penobscot Nation, the Passamaquoddy Tribe, their members, and their lands and natural resources to state law, but it prohibits state jurisdiction over "internal tribal matters," which are not defined. 30 M.R.S.A. §§ 6204, 6206(1). Since the passage of the Settlement Acts, Maine and the Tribes have engaged in protracted litigation over the nature and scope of "internal tribal matters." (Some of the cases are listed in footnote 10, below.) Restoration of the Tribes' inherent sovereign authority over the exploitation of natural resources within their Tribal Lands in accord with the "federal Indian common law doctrines" that "protected" them in 1979 will clarify the law and thereby end the acrimonious litigation that has marked tribal-state relations since 1980. In so doing, it will also properly "protect" the dignitary interests of the Tribes as sovereign tribal governments.

These "federal Indian common law doctrines" are not complicated. They establish the following with respect to the authority of Tribal nations over natural resources exploitation and environmental protection within their reservations and trust lands (what is referred to as "Tribal lands" in the L.D. 2094):

Unless limited by Congress . . . , Indian tribes have the power to enact and enforce laws governing . . . natural-resources exploitation, and environmental protection [within Tribal lands].

AMERICAN LAW INSTITUTE, COUNCIL DRAFT NO. 6, RESTATEMENT OF THE LAW OF AMERICAN INDIANS (Dec. 2, 2019) (Black Letter § 52). *See New Mexico v. Mescalero Apache Tribe*, 462 U.S. 324 (1983) (Tribes retain inherent regulatory authority over hunting, trapping, fishing, and other taking of wildlife within their tribal lands); *Merrion v. Jicarilla Apache Tribe*, 455 U.S. 130, 140 (1982) (Tribes retain "undisputed power" to exclude persons from tribal lands and with that power comes the power to regulate their activities while they remain on tribal lands). *Accord Plains Commerce Bank v. Long Family & Cattle Co., Inc.*, 554 U.S. 316, 335 (2008) ("[r]egulatory authority goes hand in hand with the power to exclude"); *Water Wheel Camp Recreational Area, Inc. v. LaRance*, 642 F.3d 802, 808-809, 811-812 (9th Cir. 2011) (citing cases).

The Importance Of Penobscot Sovereign Authority Over The Exploitation Of The Tribe's Sustenance Resources

The preservation of this governmental authority is critical for the physical and cultural survival of Indigenous peoples. As the Supreme Court has said, hunting

and fishing practices are "not much less necessary to the existence of the Indians than the atmosphere they breathe."⁶ The Penobscot People are no different.

At the hearings on the land claims settlement, the U.S. Senate Committee overseeing the settlement heard testimony from Penobscot tribal member, Lorraine Dana (a/k/a Lorraine Nelson), a single mother, who fed her family with fish her son, Barry Dana, caught from the reservation waters of the Penobscot River. Concerned that Maine would be granted full authority over the Penobscot Nation's fishing rights, she testified:

My son hunts and fishes my islands to help provide for our family, and if we are to abide by State laws, as this bill intends us to, my family will endure hardship because of the control of the taking of . . . fish. You know as well as I, inflation has taken its toll, and at the present time, I am unemployed and have a family of five to support. Two of these children are going to college. I have brought them up myself.

Senate Hearings at 419. In stating "my son . . . fishes my islands," she used a Penobscot locution, meaning he fished in the Penobscot River in the waters surrounding her family's allotted islands in the River near Lincoln, Maine. Supporting sworn testimony of Penobscot citizens, Lorraine Dana and Barry Dana, is attached hereto as **Exhibit B**.

From time immemorial and continuing into the 1990s, when they learned that water pollution was poisoning their sustenance resources, Penobscot families relied upon fish, eel, and other food sources from the River for up to four meals per week to the tune of two to three pounds per meal. Additional supporting sworn testimony of Penobscot citizens, Chris Francis, Timothy Gould, and Kirk Loring, is attached hereto as part of **Exhibit B**.

Professor Harald Prins testified to you about the central importance of Penobscot sustenance practices to Penobscot culture. Relevant excerpts from the Dr. Prins's Report, referenced in his testimony, are attached hereto as **Exhibit C**.

Given the critical importance of hunting and fishing for tribal existence, one of the most fundamental principles of federal Indian law is that Tribes generally retain

⁶ Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n, 443 U.S. 658, 680 (1979).

inherent authority, exclusive of states, to regulate the exploitation of natural resources within their lands and waters by their own members and by non-members.⁷

Were this not so, tribal resources could be exploited by local interests supported by state governments. The United States Supreme Court has consistently observed that, for reasons bound up in the history of the colonization of America's Indigenous Peoples, state governments are often hostile to tribal interests. *See New Mexico v. Mescalero Apache Tribe*, 462 U.S. 324, 339 (1983) (state and local decision making may be "based on considerations not necessarily relevant to, and possibly hostile to, the needs of the reservation."); *United States v. Kagama*, 118 U.S. 375, 384 (1886) (recognizing that "[b]ecause of the local ill feeling, the people of the States where [the Indians] are found are often their deadliest enemies").⁸

Article I, section 8 of the United States Constitution allocates plenary authority over Indian affairs to Congress, and implicitly deprives states of any authority over Tribal Nations and their resources. As one of the most respected commentators in the field of federal Indian law explains: "[o]ne of the basic premises underlying the constitutional allocation of Indian affairs to the federal government was that the states could not be relied upon to deal fairly with the Indians." WILLIAM C. CANBY, JR., AMERICAN INDIAN Law 138 (4th ed. 2004).

States are generally precluded from exercising jurisdiction over Indians in Indian country unless Congress has clearly expressed an intention to permit it. *Bryan v. Itasca County*, 426 U.S. 373, 376 n. 2 (1976); *McClanahan v. Arizona State Tax Commission*, 411 U.S. 164, 170–71 (1973). This rule derives in part from respect for the plenary authority of Congress in the area of Indian affairs. *See Merrion v. Jicarilla Apache Tribe*, 455 U.S. 130 (1982); *White Mountain Apache Tribe v. Bracker*, 448 U.S. 136, 142–43

⁷ New Mexico v. Mescalero Apache Tribe, 462 U.S. at 342.

⁸ See also Arizona v. San Carlos Apache Tribe of Arizona, 463 U.S. 566-67 (1983) (there is "a good deal of force" to the view that "[s]tate courts may be inhospitable to Indian rights."); Oneida Indian Nation of New York v. County of Oneida, 414 U.S. 661, 678 (1974) ("state authorities have not easily accepted the notion that federal law and federal courts must be deemed the controlling considerations in dealing with the Indians."). See also Idaho v. Coeur d'Alene Tribe of Idaho, 117 S.Ct. 2028, 2056 n.11 (1997) ("the readiness of the state courts to vindicate the federal right[s of Indian tribes] has been less than perfect") (Souter, J., with Stevens, Ginsburg, and Breyer, JJ., dissenting).

(1980). Accompanying the broad congressional power is the concomitant federal trust responsibility toward the Indian tribes. *Santa Rosa Band of Indians v. Kings County*, 532 F.2d 655, 660 (9th Cir.1975), *cert. denied*, 429 U.S. 1038 (1977); *see Seminole Nation v. United States*, 316 U.S. 286, 297 (1942). That responsibility arose largely from the federal role as a guarantor of Indian rights against state encroachment. *See United States v. Kagama*, 118 U.S. 375, 383–84 (1886).

Washington v. EPA, 752 F.2d 1465, 1469-70 (1985).

Given this context and the on the ground experience of the Penobscot People, it is no wonder that litigation over the control of the exploitation of their sustenance resources by outsiders has led to protracted litigation and attendant animosity.

The Experience Of The Penobscot People

It is worth repeated Congress's announcement upon settling the land claims in 1980: "The aboriginal territory of the Penobscot Nation is centered on the Penobscot River." S. REP. at 11; H.R. REP. at 11, *reprinted in* 1980 U.S.C.C.A.N. 3786, 3787. Until 1950, when a bridge was constructed from their principal community (and the seat of their government) at Indian Island (*Panawamskeag* or *Pem ta guaiusk took,* meaning "great or long River") to the mainland, the Penobscots were an entirely river bound people.

But the Penobscot River, and therefore, the Penobscot People suffered greatly from exploitation at the hands of Maine and its paper industry.⁹

As of 1968, "the Penobscot [River] . . . received the untreated industrial wastes discharged non-stop from seven pulp and paper mills," five of which flowed

⁹ A fuller history of the Penobscot Nation's relationship to the Penobscot River and its struggle to protect its sustenance resources than that set out here can be found in the dockets of two cases in the United States District Court for the District of Maine: *Penobscot Nation and United States of America v. State of Maine, Janet T. Mills,* et. al., Civil Action No. 1:12-cv-0025-GZS, Documents 102-110, as summarized in Document 119 (Statement of Material Facts in Support of the United States' and Penobscot Nation's Motions for Summary Judgement) and Document 140 (Opposing Statement of Material Facts of the United States and the Penobscot Nation) and *State of Maine v. Andrew Wheeler, Acting Administrator United States Environmental Protection Agency, et. al.* (Civil Action No. 1:14-cv-264 JDL), Document 155-1 and Exhibits 1 and 2 attached thereto. These documents are available through the Public Access to Court Electronic Records website (PACER): https://www.pacer.gov/.

directly into the Main Stem of the River (from Indian Island to Medway) – the home of the Tribe's aboriginal villages occupied from time immemorial. In 1964, this was equivalent to "untreated domestic sewage load produced in one day by about 5,000,000 people," thereby depressing "dissolved oxygen levels . . . as low as zero."¹⁰

Maine's support for industrial interests over those of the Penobscot People has marred tribal-state relations for a very long time. Since the land claims settlement in 1980, the Maine Attorney General's office consistently sided with corporations to fight the Maine tribes on water quality issues.¹¹

One such corporation, Lincoln Pulp & Paper ("LP&P") (now bankrupt), discharged dioxin into the Penobscot River, leading to warnings that the fish in the River have been, and continue to be, dangerously contaminated.¹² Siding with

¹¹ The cases include *Penobscot Nation and United States v. Mills*, 861 F.3d 324 (1st Cir. 2017) (petitions for rehearing en banc, filed by the United States and the Penobscot Nation pending) (Maine Attorney General, siding with pollutant discharging corporations, asserting that the Penobscot Indian Reservation is confined to island surfaces and excludes the River, the source of the Tribe's sustenance resources); Maine v. Johnson, 498 F.3d 37 (1st Cir. 2007) (Maine Attorney General siding with pollutant discharging corporations, arguing that Maine, not the EPA should hold authority to permit pollution discharges into the Penobscot River affecting tribal sustenance resources); Penobscot Nation v. Georgia-Pac. Corp., 254 F.3d 317, 318 (1st Cir. 2001) (whether paper corporations can invoke Maine Freedom of Access Law to obtain governmental documents of the Penobscot Nation regarding efforts of the Nation to protect its reservation from environmental pollution); Great Northern Paper, Inc. v. Penobscot Nation, 770 A.2d 574 (Me. 2001) (same); State of Maine v. McCarthy, et. als. (1:14-cv-00264-JDL), currently pending in the U.S. District Court for the District of Maine (involving whether EPA must approve Maine's water quality standards in tribal waters); and numerous proceedings before the Federal Energy Regulatory Commission in which the Maine AG's office has sided with dam owners against the U.S. Department of the Interior and the Penobscot Nation on environmental protection measures.

¹² In the late 1990s, the United States Department of the Interior, as trustee for the Penobscot Nation, commenced a natural resources damages proceeding against potentially responsible parties, in particular, LP&P. In July, 1999, the Bureau of Indian Affairs commissioned a report entitled "*Final Report: The Economic Value of Foregone Cultural Use: A Case Study of the Penobscot Nation.*" **Exhibit D.** In explaining this work to then Senator Olympia Snowe, DOI described its field observations of the Penobscot River by its Natural Resources Damages Assessment Coordinator: "it stinks, it makes you sick, you can't eat the fish, and it's killing

¹⁰ U.S.E.P.A., *A Water Quality Success Story: Penobscot River, Maine,* December, 1980 at 4-5, accessible at https://nepis.epa.gov/Exe/ZyNET.exe or via Google search with key words from title.

LP&P and other pollutant dischargers, Maine has long maintained that the Maine Tribes' rights to sustenance fishing do not include any right to water quality to support healthy fish.

The Maine AG's office first took this position in the late 1990s when LP&P applied to the EPA for a discharge permit into the Penobscot River in the heart of the Penobscot Nation's fishing territory (indeed, the very fishing grounds of Lorraine and Barry Dana.) The Maine AG wrote to EPA, stating that the Nation's sustenance fishing right afforded tribal members nothing more than the opportunity to catch "whatever fish were available" and did not afford the Nation any right to a quality or quantity of fish to nourish tribal members in accord with principles of federal Indian law. *See* STATE OF MAINE, DEPARTMENT OF ATTORNEY GENERAL, LETTER TO JOHN DEVILLARS, REGIONAL ADMINISTRATOR, REGION I, RE: LINCOLN PULP & PAPER NPDES NO. ME0002003 APPEAL (June 3, 1997), attached hereto as **Exhibit G** at 6. Maine further asserted that there was no federal trust responsibility on the part of the EPA to protect the Nation's sustenance fishing right in any manner. *Id.* at 10-14.

The Interior Department responded, "the United States has a trust responsibility to protect the lands and resources of federally recognized Indian tribes," including those of the Penobscot Nation:

Since there exists a trust relationship between the Maine Tribes and the United States, EPA must act as a trustee when taking federal actions which affect tribal resources. When taking such actions, EPA's fiduciary obligation requires it to first protect Indian rights and resources. . . . Thus, fulfillment of EPA's trust responsibility must entail considerations beyond the minimum requirements in the Clean Water Act (CWA) and in MICA to fully protect the PIN's rights and resources.

birds." **Exhibit E** at 3. The Final Report states that "the Penobscot Nation has been deprived of its rightful use of the Penobscot River" and estimates that the value of the Tribe's foregone use of the Penobscot River between \$34.9 and \$62.7 million. *Id.* at 11. In 2001, LP&P filed for Chapter 11 bankruptcy to discharge its obligations, including any claims for natural resources damages. The United States, as trustee for the Penobscot Nation, filed a proof of claim in that proceeding, to recover "damages suffered by the Penobscot Indian Nation . . . for the loss of its sustenance fishing right and cultural use due to the contamination of the waters and sediments of the Penobscot River, which includes areas of the Nation's reservation." **Exhibit F** at 2-3.

UNITED STATES DEPARTMENT OF THE INTERIOR, OFFICE OF THE SOLICITOR, LETTER TO JOHN DEVILLARS, REGIONAL ADMINISTRATOR, REGION I, RE: LINCOLN PULP & PAPER NPDES NO. ME0002003 (Sept. 2, 1997), attached hereto as **Exhibit H** at 2-4.

More recently, in 2015 the U.S. Environmental Protection Agency and the Interior Department concluded that

[F]undamental, long-standing tenets of federal Indian law support the interpretation of tribal fishing rights to include the right to sufficient water quality to effectuate the fishing right. . . . The [federal] trust relationship counsels protection of tribal fishing rights in Maine.

UNITED STATES DEPARTMENT OF THE INTERIOR, OFFICE OF THE SOLICITOR, LETTER TO AVI S. GARBOW, GENERAL COUNSEL, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, RE: MAINE'S WQS AND TRIBAL FISHING RIGHTS OF MAINE TRIBES (Jan. 30, 2015) at 10. DOI'S 2015 Opinion is attached hereto as **Exhibit I**.

Then Maine Attorney Janet Mills fought back in the federal courts, even going so far as to file briefs in the U.S. Supreme Court to overturn a decision of the U.S. Court of Appeals for the Ninth Circuit, holding that a treaty sustenance fishing right carried with it a right to fish habitat protection. The State of Maine petitioned Donald Trump's EPA Administer at the time, Scott Pruitt, to overturn EPA water quality standards promulgated to protect tribal fishing rights in Maine. Tribal leaders and environmental, religious, and civic organizations called then Attorney General Janet Mills to task for her actions. A copy of their letter is attached hereto as **Exhibit J**. (More recently, the Legislature amended Maine's water quality standards to provide more protection to the Penobscot Nation's sustenance resources in the Penobscot River. This has generated a measure of cautious optimism for the future of tribal-state relations.)

Conclusion

The implementation of consensus recommendations 7-10 through L.D. 2094 will put an end to ambiguities that have led to unrelenting wasteful, protracted litigation between the Maine Tribes and the State of Maine over environmental matters, not to mention 40 years of unfortunate animosity. It will restore the dignity of the Tribes to exercise stewardship over the resources that define them as a unique Peoples. In so doing, it will protect the environment for all Mainers.

* * *

Postscript: The Clarity of Federal Indian Law

This Committee heard testimony that if the doctrines of federal Indian law operate in Maine, there will be confusion (and protracted litigation) because federal Indian law is uncertain. This is incorrect. Indeed, the best way for the Legislature to ensure clarity would be to simply enact a law announcing that federal Indian law applies to the Maine Tribes, their members, their lands and natural resources.

Since the 1980s, Congress has restored many tribes to federal recognition by using language in the simplest terms such as "all Federal laws of general application to Indians and Indian tribes . . . shall apply with respect to the [Tribe] and its members" and the Tribe "shall have jurisdiction to the full extent allowed by law" over its reservation or lands taken into trust on its behalf by the United States. *E.g.*, 25 U.S.C. §§ 1300j-1, 1300j-7 (Pokagon Band of Potawatomi Indians Restoration Act) (emphasis added); §§ 1300k-2(a), 1300k-3 (Little Traverse Bay Bands of Odawa Indians and Little River Band of Ottawa Indians Restoration Act); §1300l(a) (Auburn Indian Restoration), § 1300m-1(a)-(b) (Paskenta Band of Nomlaki Indians of California Restoration Act), § 1300n-2(a)-(b) (Graton Rancheria Restoration).

Federal Indian Law is a body of common law, which can be readily discerned and applied. The American Law Institute will soon publish the RESTATEMENT OF THE LAW OF AMERICAN INDIANS to set forth this common law.

Further, the Office of Legal and Policy Analysis can readily confirm that, pursuant to the above-referenced Restoration Acts, as well as land claims settlement acts outside of Maine, *e.g.*, 25 U.S.C. §§ 1747(a) (Florida (Miccosukee)); 1752(3) and 1754(b)(7) (Connecticut); 1771c(a)(1)(A) and 1771d(a) (Massachusetts); 1772d(a) and (c) (Florida) (Seminole)); and 1775c (Mohegan (Connecticut)), where civil jurisdiction within Tribal Lands is governed by established principles of federal Indian law, there is very little litigation between tribes and states compared to the protracted litigation besetting tribal-state relations in Maine.¹³

¹³ Indeed, when the contours of tribal-state jurisdiction within Tribal Lands are governed by the established principles of federal Indian law, most differences are ironed out by intergovernmental agreements between tribes and states. Such agreements are commonplace across the country, but not yet in Maine.

Exhibit 3



United Nations DECLARATION on the RIGHTS of INDIGENOUS PEOPLES



United Nations Declaration on the Rights of Indigenous Peoples


Resolution adopted by the General Assembly

[without reference to a Main Committee (A/61/L.67 and Add.1)]

61/295. United Nations Declaration on the Rights of Indigenous Peoples

The General Assembly,

Taking note of the recommendation of the Human Rights Council contained in its resolution 1/2 of 29 June 2006,¹ by which the Council adopted the text of the United Nations Declaration on the Rights of Indigenous Peoples,

Recalling its resolution 61/178 of 20 December 2006, by which it decided to defer consideration of and action on the Declaration to allow time for further consultations thereon, and also decided to conclude its consideration before the end of the sixty-first session of the General Assembly,

Adopts the United Nations Declaration on the Rights of Indigenous Peoples as contained in the annex to the present resolution.

107th plenary meeting 13 September 2007

Annex

United Nations Declaration on the Rights of Indigenous Peoples

The General Assembly,

Guided by the purposes and principles of the Charter of the United Nations, and good faith in the fulfilment of the obligations assumed by States in accordance with the Charter,

Affirming that indigenous peoples are equal to all other peoples, while recognizing the right of all peoples to be different, to consider themselves different, and to be respected as such,

¹See Official Records of the General Assembly, Sixty-first Session,

Supplement No. 53 (A/61/53), part one, chap. II, sect. A.

Affirming also that all peoples contribute to the diversity and richness of civilizations and cultures, which constitute the common heritage of humankind,

Affirming further that all doctrines, policies and practices based on or advocating superiority of peoples or individuals on the basis of national origin or racial, religious, ethnic or cultural differences are racist, scientifically false, legally invalid, morally condemnable and socially unjust,

Reaffirming that indigenous peoples, in the exercise of their rights, should be free from discrimination of any kind,

Concerned that indigenous peoples have suffered from historic injustices as a result of, inter alia, their colonization and dispossession of their lands, territories and resources, thus preventing them from exercising, in particular, their right to development in accordance with their own needs and interests,

Recognizing the urgent need to respect and promote the inherent rights of indigenous peoples which derive from their political, economic and social structures and from their cultures, spiritual traditions, histories and philosophies, especially their rights to their lands, territories and resources,

Recognizing also the urgent need to respect and promote the rights of indigenous peoples affirmed in treaties, agreements and other constructive arrangements with States,

Welcoming the fact that indigenous peoples are organizing themselves for political, economic, social and cultural enhancement and in order to bring to an end all forms of discrimination and oppression wherever they occur,

Convinced that control by indigenous peoples over developments affecting them and their lands, territories and resources will enable them to maintain and strengthen their institutions, cultures and traditions, and to promote their development in accordance with their aspirations and needs,

Recognizing that respect for indigenous knowledge, cultures and traditional practices contributes to sustainable and equitable development and proper management of the environment,

Emphasizing the contribution of the demilitarization of the lands and territories of indigenous peoples to peace, economic and social

progress and development, understanding and friendly relations among nations and peoples of the world,

Recognizing in particular the right of indigenous families and communities to retain shared responsibility for the upbringing, training, education and well-being of their children, consistent with the rights of the child,

Considering that the rights affirmed in treaties, agreements and other constructive arrangements between States and indigenous peoples are, in some situations, matters of international concern, interest, responsibility and character,

Considering also that treaties, agreements and other constructive arrangements, and the relationship they represent, are the basis for a strengthened partnership between indigenous peoples and States,

Acknowledging that the Charter of the United Nations, the International Covenant on Economic, Social and Cultural Rights² and the International Covenant on Civil and Political Rights,² as well as the Vienna Declaration and Programme of Action,³ affirm the fundamental importance of the right to self-determination of all peoples, by virtue of which they freely determine their political status and freely pursue their economic, social and cultural development,

Bearing in mind that nothing in this Declaration may be used to deny any peoples their right to self-determination, exercised in conformity with international law,

Convinced that the recognition of the rights of indigenous peoples in this Declaration will enhance harmonious and cooperative relations between the State and indigenous peoples, based on principles of justice, democracy, respect for human rights, non-discrimination and good faith,

Encouraging States to comply with and effectively implement all their obligations as they apply to indigenous peoples under international instruments, in particular those related to human rights, in consultation and cooperation with the peoples concerned,

Emphasizing that the United Nations has an important and continuing role to play in promoting and protecting the rights of indigenous peoples,

².See resolution 2200 A (XXI), annex.

³A/CONF.157/24 (Part I), chap. III.

Believing that this Declaration is a further important step forward for the recognition, promotion and protection of the rights and freedoms of indigenous peoples and in the development of relevant activities of the United Nations system in this field,

Recognizing and reaffirming that indigenous individuals are entitled without discrimination to all human rights recognized in international law, and that indigenous peoples possess collective rights which are indispensable for their existence, well-being and integral development as peoples,

Recognizing that the situation of indigenous peoples varies from region to region and from country to country and that the significance of national and regional particularities and various historical and cultural backgrounds should be taken into consideration,

Solemnly proclaims the following United Nations Declaration on the Rights of Indigenous Peoples as a standard of achievement to be pursued in a spirit of partnership and mutual respect:

Article 1

Indigenous peoples have the right to the full enjoyment, as a collective or as individuals, of all human rights and fundamental freedoms as recognized in the Charter of the United Nations, the Universal Declaration of Human Rights⁴ and international human rights law.

Article 2

Indigenous peoples and individuals are free and equal to all other peoples and individuals and have the right to be free from any kind of discrimination, in the exercise of their rights, in particular that based on their indigenous origin or identity.

Article 3

Indigenous peoples have the right to self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development.

Article 4

Indigenous peoples, in exercising their right to self-determination, have the right to autonomy or self-government in matters relating to

⁴.Resolution 217 A (III).

their internal and local affairs, as well as ways and means for financing their autonomous functions.

Article 5

Indigenous peoples have the right to maintain and strengthen their distinct political, legal, economic, social and cultural institutions, while retaining their right to participate fully, if they so choose, in the political, economic, social and cultural life of the State.

Article 6

Every indigenous individual has the right to a nationality.

Article 7

1. Indigenous individuals have the rights to life, physical and mental integrity, liberty and security of person.

2. Indigenous peoples have the collective right to live in freedom, peace and security as distinct peoples and shall not be subjected to any act of genocide or any other act of violence, including forcibly removing children of the group to another group.

Article 8

1. Indigenous peoples and individuals have the right not to be subjected to forced assimilation or destruction of their culture.

2. States shall provide effective mechanisms for prevention of, and redress for:

(*a*) Any action which has the aim or effect of depriving them of their integrity as distinct peoples, or of their cultural values or ethnic identities;

(b) Any action which has the aim or effect of dispossessing them of their lands, territories or resources;

(*c*) Any form of forced population transfer which has the aim or effect of violating or undermining any of their rights;

(*d*) Any form of forced assimilation or integration;

(e) Any form of propaganda designed to promote or incite racial or ethnic discrimination directed against them.

Article 9

Indigenous peoples and individuals have the right to belong to an indigenous community or nation, in accordance with the traditions and customs of the community or nation concerned. No discrimination of any kind may arise from the exercise of such a right.

Article 10

Indigenous peoples shall not be forcibly removed from their lands or territories. No relocation shall take place without the free, prior and informed consent of the indigenous peoples concerned and after agreement on just and fair compensation and, where possible, with the option of return.

Article 11

1. Indigenous peoples have the right to practise and revitalize their cultural traditions and customs. This includes the right to maintain, protect and develop the past, present and future manifestations of their cultures, such as archaeological and historical sites, artefacts, designs, ceremonies, technologies and visual and performing arts and literature.

2. States shall provide redress through effective mechanisms, which may include restitution, developed in conjunction with indigenous peoples, with respect to their cultural, intellectual, religious and spiritual property taken without their free, prior and informed consent or in violation of their laws, traditions and customs.

Article 12

1. Indigenous peoples have the right to manifest, practise, develop and teach their spiritual and religious traditions, customs and ceremonies; the right to maintain, protect, and have access in privacy to their religious and cultural sites; the right to the use and control of their ceremonial objects; and the right to the repatriation of their human remains.

2. States shall seek to enable the access and/or repatriation of ceremonial objects and human remains in their possession through fair, transparent and effective mechanisms developed in conjunction with indigenous peoples concerned.

Article 13

1. Indigenous peoples have the right to revitalize, use, develop and transmit to future generations their histories, languages, oral traditions, philosophies, writing systems and literatures, and to designate and retain their own names for communities, places and persons.

2. States shall take effective measures to ensure that this right is protected and also to ensure that indigenous peoples can understand and be understood in political, legal and administrative proceedings, where necessary through the provision of interpretation or by other appropriate means.

Article 14

1. Indigenous peoples have the right to establish and control their educational systems and institutions providing education in their own languages, in a manner appropriate to their cultural methods of teaching and learning.

2. Indigenous individuals, particularly children, have the right to all levels and forms of education of the State without discrimination.

3. States shall, in conjunction with indigenous peoples, take effective measures, in order for indigenous individuals, particularly children, including those living outside their communities, to have access, when possible, to an education in their own culture and provided in their own language.

Article 15

1. Indigenous peoples have the right to the dignity and diversity of their cultures, traditions, histories and aspirations which shall be appropriately reflected in education and public information.

2. States shall take effective measures, in consultation and cooperation with the indigenous peoples concerned, to combat prejudice and eliminate discrimination and to promote tolerance, understanding and good relations among indigenous peoples and all other segments of society.

Article 16

1. Indigenous peoples have the right to establish their own media in their own languages and to have access to all forms of non-indigenous media without discrimination. 2. States shall take effective measures to ensure that State-owned media duly reflect indigenous cultural diversity. States, without prejudice to ensuring full freedom of expression, should encourage privately owned media to adequately reflect indigenous cultural diversity.

Article 17

1. Indigenous individuals and peoples have the right to enjoy fully all rights established under applicable international and domestic labour law.

2. States shall in consultation and cooperation with indigenous peoples take specific measures to protect indigenous children from economic exploitation and from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development, taking into account their special vulnerability and the importance of education for their empowerment.

3. Indigenous individuals have the right not to be subjected to any discriminatory conditions of labour and, inter alia, employment or salary.

Article 18

Indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decisionmaking institutions.

Article 19

States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them.

Article 20

1. Indigenous peoples have the right to maintain and develop their political, economic and social systems or institutions, to be secure in the enjoyment of their own means of subsistence and development, and to engage freely in all their traditional and other economic activities.

2. Indigenous peoples deprived of their means of subsistence and development are entitled to just and fair redress.

Article 21

1. Indigenous peoples have the right, without discrimination, to the improvement of their economic and social conditions, including, inter alia, in the areas of education, employment, vocational training and retraining, housing, sanitation, health and social security.

2. States shall take effective measures and, where appropriate, special measures to ensure continuing improvement of their economic and social conditions. Particular attention shall be paid to the rights and special needs of indigenous elders, women, youth, children and persons with disabilities.

Article 22

1. Particular attention shall be paid to the rights and special needs of indigenous elders, women, youth, children and persons with disabilities in the implementation of this Declaration.

2. States shall take measures, in conjunction with indigenous peoples, to ensure that indigenous women and children enjoy the full protection and guarantees against all forms of violence and discrimination.

Article 23

Indigenous peoples have the right to determine and develop priorities and strategies for exercising their right to development. In particular, indigenous peoples have the right to be actively involved in developing and determining health, housing and other economic and social programmes affecting them and, as far as possible, to administer such programmes through their own institutions.

Article 24

1. Indigenous peoples have the right to their traditional medicines and to maintain their health practices, including the conservation of their vital medicinal plants, animals and minerals. Indigenous individuals also have the right to access, without any discrimination, to all social and health services.

2. Indigenous individuals have an equal right to the enjoyment of the highest attainable standard of physical and mental health. States shall take the necessary steps with a view to achieving progressively the full realization of this right.

Article 25

Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations in this regard.

Article 26

1. Indigenous peoples have the right to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired.

2. Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use, as well as those which they have otherwise acquired.

3. States shall give legal recognition and protection to these lands, territories and resources. Such recognition shall be conducted with due respect to the customs, traditions and land tenure systems of the indigenous peoples concerned.

Article 27

States shall establish and implement, in conjunction with indigenous peoples concerned, a fair, independent, impartial, open and transparent process, giving due recognition to indigenous peoples' laws, traditions, customs and land tenure systems, to recognize and adjudicate the rights of indigenous peoples pertaining to their lands, territories and resources, including those which were traditionally owned or otherwise occupied or used. Indigenous peoples shall have the right to participate in this process.

Article 28

1. Indigenous peoples have the right to redress, by means that can include restitution or, when this is not possible, just, fair and equitable compensation, for the lands, territories and resources which they have traditionally owned or otherwise occupied or used, and which have been confiscated, taken, occupied, used or damaged without their free, prior and informed consent.

2. Unless otherwise freely agreed upon by the peoples concerned, compensation shall take the form of lands, territories and resources

equal in quality, size and legal status or of monetary compensation or other appropriate redress.

Article 29

1. Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall establish and implement assistance programmes for indigenous peoples for such conservation and protection, without discrimination.

2. States shall take effective measures to ensure that no storage or disposal of hazardous materials shall take place in the lands or territories of indigenous peoples without their free, prior and informed consent.

3. States shall also take effective measures to ensure, as needed, that programmes for monitoring, maintaining and restoring the health of indigenous peoples, as developed and implemented by the peoples affected by such materials, are duly implemented.

Article 30

1. Military activities shall not take place in the lands or territories of indigenous peoples, unless justified by a relevant public interest or otherwise freely agreed with or requested by the indigenous peoples concerned.

2. States shall undertake effective consultations with the indigenous peoples concerned, through appropriate procedures and in particular through their representative institutions, prior to using their lands or territories for military activities.

Article 31

1. Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions. 2. In conjunction with indigenous peoples, States shall take effective measures to recognize and protect the exercise of these rights.

Article 32

1. Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources.

2. States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources.

3. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact.

Article 33

1. Indigenous peoples have the right to determine their own identity or membership in accordance with their customs and traditions. This does not impair the right of indigenous individuals to obtain citizenship of the States in which they live.

2. Indigenous peoples have the right to determine the structures and to select the membership of their institutions in accordance with their own procedures.

Article 34

Indigenous peoples have the right to promote, develop and maintain their institutional structures and their distinctive customs, spirituality, traditions, procedures, practices and, in the cases where they exist, juridical systems or customs, in accordance with international human rights standards.

Article 35

Indigenous peoples have the right to determine the responsibilities of individuals to their communities.

Article 36

1. Indigenous peoples, in particular those divided by international borders, have the right to maintain and develop contacts, relations and cooperation, including activities for spiritual, cultural, political, economic and social purposes, with their own members as well as other peoples across borders.

2. States, in consultation and cooperation with indigenous peoples, shall take effective measures to facilitate the exercise and ensure the implementation of this right.

Article 37

1. Indigenous peoples have the right to the recognition, observance and enforcement of treaties, agreements and other constructive arrangements concluded with States or their successors and to have States honour and respect such treaties, agreements and other constructive arrangements.

2. Nothing in this Declaration may be interpreted as diminishing or eliminating the rights of indigenous peoples contained in treaties, agreements and other constructive arrangements.

Article 38

States, in consultation and cooperation with indigenous peoples, shall take the appropriate measures, including legislative measures, to achieve the ends of this Declaration.

Article 39

Indigenous peoples have the right to have access to financial and technical assistance from States and through international cooperation, for the enjoyment of the rights contained in this Declaration.

Article 40

Indigenous peoples have the right to access to and prompt decision through just and fair procedures for the resolution of conflicts and disputes with States or other parties, as well as to effective remedies for all infringements of their individual and collective rights. Such a decision shall give due consideration to the customs, traditions, rules and legal systems of the indigenous peoples concerned and international human rights.

Article 41

The organs and specialized agencies of the United Nations system and other intergovernmental organizations shall contribute to the full realization of the provisions of this Declaration through the mobilization, inter alia, of financial cooperation and technical assistance. Ways and means of ensuring participation of indigenous peoples on issues affecting them shall be established.

Article 42

The United Nations, its bodies, including the Permanent Forum on Indigenous Issues, and specialized agencies, including at the country level, and States shall promote respect for and full application of the provisions of this Declaration and follow up the effectiveness of this Declaration.

Article 43

The rights recognized herein constitute the minimum standards for the survival, dignity and well-being of the indigenous peoples of the world.

Article 44

All the rights and freedoms recognized herein are equally guaranteed to male and female indigenous individuals.

Article 45

Nothing in this Declaration may be construed as diminishing or extinguishing the rights indigenous peoples have now or may acquire in the future.

Article 46

1. Nothing in this Declaration may be interpreted as implying for any State, people, group or person any right to engage in any activity or to perform any act contrary to the Charter of the United Nations or construed as authorizing or encouraging any action which would dismember or impair, totally or in part, the territorial integrity or political unity of sovereign and independent States.

2. In the exercise of the rights enunciated in the present Declaration, human rights and fundamental freedoms of all shall be respected. The exercise of the rights set forth in this Declaration shall be subject only to such limitations as are determined by law and in accordance with international human rights obligations. Any such limitations shall be non-discriminatory and strictly necessary solely for the purpose of securing due recognition and respect for the rights and freedoms of others and for meeting the just and most compelling requirements of a democratic society.

3. The provisions set forth in this Declaration shall be interpreted in accordance with the principles of justice, democracy, respect for human rights, equality, non-discrimination, good governance and good faith.

THE ALTAMONT ENTERPRISE OPINION

CHPE electricity would not be safe, clean, or renewable

Wednesday, August 12, 2020 - 14:01 To the Editor:

I wrote this letter to the Guilderland Town Board on Aug. 3.

I recently learned the Guilderland Town Board may pass a resolution at your Aug. 4, 2020 meeting welcoming the developers of the Proposed Champlain Hudson Power Express (CHPE) to construct a transmission corridor through Guilderland. I urge the town of Guilderland to reject the CHPE resolution.

CHPE is a proposed minimum one-billion watt, 333-mile long direct-current-transmission corridor (power-line) that would traverse eastern New York State from the Canadian border to New York City. Much of it would be buried under Lake Champlain and under or on the river-bottom of the Hudson River.

More than 100 miles would be buried along roads and railroad right of ways in Clinton, Washington, Saratoga, Schenectady, Albany, Greene, and Rockland counties. CHPE would cross many rivers, streams, and wetlands.

If the town adopts the resolution, the town is, in effect, and whether the town realizes or acknowledges it, endorsing the continued destruction of distant rivers in Canada, the poisoning of Canadian wildlife and people, the intensification of climate change worldwide, and damaging the New York State economy and environment.

CHPE has been under development for nearly a decade. Construction has yet to begin with many technical and legal issues far from resolved. The Solidarity Committee of the Capital District has opposed CHPE since it was first announced in 2010, and previously opposed and helped defeat the proposed Great Whale River project in northern Québec more than 25 years ago.

New York City Mayor Bill de Blasio and New York State Governor Andrew Cuomo have both endorsed CHPE in recent months.

CHPE electricity would come from Québec and Labrador where government-subsidized, provincially-owned utility companies continue to block (destroy) formerly free-flowing spectacular rivers by constructing dams, dikes, power stations, enormous and stagnant

8/14/2020

CHPE electricity would not be safe, clean, or renewable | The Altamont Enterprise

reservoirs, and lengthy powerlines to transport the dirty electricity to New York and New England states.

Hydro-Québec is presently destroying the Romaine River with four dams. Nalcor Energy has greatly damaged the Churchill (aka Grande) River in Labrador with dams at Muskrat Falls (near Happy Valley-Goose Bay) and is planning another giant power station at Gull Island, also on the Churchill River. Much of this electricity is and would be for export to the United States.

We live in a world where rich and powerful corporations (public and private) often lie about the dangers of their technologies. CHPE electricity would not be safe, clean, or renewable.

Most people think hydroelectricity is clean, but not all of it is. Mega-hydro stations of the type built in Québec and Labrador in recent decades are gigantic in scale and contribute to global warming while poisoning waters and damaging animal and human health.

Submerged river valleys drown vegetation that can no longer remove carbon from the atmosphere. Rotting submerged vegetation releases carbon into the water and air. Drowned river valleys convert mercury contained in soil and rocks into methylmercury in the water that poisons everything that lives in or drinks the water, or eats fish caught in the water.

Hydro dams are sending species to extinction. Dams and enormous reservoirs disrupt the flow and function of rivers, block sediment movement and nutrients to wildlife. The shores of free-flowing rivers are rich in biodiversity. The shores of reservoirs are much different because the water depth moves up and down, exposing shorelines to changing conditions that create dead zones for wildlife.

The Hudson River is critically important to many fish species, some of which are in serious decline. PCBs in the Hudson riverbed could be resuspended into the water during cable installation and maintenance.

We live in a world with rapidly intensifying climate change and accelerating species extinction. Nature, if allowed to, has a tremulous capacity to heal itself. Rather than destroying rivers and watersheds, we should preserve them in the hope that enough of nature can survive and thrive so that people born today will have a healthy planet to live on throughout their entire lives.

The CHPE project is a bad choice for New York State and its economy. CHPE construction would provide only a few hundred temporary construction jobs and a few dozen permanent jobs here in New York.

Hundreds of millions of dollars would be exported from New York State to Canada each year to purchase the imported electricity. Much better would be to invest in energy conservation and efficiency, and appropriately sited solar and wind electricity generation here in New York State or just offshore.

Tens — maybe hundreds — of thousands of good-paying unionized jobs would be created for carpenters, plumbers, sheet-metal workers, roofers, laborers, and others here in New York State by investing in these technologies.

UNITED STATES INTERNATIONAL TRADE COMMISSION INVESTIGATION NO. 332-574



Part II of III

August 14, 2020 Final Submittal of North American Megadam Resistance Alliance

Exhibit 5: Brief of Alliance Romaine In Opposition to the Romaine River Hydro-Electric Mega Project

Exhibit 6: Comments of Indigenous Elder Jim Learning, Labrador, on NECEC Hydropower Transmission Corridor, Maine Public Utilities Commission

Exhibit 7: Shocking Revelations at Hydro-Quebec: The Environmental and Legal Consequences of the Quebec

Exhibit 8: Media: United Nations calls for methylmercury mitigation at Muskrat Falls, 2019

Exhibit 9: Media: Broken Promises, Nunatsiavut president, premier clash over Muskrat Falls water levels, 2019

Exhibit 10: Dammed If You Do: How Sunk Costs Are Dragging Canadian Electricity Ratepayers Underwater

Exhibit 11: Scientific Paper: Mapping the world's free-flowing rivers



Projet d'aménagement d'un complexe hydroélectrique sur la rivière Romaine par Hydro-Québec Basse-Côte-Nord 6211-03-005

Brief: In Opposition to the Romaine River Hydro-Electric Mega Project

Presented to the BAPE, November 27, 2008





Alliance Romaine

Alliance Romaine, un groupe environnemental fondé en janvier 2008 pour opposer le projet d'Hydro-Québec de construction de 4 barrages sur la rivière Romaine, représente plus de 100 membres à travers le Québec, le Canada et les États-Unis, parmi lesquels on retrouve des scientifiques, des académiciens, des éducateurs pleinairistes et des citoyens concernés. Alliance Romaine s'est dévoué à la rivière cet été et a mené une expédition de canot de 48 jours. Les membres sont principalement des jeunes engagés qui veulent s'impliquer dans l'édification d'un monde meilleur, ce monde dans lequel ils vont continuer de vivre. Alliance Romaine a participé activement aux procédures publiques jusqu'à présent, soit dans le contexte de l'Agence canadienne d'évaluation environnementale et du BAPE.

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Intérêts

Nos intérêts principaux dans ce projet sont ceux de citoyens concernés par l'environnement que nous laisserons aux générations futures et concernés par un besoin de voir nos autorités politiques mettre en place un plan énergétique ambitieux axé sur la conservation de l'énergie plutot que la surconsommation de ressources et investissant de manière transparente dans les énergies propres et renouvelables. En tant que contribuables, nous ne voulons pas devoir payer pour les pertes et nous ne voulons pas passer les prochains 50 ans de nos vies à absorber les couts de barrages rendus désuets ou qui auraient pu être évités.

Summary

This Brief is based on an extensive review of the Environmental Impact Statement (EIS) and scientific literature relating to the environmental impacts of large dams, as well as on first- hand experience of the local environment.

The pristine River Romaine is one of the last major free flowing rivers in Quebec and one of the most beautiful. The proposed hydro-electric megaproject will alter the entire river ecosystem and have potential far reaching and long term environmental and social consequences.

Potentially significant emissions of green house gases (GHGs) (methane, Co2), caused by the decomposition of flooded organic matter, will arise from reservoir surfaces, turbines, spillways and associated structures. GHG emissions attributable to the megaproject will also arise from loss of boreal forest and associated peat lands due to inundation, deforestation by the Forestry Industry and by installation of 500 km transmission line corridor and 150 km access road, from construction activities (use of fuel etc.) and from the energy intensive Aluminum Smelting Industry supplied with electricity from the Romaine complex.

Mercury bioaccumulation in the food chain resulting from reservoir creation is an important health issue particularly for local communities relying on fish as a dietary staple. The incremental loading of mercury into the St. Lawrence estuary and its impact on fish eating birds and animal species is also a concern.

Migratory and resident fish species to be potentially impacted by loss or degradation of habitat, by changes in river flow regime and by other perturbations, include two genetically unique races of the economically important Atlantic Salmon (at risk), the American Eel (at risk), Arctic Char subspecies oquassa (protected status), Brook Trout,

Sea-Run Brook Trout, Landlocked Atlantic Salmon (Ouananiche), Rainbow Smelt, White Fish and Lake Trout.

Perturbations and loss of habitat (construction, inundation, transmission lines, roads, future deforestation and mining etc.) will have potential major repercussions on birds, animals and plants, incuding species considered to be at risk. Examples are the Woodland Caribou, Lynx, Wolf, Wolverine, Black Bear, Osprey, Bald Eagle, Golden Eagle, Peregrine Falcon, Horned Grebe, Harlequin Duck, Barrow's Goldeneye, Nighthawk and Short Eared Owl, amongst others. Plant species include medicinal plants and those that are rare or with protected status, such as orchids. The ecological integrity of the coastal wetland complex at the mouth of the Romaine River, an area is known for its rare biotypes, is of special concern.

A major concern is that the proposed large scale hydrological alterations may have repercussions with respect to the productivity of the marine ecosystem (i.e., the river mouth zone, the Mingan Archipelago, National Park Reserve and beyond) and its ability to support the current population levels of marine birds (e.g. Puffins, Penguins, Eider Duck, Arctic Tern, Razor Bill etc.) and mammals (e.g. seals, dolphins, whales) as well as commercially important fish, mollusc and crustacean species (e.g. snow crab, whelk, clam, scallop, capelin etc). Of particular concern are major alterations to freshwater flows, sediments, organic matter (dissolved and particulate) and inorganic nutrient (e.g. silicates, iron) inputs to the coastal zone with regard to short and long term impacts on primary and secondary productivity . The impact of the proposed hydrological alterations on the incidence of toxic algal blooms in the coastal zone (e.g. Diarrhetic Shell Fish Poisoning and Paralytic Shell Fish Poisoning) is another concern.

Other impacts of the megaproject include potential deterioration of water quality and reservoir induced seismicity (earthquakes).

The potential loss of natural heritage and ecosystem services on which the local and regional economy depends is considered to outweigh any short term economic benefits accruing from the megaproject. Of particular concern is the potential of the megaproject to severely compromise sustainable employment from development of ecotourism, recreational activities and Fisheries.

Conservation, combined with the development of alternative energy sources such as wind and solar, represent alternative options that are consistent with sustainable development while respecting the needs and quality of life of present and future generations.

The Romaine River, a Unique Natural Wonder: Description of the River Environment, Flora and Fauna

The Romaine is one of the most beautiful rivers in Quebec. It is almost 500km long and rises North of the 52nd parallel on the Labrador plateau about 45 km South west of the Churchill River where it forms part of the Quebec–Labrador boundary. From its source (elevation 750 metres) the river flows in a series of chutes, falls and rapids through some of the world's most picturesque scenery that include rock islets and a series of deep gorges cut through ancient Precambrian mountains rising to more than 2000 ft. The Romaine is a large, powerful river and in places is more than 1 km wide.

Over the last 50 km, the river flows through a vast and magnificent post-glacial delta, complete with coastal wetlands, before entering the Gulf of St Lawrence near the town of Havre St Pierre (population 3,500). There is no road access inland and the Romaine is traversed only by route 138 near its mouth and by a 40 km long railway at kilometre 15 (Chute de l'eglise) to a titanium mine at Lac Allard.

Historically, the Innu people used the river in their annual migrations to the Labrador coast. The name "Romaine" derives from the Innu word "uramen" or red ochre that describes the river's red coloured rock formations.

The pristine waters of the Romaine and a tributary, the Puyjalon, attract spawning runs of Atlantic salmon, a prized species that is considered to be at risk. The Romaine and Puyjalon salmon represent genetically distinct strains and are unique in the world.

About 50 km from the mouth of the Romaine is a spectacular waterfall, aptly named the "Grande Chute", where the entire river plunges more than 80 vertical feet into a spray filled gorge.

The Romaine salmon are unable to negotiate this obstacle and spawn in the main channel of the river. The Romaine is well known for the large size of its salmon and specimens of over 40 lbs have been caught.

Churchill and Roosevelt are thought to have fished the river around the time of the Second World War. Prior to about 1980, a salmon club had exclusive fishing rights and operated a camp near the mouth of the river as well as a smaller camp on the Puyjalon. After 1980 the river was made public.

The salmon are of importance to sport fishermen and to Innu people from neighbouring communities and a subsistence gill net fishery is operated in the river.

Other migratory fish species of importance include sea trout (sea run brook trout), rainbow smelt and the American Eel (a species considered to be at risk).

Above the Grande Chute (km 50) are populations of scarce landlocked salmon or Ouananiche (descendants of Atlantic salmon), an endangered subspecies of arctic char, lake trout, white fish and brook trout. Because populations of brook trout have been isolated between impassable falls and chutes they may represent a number of distinct genetic strains.

The southern part of the river basin provides habitat for moose whereas further north is a population of endangered woodland caribou, already impacted by loss of habitat from flooding much of the Labrador plateau by the massive Smallwood Reservoir near the headwaters of the Romaine (third largest in the world, by area). Other animal species include lynx, wolves, wolverine, beaver and black bears. Bird species include the Osprey, Bald Eagle, Golden Eagle the endangered Peregrine Falcon, Horned grebe, Harlequin Duck, Barrow's Goldeneye, Nighthawk and Short Eared Owl amongst others.

Because of the absence of roads, the river valley is covered with virgin boreal forest, interspersed with wetlands rich in biodiversity. The Romaine's plants have been little studied, although medicinal plants and species that are rare or have protected status (e.g. Hudsonia tomentosa, orchids such Arethusa bulbosa and the "Mingan thistle") are known to occur. The spray zone in the vicinity of the Grande chute probably harbours rare and uniquely adapted plant species.

In the mouth of the Romaine lies the Mingan Archipelago National Park Reserve (27), a unique treasure consisting of a chain of forty limestone islands and numerous granite islets and reefs. The islands continue to be shaped through erosion by the wind, sea and by the strong currents of the Romaine River give rise to strange rock monoliths. Partly because of the freshwater, organic /inorganic nutrients and sediments supplied by the Romaine River, the river mouth zone, islands and surrounding marine environment support abundant wild life including seabird colonies (e.g Puffins, Penguins, Razor Bills, Arctic Terns, Eider Ducks), seals, dolphins and nine species of whales (e.g endangered Humpbacks and the world's largest animal - the Blue Whale). Rare and unique plant species also occur on the islands. Commercially important snow crab, shrimp, herring and capelin occur in this zone as well as various mollusc species such as clams, whelk and scallops.

The Romaine is known among kayakers and canoeists not only for its world class challenging white water, but also for its pristine natural beauty. An interesting account of a kayak expedition on the Romaine was published in the American White Water Journal (28). The authors describe their experience: "*It's good to know that there are still some*

parts of this world where we don't belong. Not many people will see what we have seen... No descriptions or photographs can do the Romaine justice. Only in our heads can the magic be preserved".

During 2007 and 2008, Alliance Romaine undertook two major canoes trips from the source to the mouth of the Romaine. Bernard Voyer (29), famous explorer, canoed the Romaine, an expedition that is ranked with his other notable adventures such as canoeing the once pristine Rupert River in James Bay (currently undergoing Hydro-electric development), the ascent of Everest and skiing to the North and South Poles.

One Hundred and One Reasons for Opposing the Romaine Hydro-Electric Mega Project: Green, Clean and Sustainable?

Climate Change: Green House Gas Emissions (GHGs)

1. GHG Emissions from reservoir surfaces - diffusive and bubbling fluxes (Co2, methane and nitrous oxides)

It is well known that when land is flooded, the labile carbon in plants and soil is decomposed by micro-organisms leading to the release (via diffusion and gas bubbles) of carbon dioxide and the potent GHGs, methane and nitrous oxides to the atmosphere. Emissions also result from the decomposition of plankton produced in the reservoirs and from organic matter entering reservoirs from upstream or from shoreline erosion (3,7, 8).

All reservoirs that have been investigated in various regions of the world (boreal, temperate and tropics) have been found to emit methane and carbon dioxide as well as small quantities of nitrous oxides (3).

Researchers at the Canadian Government's Freshwater Research Institute investigated several hydroelectric reservoirs in Northern Canada to produce the first detailed calculations of GHG emissions. At one site it was estimated that annual production of methane was more than 7 grams per square meter of reservoir surface. In another study on flooded peat bog, it was estimated that each year, up to 30 grams of methane and between 450 and 1800 grams of C02 were emitted per square meter of reservoir surface.

GHG emissions over the 50 year productive life expectancy of a hydro-electric reservoir were calculated. It was estimated that about two thirds of labile carbon in flooded vegetation and soils would decompose over that period; up to 10% of this carbon would be released as methane with the remainder as C02. Averaged over the 50 year life expectancy, it was estimated that each square metre of a typical reservoir in Northern Canada will emit between 400 and 700 grams GHGs (CO2 equivalents) per year - the higher figures corresponding to those reservoirs where peat bog dominates. For the Cedar

Lake Reservoir in Northern Manitoba, it was estimated that GHG emissions over the 50 years could be similar to a coal-fired power station of equivalent capacity (1-7).

Methane and C02 have recently been shown to accumulate under ice cover during winter. A preliminary study on three Quebec reservoirs suggests that the winter diffusive fluxes at the air–water interface represent < 7% of the cumulative carbon emissions during the ice-free period. The release (upon ice-break) of methane bubbles accumulated under ice during the winter was estimated to represent about 2% of the summer carbon emissions from hydroelectric reservoirs in Northern Quebec. These represent a small, but non–negligible component of annual GHG emissions (9).

The surface soil layers in the study area of the Romaine complex are almost entirely peat based (high organic matter). These, together with the substantial areas of wetlands that are to be flooded, may contribute significantly to annual GHG emissions (methane, Co2).

2. GHG emissions (degassing fluxes) from turbines, spillways and associated structures.

Until recently researchers had only considered emissions from reservoir surfaces that originate from diffusion of dissolved gas through the water column or from bubbles rising to the surface. It is now known that a significant source of methane emissions is downstream of the dam: from the turbines and spillways (10 -14). Methane gas is produced by microbes that decompose organic matter under oxygen depleted conditions. The gas produced dissolves under the pressure of deep water. When water is drawn through the turbines and discharged from spillways the pressure is released and the gases escape to the atmosphere. When "degassing" emissions of methane from turbines and spillways were first measured and factored into estimates for a Brazilian hydro dam, they were several orders of magnitude higher than official estimates (10 - 13).

As far as is known, there have been no studies on potentially significant degassing emissions of methane from spillways and turbines of Quebec's hydro- reservoirs.

3. Indirect GHG Emissions

These include emissions attributable to:

a) Large scale deforestation resulting from flooding, road construction, clearing of 500km transmission line corridor, logging by the Forestry Industry etc. Canada's boreal forests, associated peat deposits and wetlands represent one of the largest stores of carbon on earth. Peat lands are considered sinks for C02 but are slight sources of methane; boreal forests are slight sinks for methane but are neutral for C02 (7). Deforestation upsets these balances and constitutes an indirect form of greenhouse gas emissions. The

preservation of Canada's boreal forests is essential for a healthy future and for mitigating against climate change.

b) The use of cement in the construction of four mega dams (the manufacture of 1 ton of cement releases 1 ton of Co2).

c) The use of fuel during construction over a 10 year period (helicopters, planes, heavy vehicles etc.) and from eventual mining operations for intensive mineral extraction etc.

d) The energy intensive Aluminum Smelting Industry (one of the world's largest) that is supplied with cheap electricity from the Romaine complex. More energy is spent in aluminum production than in any other industrial process. GHGs emissions from smelting include as much as 1.6 tons of Co2 per ton of metal produced and, perfluorocarbons (PFCs), potent GHG's, with a lifespan of up to 50,000 years and a global warming potential of 6,500 - 9,200 times greater than that of Co2) (16).

e) Potential cumulative impacts on the efficiency of the ocean to act as sink for atmospheric C02 (17, 21). Research has shown that reservoirs are effective at retaining silicates (clay based minerals). Diatom populations (silicate 'shelled' phytoplankton) in coastal areas are sustained by silicate inputs from rivers and by ocean upwelling. More than 80% of the total silicate input to the oceans is supplied by rivers (22). Diatoms play a crucial role in the biological uptake of Co2 by the ocean through the so-called Biological carbon pump (when diatoms die they settle to the ocean floor, thereby sequestering carbon). Could the large scale damming of most of the major rivers draining into the St. Lawrence (e.g. Ottawa, Betsiamites, Outardes, Manicougan, Saguenay, Sainte Marguerite etc.) have incremental and cumulative impacts on this process?

The United Nations Intergovernmental Panel on Climate Change (IPCC) recommends accounting for direct and indirect GHG emissions attributable to mega projects such as the Romaine complex.

Migratory and resident fish species: two genetically unique races of Atlantic Salmon, the American Eel (at risk), Arctic Char subspecies oquassa (protected status), Brook Trout, Sea-Run Brook Trout, Landlocked Atlantic Salmon (Ouananiche), Rainbow Smelt, White Fish and Lake Trout.

1. Atlantic salmon

Atlantic salmon are in severe decline throughout their range and are considered to be 'at risk'. Historically, numerous wild Atlantic salmon populations have been extirpated as a direct result of dam construction on rivers throughout North America and Europe.

The Romaine's wild salmon are of economic importance and are valued by sports fishermen; specimens of over 40 lbs have been caught. The salmon are of particular importance to the local Innu community and a subsistence fishery is operated on the river. The Grande Chute (a spectacular 80 ft waterfall) located at the 50 km point serves as a natural barrier to salmon migration; this is the site proposed for the construction of Romaine 1 dam.

The Atlantic salmon that spawn in the main channel of the Romaine River are morphologically and genetically distinct from those that spawn in the River Puyjalon (a major tributary located at the 12 km point); both strains of salmon are unique.

Concerns regarding the survival of viable wild salmon runs include (see also15, 30):

- potential deterioration of suitable salmon spawning areas due to siltation (during construction)
- potential negative impacts on spawning salmon from reduced river flow (during reservoir filling) and from sub-optimal flow regimes after reservoir filling; low water levels (dewatering) could cause mortality in developing eggs.
- potential loss of spawning sites from erosion as sediment deficient water discharged from the dams (after reservoir filling) attempts to regain sediment equilibrium; permanent loss of two spawning grounds in the tail-race canal below the Romaine 1 dam (EIS: CA-042)
- negative impacts on the downstream productivity of invertebrates (such as insects) on which jeuvenile fish depend for food due to retention of organic and inorganic nutrients in the reservoirs.
- potential premature development of salmon eggs in winter causing jeuveniles to emerge at an inappropriate time for finding food (release of warmer than normal water in winter and cooler than normal water in summer due to thermal stratification in reservoirs)
- potential negative impacts on jeuveniles (smolts and parr), and on the timing of salmon runs caused by irregular river flows and changes in seasonal flow pattern. [Hydro-electric reservoirs trap high spring flows for storage and release higher than normal flows in winter when power is most needed. This changes the natural cycle by transferring runoff from the biologically active period (spring) to the biologically inactive (winter)]

• potential negative impacts on the productivity of the river mouth zone that is likely used as a feeding ground for jeuvenile salmon (smolts) before they move off shore on their ocean migration. (Dams cause major changes in river inputs of freshwater, nutrients (organic and inorganic) and sediments to the coastal zone).

To mitigate for perturbations and loss of salmon spawning habitat (EIS) it is proposed to stock the river with salmon (artificially reared) and to create artificial spawning beds. According to DFO (EIS: CA-041), stocking is not an acceptable means of compensating for loss of spawning habitat. The success of man-made spawning sites is poorly documented and has not been demonstrated on large rivers such as the Romaine, making this a high risk venture. Stocking could also jeopardize efforts to monitor any salmon recovery after dam construction.

In contrast to constructing new dams on salmon rivers, other countries such as France and the US (e.g. 15, 20, 30) have long embarked on programs to dismantle dams particularly on rivers where salmon have been rendered extinct or are in severe decline.

It has been stated (EIS: A-034) that approval of the Romaine megaproject is needed in order to proceed with a future hydro-electric megaproject on the River Mecatina. This is a major river and one of the last pristine wild Atlantic salmon rivers in Quebec.

2. American Eel (at risk), rainbow smelt and sea run brook trout:

These migratory species may be negatively impacted by many of the factors detailed for the Atlantic salmon and in particular by regulated river flow and potential impoverishment or perturbation of feeding grounds at the mouth of the Romaine due to altered inputs of freshwater, organic and inorganic nutrients and sediments (retention by the dams). Refuge habitat (in the mouth of the river) for rainbow smelt could be negatively impacted during winter. The American eel is in critical decline throughout its range.

3. Brook Trout, Arctic Char subspecies oquassa (protected status), Landlocked Atlantic Salmon (Ouananiche), White Fish and Lake Trout:

The brook trout populations resident in the Romaine are adapted to well oxygenated river water and spawn in the littoral zone. They may represent a number of distinct populations isolated between impassible chutes and falls. According to the EIS they will be displaced following creation of the very deep reservoirs, due to habitat loss. A similar fate probably awaits Arctic Char subspecies oquassa that has protected status (resident in certain lakes), Land-Locked Salmon, Whitefish and Lake Trout populations. The fluctuations (draw down) in the Romaine's deep reservoirs will be as much as 19 metres (EIS) potentially causing major perturbations and loss of suitable fish habitat.

In the EIS it is concluded that fish production in the Romaine's deep reservoirs will be similar to relatively shallow reservoirs such as the Caniapiscau Hydro-Electric Reservoir in Hudson's Bay. DFO experts do not consider that this comparison is valid (EIS: CA-043). The physical and operational characteristics of Romaine 2, 3 and 4 reservoirs raise major concerns about their quality as future fish habitat.

The proposed filling period of the Romaine's four reservoirs involves an interval of up to four months where no water will be discharged through the diversion tunnels. This will leave considerable expanses of riverbed below the dams almost devoid of water. The resulting desiccation will be potentially very damaging to fish communities and their habitat. (EIS: CA-056 and CA-057)

Mercury Bioaccumulation in the Food Chain: an Important Health issue

It is well known that decomposing organic matter in hydro-electric reservoirs provides conditions suitable for bacteria to convert naturally occurring inorganic mercury into readily available organic methyl mercury, a potent neurotoxin. Methyl mercury is assimilated by aquatic organisms and bio-accumulates with each level in the food chain. Predatory fish (e.g., lake trout) are most affected and can be rendered unsafe to eat. For example, mercury in the flesh of predatory fish in La Grande 2 Reservoir in James Bay reached about six times background level, or more than seven times the Canadian marketing limit of 0.05ug/g (19). Mercury levels in fish may remain at elevated levels for more than 30 years (18). Mercury contamination of the food chain is an important human health issue. Children and the developing foetus are particularly susceptible.

Birds (e.g. Osprey) and animals that feed on contaminated fish are affected. Fish resident below dams often show exceedingly high levels of mercury in their flesh. Methyl mercury may bind to organic matter in reservoirs and be transported downstream for considerable distances; ultimately it is deposited in sediments in coastal areas. Marine mammals such as seals that feed on fish in affected estuaries can accumulate high levels of mercury.

Of particular concern are the potential health impacts of pervasive long term mercury contamination on local and Innu communities and in particular those that rely on fish as a dietary staple. Also of concern are the potential long term effects of incremental loadings of mercury into the St. Lawrence and the impacts on populations of fish eating birds.

Animals, birds and plants, including species that are rare or with protected status.

Many bird and animal species will be impacted by extensive habitat loss caused by: flooding, irregular fluctuations in reservoir water levels (drawdown), construction of 150 km access roads and more than 500 culverts, deforestation via logging, mining operations, and the installation of 500 kilometres transmission line corridor.

Other impacts can be expected to result from disturbance (human encroachment, construction activities such as use of explosives and helicopters), from the use of herbicides in transmission line corridors and from potential pollution from construction activities (fuel spills, generation of air borne fine particulates etc.). Of particular significance could be the loss of migratory bird species from collisions with future transmission lines.

Species with protected status that could be impacted include: Woodland Caribou (already in severe decline throughout its range), Wolverine, Eastern Wolf, Yellow Nosed Vole, Peregrine Falcon, Golden Eagle, Bald Eagle, Short Eared Owl, Harlequin Duck, Nighthawk, Barrow's Goldeneye and the Horned Grebe.

The Eastern Wolf, is given little attention in the EIS because they were not detected in the Sectoral studies. In 2007, Alliance Romaine observed an Eastern Wolf in the area of the proposed Romaine 2 dam, and numerous tracks were observed in both 2007 and 2008.

Particularly vulnerable will be the Woodland Caribou population that frequents the Romaine valley due to loss of habitat and human encroachment.

In the EIS, helicopters were used (mostly during winter) to count Woodland Caribou, but few observations were made. Caribou are notoriously sensitive to disturbance and noise, more so than most animals. As a result, Caribou may be difficult to observe from helicopters, particularly in winter when sound travels more readily. In the EIS it is estimated that there are only about 0.29 Moose per 10 km 2 and 0.37 Caribou per 100 km 2 in winter.

During the summer of 2008, Alliance Romaine observed significantly higher numbers of both Moose and Caribou than is indicated in the EIS.

Based on our observations there may be significant differences in the size of summer and winter populations of Woodland Caribou. There is clearly an urgent need for further studies on summer populations.

The Government of Newfoundland and Labrador has also expressed concern regarding the fate of Woodland Caribou populations in the region. Because of the very limited area

studied in the EIS, the impacts of the megaproject on the Lac Joseph herd of Caribou were not considered. In this regard, there is an urgent need for follow up studies.

According to Health Canada, the filling of the Romaine's reservoirs will result in net habitat loss for about 97,000 bird pairs (EIS: CA-100), including species with protected status. As well, there could be significant potential loss of migratory bird nests and eggs due to deforestation.

Plant species to be potentially impacted by loss of habitat include medicinal plants and rare/protected status species such as *Hudsonia tomentosa* and orchids such as *Arethusa bulbosa*. These species have highly specialized habitat requirements. In the EIS it is proposed to mitigate for loss of habitat (e.g. *H. tomentosa*) by transplanting to new locations.

The peat / wetland complex at the mouth of the Romaine River has been identified as an area in need protection under Environment Canada's conservation plan to protect the biodiversity of the St. Lawrence (24). This area constitutes a very fragile ecosystem and is known for its rare biotypes. Of concern is the potential for sediment deficient water discharged from the Romaine 1 Dam to cause erosion of the river bed and thereby affect (lower) the water table of the peat land complex situated at the mouth of the River Romaine. This in turn could have potential negative impacts on plant, animal and bird diversity and abundance through loss of habitat. The potential construction of permanent access roads through this area could also have potential negative impacts.

Marine environment and the Mingan Archipelago: birds, mammals (whales etc.) and Fisheries

It is well documented that natural seasonal runoff patterns heavily influence downstream deltaic, estuarine and marine coastal areas (e.g. 19). These areas are high in biological productivity because of the delivery of freshwater and nutrients (inorganic and organic) in river runoff. As well, river runoff may cause mixing and entrainment of nutrient rich, deep ocean water, to the surface. Near shore biological processes (e.g., primary and secondary productivity, fish feeding, migration and spawning etc.) are attuned to these natural seasonal runoff cycles (19). Once a dam is constructed it disrupts natural river processes and the flow of nutrients and sediments to the ocean are impeded. Northern rivers typically have high flows in the spring and low flows in winter. Hydro-electric developments, on the other hand, usually trap the high spring flows for storage in reservoirs and release higher than normal flows in the winter when power is most needed. This transfers runoff from the biologically active period (spring) to the biologically inactive (winter). The large scale construction of hydro-electric dams in the St Lawrence drainage basin has greatly reduced freshwater flow to the Gulf during the natural flood

period (June) but raised it in winter. The cumulative impact of these hydrological alterations on the marine environment is unknown (25).

A concern is that the hydrological alterations proposed for the Romaine will have potential repercussions with respect to the productivity of the marine ecosystem and its ability to support the current population levels of marine birds (e.g. Puffins, Penguins, Eider Duck, Arctic Tern, Razor Bill etc.) and mammals as well as commercially important fish, mollusc and crustacean species (e.g. snow crab, whelk, clam, scallop, capelin etc). Of particular concern are major alterations to freshwater flows, sediments, organic matter (dissolved and particulate) and inorganic nutrient (e.g. silicates, iron) inputs to the coastal zone with regard to short and long term impacts on primary and secondary production.

Reduced freshwater inputs can result in a loss of the stable layer (stratification) that is necessary for high offshore primary production in the Spring (19). As well, plant communities in salt marshes of islands of the Mingan Archipelago (e.g. la Grosse and la Petite Romaine) could be impacted by reduced river flow from the proposed Romaine complex, particularly in the Spring period (EIS: CA-122).

Silicates (clay minerals) are essential for the development of certain types of phytoplankton (diatoms) that possess silicate walls or "shells". Diatoms are a major component of primary production. Diatom populations in coastal waters are sustained by silicate inputs from rivers and by ocean upwelling. More than 80% of the total silicate input to the oceans is supplied by rivers (22).

Reservoirs are very effective at retaining silicates (31). Evidence suggests that reduced silicate inputs from dammed rivers may cause changes in the composition of marine plankton populations (favoring non-siliceous species) and thereby altering the food chain. These perturbations, in turn may affect Fisheries and the overall productivity of estuarine and coastal ecosystems. For example, reduced silicate inputs from the River Danube following damming is implicated in the collapse of a once highly productive fishery in the Black Sea (21, 31).

The pattern of silicate uptake and the availability of iron from rivers suggest that the effects of changing river inputs may go beyond coastal aquatic ecosystems: reduced river inputs of iron due to dams can affect the uptake of silicate in nutrient rich waters in upwelling regions away from the coast (21, 26).

A further concern is that the proposed megaproject might have potential impacts on whales (Rorquals, such as the Blue Whale and endangered Hump Back Whale) that frequent the Mingan Archipelago. In the EIS (DFO comments : CA-085) it is pointed out that the assumption that the proposed hydrological alterations will not affect the

zooplankton prey (i.e. krill) of Baleen Whales is not valid because the results of the NPZ simulation model that was used to simulate primary production cannot reliably be extrapolated to secondary production (zooplankton).

Altered particulate and dissolved organic matter inputs (retention by the reservoirs) could have potential negative effects on both primary and secondary production, particularly in the spring flood season (EIS: CA-084).

It is well documented that the sediments transported by free flowing rivers play a vital role in the stabilization and maintenance of sand bars and deltas in estuaries and coastal zones. These are important areas for biological productivity (e.g. fish and shellfish). The discharge of sediment deficient water from dammed rivers can result in the erosion and destabilization of these coastal areas resulting in a loss of habitat and biological productivity (19, 30).

Of concern are the impacts of significantly reduced sediment inputs from the Romaine hydro-complex on shoreline stability and erosion, on Shellfish (e.g. soft shelled clam), on Capelin spawning grounds and on Snow Crab (EIS: CA070 – CA083). Reduced sediment inputs could also reduce the input of natural ballasts that are important in the removal and preservation of carbon (19).

Eelgrass beds are common in estuaries and are important areas for high primary and secondary productivity and as feeding, shelter and nursery areas for fish. Studies have shown that hydro-electric developments can affect eelgrass beds and may even destroy them (EIS: CA-080). The potential impacts of stresses from the Romaine mega project on the Eelgrass beds at the mouth of the River and, in particular the cumulative effects associated with altered (reduced) river flow, and changes in temperature, salinity and ice formation characteristics are of particular concern (EIS: CA-080).

Toxic algal blooms

Changes in nutrient ratios in coastal zones have been postulated to be responsible not only for shifts in phytoplankton communities but also to favor the growth of toxic algae (31).

Diatoms (silicate shelled phytoplankton) are a major component of primary production and require dissolved silicate (clay minerals) as a nutrient whereas non-siliceous phytoplankton do not.

More than 80% of the total silicate input to the oceans is supplied by rivers (22). Hydroelectric reservoirs are effective at retaining silicates. Diatoms in coastal areas are sensitive to a decline in Silicate (Si):Nitrate (N) and Si:P (Phosphate) ratios. Growth of diatoms have been reported to be affected by dissolved silicate limitation, giving rise to non siliceous algal types, such as the Dinoflagellates, which have many more toxic species (21, 23, 31). Diarrhetic Shell Fish Poisoning and Paralytic Shell Fish Poisoning, represent an important health issue in the St. Lawrence region and are caused by toxic blooms of Dinoflagellate species. Red tide events caused by toxic algae occur in the St. Lawrence estuary and can cause amongst other things, fish and mammal deaths (e.g. whales).

The decomposition of organic matter in the first few years following impoundment of reservoirs leads to an increase in the level of phosphates and humic compounds. These compounds, transported downstream to coastal areas in the discharge water from dams, have been implicated in promoting the growth of toxic algal blooms of Dinoflagellates (e.g. Paralytic Shell Fish Poisoning) in the St. Lawrence estuary (32, 33; EIS: CA-086). Additionally, reduced river flows following impoundment of the Romaine's reservoirs could reduce the 'flushing'' effect of toxic algal cysts (a highly resistant and long lived life stage) from the river mouth zone and thereby facilitate the deposition of cysts in sediments (EIS: CA-086).

Water Quality

Research has shown that significant changes in water quality may occur following impoundment of hydro-electric reservoirs. For example, depletion of oxygen triggers reduction of nitrate, manganese oxides, iron oxides and sulphate. Reduced products of manganese, iron, ammonium and hydrogen sulphide may accumulate in deep water. The reduced compounds are not only toxic to fish and other organisms, but may also cause a reduction in the capacity of sediments to retain phosphates. As a result phosphate levels become elevated (31).

The filling of nearby River Sainte Marguerite 3 (SM3) Reservoir in about 1998 was reported to have caused certain metals (unspecified) to become elevated to toxic levels in a down-stream reservoir. This rendered the water unfit to drink. Bottled water was distributed to affected users. Clarke City which drew water from the affected reservoir was connected to a new supply of drinking water in Sept Iles (34).

Increased salinity of the drinking water was encountered by the Inuit of Kuujjuaq at the mouth of the Koksoak River following impoundment of the Caniapiscau River in 1982 to fill the Caniapiscau Reservoir (19).

A concern is that the large scale hydrological alterations proposed for the Romaine could affect (lower) the water table at the mouth of the river and thereby affect the quality of the drinking water of Havre St Pierre that is currently pumped from ground water. Another concern is the potential impact on water quality caused by construction activities, as well as the operation and maintenance of 150 km access road and about 500 culverts (EIS).

Reservoir Induced Seismicity (earthquakes)

Reservoir induced earthquakes occurred after the filling of the Manicougan (Manic 3), Toulnostouc and Sainte Marguerite River (SM3) reservoirs (35). Globally, more than 90 earthquakes have been triggered by the filling of reservoirs. The largest and most damaging earthquake triggered by a reservoir was in 1967 in Koyna, India: the magnitude of the earthquake was a 6.3. Depth of water (> 80 metres) is considered to be the most important factor in reservoir induced earthquakes (36, 37). Some of the reservoirs proposed for the Romaine complex exceed 80 metres at the foot end. Of concern, is the risk of potential earthquakes (induced by reservoir filling) affecting the structural integrity of older dams in the region.

Social, Economic and other considerations

1. According to the EIS, the power generated by the proposed Romaine megaproject will be sold to Ontario, New York State and to the New England States. However, based on size limitations, the current Renewable Portfolio Standards (RSP) for Massachusetts (39) and Maine (40) do not allow for the purchase of electricity generated from the Romaine Hydro complex. New York State and other New England States also have limitations on the sources from which power can be purchased. As the American Public becomes more environmentally conscious, they may pay more attention to the source of their power and favour local sourcing (e.g. Vermont Power Co-ops.)

The EIS indicates that it will cost 9.2¢/kWh (Canadian \$) to produce electricity from the Romaine complex. This does not consider power transmission, which may significantly increase the cost of production. In March 2008 an agreement was signed between the Government of Quebec and Alcoa, to supply subsidized electricity at 4 ¢/kWh until 2050. If the power is from the Romaine complex, then any shortfall will likely have to be made good by the Quebec taxpayer.

Justification of the hydro-electric complex is based on the revenue that will be generated by the sale of electrical power. The EIS does not consider any uncertainty with regard to the price at which prospective buyers will pay for the power or the exchange rate between the Canadian and U.S. dollars. These factors have an impact on the value of any sales made to the U.S. Moreover, the price of alternate fuels, (e.g., natural gas), that compete with Hydro could influence the economic viability of the megaproject.

Chaton and Doucet (41) used modelling to assess potential investment decisions for electricity generation by Hydro-Quebec. The model considered the effects of uncertainty
in demand growth and fuel prices, and attempted to minimize expected costs. The authors state: "*Given the current cost of CCGT* [Combined Cycle Gas Turbine], *which are likely to be the marginal units in most neighbouring systems, it may be difficult to justify large investments in large-scale hydro projects based on export opportunities.*" The authors acknowledge that this conclusion could change if any underlying factors change and they cite the possibility of increased demand for hydro because of climate change concerns.

The EIS refers to anticipated additional revenue that the Romaine Hydro- electric complex will generate for Quebec and Federal Governments. Some of this revenue will be in the form of additional payments to the Fonds des générations to help reduce the provincial debt, additional payroll taxes, contributions to the Régime des rentes du Québec (RRQ), Fonds des services de santé (FSS), Commission de la santé et de la sécurité au travail (CSST) and Employment Insurance. These payroll taxes are paid by all employees in Quebec, irrespective of the nature of their work and therefore this should not be included as Government revenue attributable to this project.

2. The construction phase of the Romaine megaproject is expected to bring short term manufacturing jobs to Industrial regions of Quebec and short term construction jobs to local communities. Local communities and tourism may be adversely affected during the construction phase due to congestion of the coastal road (route 138), by trucks and heavy equipment, by noise and aerial pollution (particulates, fumes etc). The transmission lines for the Romaine complex are expected to follow the coastal highway (Route 138), thereby degrading the aesthetic value of the Region's natural attractions. Once the project is completed construction jobs will all but disappear. The natural environment (terrestrial and marine) will be irrevocably degraded, potentially compromising sustainable employment from the development of ecotourism, recreational activities and Fisheries. The traditional lifestyle of aboriginal communities may be adversely affected by, amongst other things, loss of ancestral hunting, fishing and gathering grounds, by encroachment and by long term mercury contamination of fish, a dietary staple.

3. The potential of Quebec's little known lower North shore region for ecotourism and recreational activities is enormous and probably surpasses that of the Gaspesie region. Currently, the Havre-St Pierre area attracts more than 30,000 tourists each year. Activities focus on the areas unspoilt natural attractions and, include sports fishing, hunting, canoeing/kayaking, cruises, whale/ bird watching and visits to Anticosti Island and the Mingan Archipelogo, National Park Reserve. The River Romaine's natural attractions including the Grande Chute (a magnificent 80ft waterfall) and the river mouth area, have yet to be developed for ecotourism.

Historic and prehistoric artefacts have been found in the Romaine watershed (EIS) and the flooding of this area could result in the loss of archaeology of cultural significance.

4. Natural Wonders and Cultural Treasures: Mingan Archipelago National Park Reserve of Canada: Parks Canada's mission: "*At a time when nearly every natural environment has been exploited by man, it is good to know that there are still some that remain unspoiled. This is precisely Parks Canada's mission: to protect the natural resources of representative regions around the country. The Mingan Archipelago National Park Reserve of Canada is one of these. This park protects and maintains the ecological integrity of the region of the Eastern St. Lawrence Lowlands" (27).*

The ecological integrity of the Mingan Archipelago National Park is unquestionably heavily dependent on natural seasonal freshwater inputs from the Romaine River.

It is hard to reconcile Parks Canada's mission, for the benefit of present and future generations, with the proposal to harness the Romaine for electricity generation, deforestation and intensive mining.

5. The average useful life expectancy of a hydro-electric reservoir is about 50 years. The Romaine complex will take more than 10 years to complete at a cost of more than \$6.5 billion. In the EIS, the environmental, social and economic costs of eventual dam decommissioning are not considered. This effectively passes on the considerable costs of inevitable decommissioning and remediation to future generations. With the prospect of climate change and the need for clean energy, dam decommissioning is likely to become a major environmental and economic issue in the coming decades as many dams reach the end of their useful life.

6. Newfoundland and Labrador has announced its intention to proceed independently with a hydro-electric megaproject on the last remaining free flowing stretch of the lower Churchill River (Gull Island), apparently to supply energy to an aluminum smelting industry to be established in Labrador. Despite the fact that the water sheds of the Churchill and Romaine rivers share an interconnected and fragile ecosystem, the cumulative environmental and social impacts of the Gull Island megaproject were not considered in the Romaine Environmental Impact Study. Neither was consideration given to the cumulative environmental impacts of the other dams in the region (e.g., Ste. Marguarite, Manicougan, Outardes, Betsiamites, Saguenay or the Smallwood Reservoir complex in adjacent Labrador).

Conclusion and Recommendations

"Large dams [and river diversions] have proven to be primary destroyers of aquatic habitat, contributing substantially to the destruction of fisheries, the extinction of species and the overall loss of the ecosystem services on which the human economy depends. Their social and economic costs have also risen markedly over the last decades" [Postel, 1998 page 636 (38)].

The potential environmental, economic and social costs of the proposed Romaine River Hydro-electric mega project are anticipated to be far reaching and long term. The potential loss of

Natural heritage and ecosystem services on which the Local and Regional economy depends will likely outweigh any short term economic benefits.

It is recommended that a complete moratorium be placed on all proposed and future large dams. In recognition of the value of ecosystem services provided by free flowing rivers, the US and European countries have long undertaken initiatives to dismantle dams on rivers.

Alternatives to large dams exist, such as wind power (for which the lower North Shore region has enormous potential), and solar. Conservation measures could reduce the need for the construction of new dams. As an example, the economies of Denmark and Germany are benefitting significantly from leadership in the development of technologies for wind and solar power generation, respectively.

Résumé

Les émissions de gaz à effet de serre (GES)

Lorsqu'une terre est inondée, la matière organique se décompose à l'aide de microorganismes, relâchant dans l'atmosphère du dioxyde de carbone, du méthane, et des oxydes de nitrate. Des chercheurs à l'Institut de l'eau douce du gouvernement fédéral ont étudié plusieurs réservoirs hydroélectriques dans le nord canadien. Dans l'un des sites, on calcule que la production annuelle de méthane dépasse les 7 grammes par mètre carré de surface du réservoir. Sur une pessière inondée, on estime que la production atteindrait jusqu'à 30 grammes annuellement par mètre carré. Dans un cas type, on trouve que la production de GES, calculé sur une période de cinquante ans (soit, la durée de vie productive d'un projet hydroélectrique) serait comparable à celle d'une centrale thermique au charbon qui générerait la même quantité d'énergie.

Émissions indirectes de GES

Le Groupe intergouvernemental d'experts sur le climat (GIEC) de l'ONU recommande que l'on comptabilise les émissions directes et indirectes de GES dans le cas de mégaprojets comme La Romaine. Cependant, alors qu'Hydro-Québec prétend qu'il ne peut être tenu responsable des effets négatifs indirects qui résulteraient du projet, il veut bien qu'on tienne en compte les effets indirects qui s'avéreraient positifs ! Dans son rapport (tome 3, question P1-P66), le promoteur affirme ne pas responsable être si les routes qu'il construit contribuent ensuite à l'augmentation des coupes forestières. Mais, plus loin dans le même rapport, il se vante que ces mêmes routes ouvriront la voie à l'écotourisme ! Le promoteur se doit de demeurer conséquent. Soit il est responsable des effets indirects, bons et mauvais (et ce serait la position du GIEC), soit il ne l'est pas.

En ce qui a trait aux émissions de GES, les effets indirects du projet incluent la déforestation reliée à la construction de routes (sur 500 Km), l'utilisation de ciment pour 4 barrages (fabriquer une tonne de ciment équivaut à relâcher une tonne de CO2), et le carburant brûlé par les hélicoptères et véhicules lourds. Aussi, l'industrie d'aluminium, hyper polluante, bénéficiera d'une énergie à prix subventionné fourni par le complexe La Romaine.

Populations de poissons (migratoires et permanentes) deux races de saumons atlantiques, anguille américaine (à risque) omble chevalier arctique (statut protégé), truites, saumon atlantique non migratoire (ounaniche), et autres

Les saumons atlantiques, en déclin à travers tout leur territoire, sont considérés « à risque ». Par le passé, des populations de saumons atlantiques ont disparu à la suite de construction de barrages sur plusieurs rivières de l'Amérique du Nord et de l'Europe. Le saumon sauvage de la rivière Romaine est d'une importance économique et est prisé par les pêcheurs sportifs. La construction de quatre barrages risque fort d'affecter le cycle reproductif de cette espèce en raison d'une détérioration du milieu aquatique (envasement), d'une réduction du débit de la rivière, et d'une réduction de la population d'invertébrés (insectes) dont les jeunes saumons dépendent.

Afin de mitiger la perte de milieu aquatique servant à la reproduction, il a été proposé de transférer des saumons d'élevage dans la rivière, et d'y créer des zones reproductives artificielles. Mais, selon le Département des Pêches et Océans, le « stockage » ne représente pas une manière acceptable de compenser la perte d'habitat reproductif. Le succès des zones reproductives artificielles est peu documenté et n'a pas été démontré sur des grandes rivières comme la Romaine. Plutôt que de construire de nouveaux barrages sur des rivières à saumon, d'autres pays comme la France et les Etats-Unis réalisent des programmes pour démanteler des barrages, particulièrement sur les rivières où les saumons ont disparu ou bien sont en déclin.

En outre, il a été dit (étude d'impact A-034) que le mégaprojet de la Romaine est un préalable à la réalisation d'un futur mégaprojet sur la rivière Mécatina. Or la Mécatina est une rivière majeure, et constitue une des dernières rivières à saumon à survivre à l'état naturel au Québec.

D'autres espèces

Les autres espèces de poissons, dont plusieurs à risque ou possédant un statut protégé, seront affectés par la plupart des mêmes facteurs touchant le saumon. On n'insistera jamais assez sur le fait que l'habitat en aval des barrages pourrait ne plus recevoir les sédiments, de même que les nutriments organiques et inorganiques qui constituent la base de la chaîne alimentaire en milieu aquatique. Les scientifiques se demandent si la raison que la morue ne s'est pas remise dans le Golfe Saint-Laurent, malgré le moratoire sur la pêche, serait le grand nombre de barrages sur toutes les rivières qui fournissaient jadis le fleuve Saint-Laurent en nutriments.

Le projet, tel qu'il est proposé par Hydro-Québec, transformera l'écosystème de la rivière Romaine en une série de lacs. On prétend que les valeurs ichthyques ne seront pas atteintes parce que le volume (biomasse) de poissons restera le même. C'est une affirmation simpliste et idéologique ne considérant pas le fait que le nombre et la diversité des espèces seront diminués. Selon le promoteur, le brochet nordique, entre autres, disparaîtra de la rivière. Dans un rapport de 2000, les scientifiques Kolar et Lodge expliquent qu'il y a une forte relation entre la construction de barrages, et l'établissement d'espèces exotiques invasives sur les rivières. Le promoteur ne propose aucune mesure pour pallier à la perte de diversité et l'altération de l'écosystème.

Bioaccumulation de mercure: un enjeu de santé

Il est bien connu que la décomposition de matière organique dans le réservoir crée des conditions propices pour la conversion de mercure inorganique, déjà existant, en méthylmercure, une neurotoxine. Les niveaux de mercure chez les poissons peuvent rester élevés pendant plus que 30 ans. Le mercure a tendance à monter, et à se concentrer dans la chaîne alimentaire chez les animaux. La contamination de la chaîne alimentaire pose un risque inacceptable aux populations humaines. Les enfants et les fétus sont particulièrement à risque.

Animaux et plantes (dont ceux qui sont rares, ou ont un statut protégé)

Le tome 4 de l'étude d'impact examine l'effet qu'auraient les barrages sur la flore et la faune. Dans cette analyse, on traite des étendues de forêt boréale qui seront inondées, et aussi une périphérie de 5 Km autour de la zone inondée. Cette démarche se révèle inadéquate, parce qu'un grand nombre d'animaux ont un habitat plus large que 5 Km (le caribou des bois, une espèce menacée, de même que le carcajou, le loup oriental, et de multiples espèces d'oiseaux migratoires). De nombreuses espèces seront touchées par la perte d'habitat, mais aussi par la construction de routes d'accès, la présence humaine, la déforestation encourue par les opérations forestières, etc. On redoute la contamination causée par les herbicides autour des lignes de transmission, ainsi que la pollution qui résulterait d'accidents industriels durant la construction.

Le projet perturbera un grand nombre d'espèces qui ont un statut protégé, dont notamment le caribou des bois, le carcajou, le loup oriental, et plusieurs rapaces. L'étude d'impact n'examine pas de manière adéquate à la perte et la fragmentation d'habitat chez les espèces nécessitant un grand territoire. Par exemple, Hydro-Québec néglige les effets sur le carcajou et le loup, arguant qu'il n'en a pas documenté sur le territoire. Par contre, les membres d'Alliance Romaine ont vu un loup oriental dans la région de Romaine 2 en 2007, et ils ont noté plusieurs traces de loups en 2007 et 2008. Le promoteur a effectué ses études en hélicoptère, alors que beaucoup d'espèces sont sensibles au bruit et auront tendance à fuir lorsqu'ils entendent le son des moteurs.

Selon Santé Canada, la mise à l'eau des réservoirs de la Romaine encourra une perte nette d'habitat pour 97 000 paires d'oiseaux, ce qui inclut des espèces dotées d'un statut protégé. Les plantes qui seraient affectées par une perte d'habitat incluent des plantes médicinales et des plantes rares ou protégées, nécessitant un habitat très spécialisé.

La pessière située à l'embouchure de la rivière Romaine a été identifiée comme ayant besoin de protection selon les critères d'Environnement Canada. Il s'agit d'un écosystème très fragile. On s'inquiète du manque de sédiment dans les eaux qui arriveront à l'embouchure, suite au projet - ce qui aura des conséquences sur la structure de la pessière.

Archipel de Mingan

En raison d'un manque de nutriments dans les eaux à l'embouchure, occasionné par les barrages, les changements sur la Romaine auront des répercussions potentielles sur la productivité des écosystèmes marins, et sur les espèces d'oiseaux, de mammifères et de crustacées. Une autre préoccupation est que le mégaprojet aurait des répercussions pour des espèces de baleines déjà menacées. Rappelons que l'Archipel de Mingan constitue un Parc national, censé être à l'abri des effets majeurs des mégaprojets. Des altérations dans le ratio de nutriments dans les eaux côtières seraient liées, selon certaines évidences, à une profusion d'algues bleues.

Considérations économiques

Le promoteur affirme qu'il pourra vendre de l'énergie provenant de la Romaine à l'Ontario, l'Etat de New York, ou la Nouvelle Angleterre. Toutefois, les normes d'énergie renouvelable qui sont en vigueur dans les états de Maine et Massachusetts ne permettent pas d'acheter de l'énergie produite à la Romaine. Ces normes fixent une taille maximale à tour projet hydroélectrique d'où l'on peut acheter l'énergie et, en l'occurrence, le Complexe de la Romaine sera trop grand. L'état de New York et la Nouvelle-Angleterre mettent aussi des limites sur les sources où ils s'approvisionneront en énergie. De plus en plus, les électeurs tiennent comptent de l'environnement dans leur choix politiques; il est donc loin d'être certain, comme le voudrait le promoteur, que l'énergie de la Romaine sera vendable facilement.

L'étude d'impact affirme qu'il coûterait 9,2 sous le kWh pour produire l'électricité. Ceci ne tient pas compte des coûts de transmission des kilowatts, ce qui augmentera le coût du projet. On ne tient pas compte non plus du fait qu'en mars 2008, la province, Alcoa, et Hydro-Québec ont signé une entente pour fournir l'aluminerie d'Alcoa en électricité au prix de 4 sous kWh jusqu'en 2050. Il s'agit manifestement d'une subvention à être facturée aux contribuables, ce qui est inacceptable.

Il est vrai que la Côte Nord vit un taux de chômage élevé. Hydro-Québec se targue d'amener des jobs en région avec le projet. Malheureusement, ces emplois seront de courte durée, et l'immense majorité, ne dureront pas plus que le temps de la construction

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"No descriptions or photographs can do the Romaine justice. Only in our heads can the magic be preserved" Fairburn (1987)















Moose or caribou swims across tranquil stretch of the Romaine at sunset



Lichens in the foreground serve as food for Caribou



Insectivorous Pitcher plants



Gentiana andrewsii (Closed Gentian)



Arctic Willow Herb



100 metre canyon



Romaine river mouth: One of two River channels entering the St Lawrence. In the distant background is la Grosse Ile Romaine and granite islets belonging to the Mingan Archipelago, National Park, Reserve.



Romaine river mouth panorama: One of two channels with Rapide a Brillant in the far distant background (left) and rock islets of the Mingan Archipelago in the right background.

Proposed Dam Sites:



La Grande Chute: Proposed site for Dam #1



Proposed site for Dam #2



Proposed Site for Dam # 3



Proposed site for Dam #4

Expressions of Sentiment from Alliance Romaine Members

Listen to the Rivers

Quebec produces 96% of its electric power through the damming of its rivers. No one can measure the damage done to the environment when each of the rivers, listed below, was altered from its natural state to provide us with energy. What would these rivers tell us if you could ask them? Would they question why Quebecers need all this energy? Why their environment is destroyed so we, and others beyond our borders, can continue to use energy wastefully. Why do we dam them, creating mercury toxic lakes, silencing their voices that thunder through rapids and over falls, and blocking their life's ambition to reach the ocean? Here is their petition to save the Romaine, one of the few wild and free flowing rivers left in Quebec.

Abénaquis River Batiscan River **Betsiamites River** Blanche River Caniapiscau River Chaudiere River Chicoutimi River Coaticook River Coulonge River Eastmain River Etchemin River Gatineau River Gouffre River Hall River Hart-Jaune River Jacques-Cartier River Kiamika River La Belle River La Grande River La Sarre River Laforge River Lievre River Magog River Magpie River Manicouagan River Maguatua River Mistassibi River Mitis River Montmorency River Nicolet River Niger River Noire River Ottawa River Ouareau River Peribonka River

Petites Bergeronnes River Portneuf River Rimouski River **Riverin River** Rivière aux Outardes **Rivière aux Sables Rivière des Prairies** Rivière du Loup Rivière du Nord Rivière du Sud Rivière Ha! Ha! Rouge River Rupert River Saguenay River Sainte-Anne River Sainte-Anne de la Pérade River Sainte-Marguerite River Saint-Francois River Saint-Jean River Saint-Maurice River Salmon River Sault aux Cochons River Shawinigan River Shipshaw River St Francois River St Lawrence River **Toulnustouc River** Winneway River Yamaska River

If we can take energy from the sun without blocking out its rays and capture the power of the wind without stopping its flow, surely we can capture a river's energy without building dams?

Gary Bristow, Halifax, NS

Je sais que dans 50 ans, et même plus tôt, on va tellement regretter ces 4 barrages! (Gilles D.)

Il faut plus des gens comme Steve et Fran qui descendent et défendent la rivière en toute humilité! (Sylvie R.)

Ça fait longtemps qu'on milite pour sauver nos belles rivières du Québec, et une par une elles se font harnacher mais il ne faut pas lâcher parce que si on peut en sauver encore quelques unes, c'est déjà mieux que rien! (Jean-Guy P.)

Poor them (Charest and Hydro-Québec), one day they will realize what they've done to our precious rivers and forests, especially those of Northern Québec. (Simone A.L)

When are we going to stop going ahead with harmful projects without properly testing the consequences on future generations' health? When will health be more important than profit? (Alexandra R.)

My most intimate moment with a river was with a small unknown one in Northern Ontario. It was nightime and the stars were reflecting beautiful images and shadows onto the surface of the water and I felt so connected to nature at that moment. I wish everyone could feel that connection, that way we'd have more people trying to defend the Romaine river and other rivers. Until then, I hope that more people can seek that connection with the natural world and better understand that we are so closely connected and that we have to let the rivers run free. (Michelle T.)

Water is sacred. there is no greater argument to convince people that the Romaine River must not be dammed. (Marion D.)

When I meditate I put on CDs that have sounds of water flowing and moving and trickling. Water comforts me, soothes me, helps me reach a higher state of consciousness. lately this summer and fall, at times when I meditate, I imagine I am close to the Romaine River and I give it lots of love. (Janet M.)

Gaining market wealth by exhausting natural resources or polluting the environment does not generate real wealth. Real wealth means a spirit of adventure and inquiry. As a world citizen...what we do, how we act, at the crucial moment is what determines ultimate victory or defeat. We must not let our governments fail us in our vision to save this river from environmental impact disaster! (Russell J.)

I just want it to be free. I wish I could verbalize how I feel about the importance of the Romaine River, but the point is that I can't put it into words. It is part of my mental landscape... the rivers I have had the fortune of seeing and touching and feeling are a part of me, and I feel I am a part of them. The world needs a big, powerful, free, unfettered rushing river to stay free. (Tanya R.K.)

First and Last by Chantale K.

Every time I see Niagara Falls, I wonder what the first person ever to see that mighty force must have felt. Were they alone? With their whole tribe? Had they been traveling and heard the mighty roar for days? Had they dreamt of the river's power, of it tumbling over a great abyss? Surely they would not have had the historical perspective to know or to care that they were *the first ever*. The first ever human that is.

Our time on this planet has been brief. Very short indeed, and yet we have made ourselves known. A river is timeless, they say, it is always flowing. It is always changing too, never the same water twice. Many forces can affect a river, and many populations will change its composition. But when one single species can in 10 years or less disrupt a river to the point of affecting every single living population along that river, and of upsetting the balance quicker than any species can adapt, I say this is a rift in the pace of nature. And if not a rift, well, a cataclysm.

I don't pretend that any of what you read in this annex will have any direct affect on whether or not the Romaine is damned. I have seen through case study that there is no place in such matters for arguments based on emotion, spirit or beauty. The values have been chosen, and they just don't include anything quite so...artistic? Abstract? Some might say... human?

But I *do* hope that if all the very real political, economic, scientific, social and just plain rational reasons not to damn the Romaine are not enough, and if yet another wild river is harnessed for our consumption, if this is to be the way, I hope that somewhere, some engineer or labourer, or Hydro Quebec CEO with the historical perspective we have now gained will take the time to take a good look at that river just before it is damned. I hope this worker will pause to think about all the humans who have ever come to its banks in awe. I hope he or she will think about his or her very own ancestors and the first ever humans to come to the waters of the Romaine River. I long for them to stop to think about their own children, and the children of those around them. For in this age we are consuming many things which might have been theirs. I hope that someone somewhere will realize that *they* will be the very last human ever to see the Romaine River in its wild and whole form. I hope that person will dream of the river that night.

Jim Learning Comments PUC Docket NECEC March 26 2019

I am an Aboriginal member of NunatuKavut, Labrador, Canada. I live on the Mistashipu (aka the Churchill River), also called the Grand River by original settlers, in the town of Happy Valley-Goose Bay population 7800. I live downstream of the present Churchill Falls and the Muskrat Falls Hydro Projects. At present there is talk of a third Project at Gull Island which lies between the Churchill Falls and Muskrat Falls. The Churchill Falls project came on stream in the late 1960's and early 1970's. The power from this project serves a few Labrador communities and the New England Markets through Hydro Quebec which has an agreement for most of the power produced at Churchill Falls until the year 2041. Muskrat Falls is currently under construction by Nalcor Energy of Newfoundland. These two hydro projects pose huge problems for Aboriginal and non-aboriginal people downstream because of the health risks of methyl-mercury which is a neuro-toxin. MM bio-accumulates up the food chain into the traditional food sources of all northern communities where reservoirs are flooded. Our communities are directly affected. Please visit www.makemuskratright.com for a complete report by Harvard University. The safety of the one of the dams at Muskrat Falls is seriously questioned because of the existence of layers of quick clay (leda clay) which is prone to liquify. No evacuation plan exists for either of these communities. Mud Lake, which has no roads, will have less than 1 hour to get out of harm's way before inundation. For that community, a dam break spells sudden death by drowning for the entire community. The NL government and Nalcor refuse to address the North Spur and methyl-mercury issues. The people of Maine and Massachusetts need to understand what is at the other end of that extension cord called the New England Clean Energy Connect and all the negative effects the production of that power are having on our culture, our environment and even our traditional food sources

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Shocking Revelations at Hydro-Quebec: The Environmental and Legal Consequences of the Quebec-New York Power Line

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Shocking Revelations at Hydro-Quebec: The Environmental and Legal Consequences of the Quebec-New York Power Line

I. Introduction

In 1973, the average American realized the implications of rising tensions in the Middle East.¹ The citizens of the United States were reduced to purchasing gasoline for their automobiles on either odd- or even-numbered days; waiting in block-long lines to obtain gasoline for their vehicles; and paying significantly higher prices for petroleum products.² Thus, with the advent of the 1972 oil crisis, the eyes of the world focused upon the Middle East, and the common citizen began to comprehend the magnitude of the importance of the globe's oil lifeline—the Persian Gulf. Accordingly, the nations of the world searched to find nearer and more reliable sources of energy.³

Although hydroelectricity⁴ has been in use for several decades,⁵ its full potential as a legitimate energy source had never been realized.⁶ Not surprisingly, the old hydroelectric plants in the developed countries were examined with a renewed interest during the oil crisis.⁷ Hydroelectricity seemed to be the source of power that the nations of the world had looked for, found, and prematurely disregarded.⁸ In the developing world, as well, extensive outlays for hydro

5. Id.; see, Cliff, Hydro, supra note 1, at 15.

6. See generally, Osterland, Meeting US electricity demand in the 90's, Christian Sci. Monitor, July 25, 1985, at 7, col. 1; see Cliffe, Hydro, supra note 1, at 15.

7. Telephone interview with source affiliated with Hydro-Quebec (Oct. 6, 1987) [hereinafter Hydro-Quebec interview].

^{1.} See, Cliffe, Hydro Past or Future?, 89 TECH. REV., Aug./Sept. 1986 at 15 [hereinafter Cliffe, Hydro].

^{2.} Van Gelder, State Begins Regulating Sale of Gasoline Today, N.Y. Times, Feb. 26, 1974, at A1, col. 2; Rosenbaum, Crisis in Energy is Over for Nation, N.Y. Times, Feb. 25, 1974 at A1, col. 4.

^{3.} Cliffe, Hydro, supra note 1, at 16.

^{4.} Simply described, hydroelectricity and hydroelectric power are created via the wholesale transfer of energy harnessed from the water's potential force. Hydroelectric power has been deemed the most widely used renewable energy resource in the world. *Hydroelectric*, ALTERNATIVE SOURCES OF ENERGY, Dec. 1987 at 53 [hereinafter ASE]. From 1979 through 1986 the use of hydroelectric power has resurged and now constitutes thirteen percent of the United States' electric generating capacity. *Id*.

^{8.} See, e.g., Cliffe, Hydro, supra note 1, at 18. Hydropower has been deemed "clean, safe, renewable and reliable," and the developed nations of the world have lauded its benefits for years; yet the developed nations had failed to use hydroelectric energy to grand scale that was readily possible prior to 1972. Many of the existing hydroelectric facilities are more than

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development granted by the World Bank and other financial institutions were committed to bringing the Third World into self-sufficiency in the energy-producing field.⁹ Unfortunately, the rush to exploit hydroelectric power was instituted absent significant evaluation of the long-term consequences of its use.¹⁰

It was once assumed that hydroelectric power was harmless,¹¹ but new evidence has been presented by the New York State Powerline Project Scientific Advisory Panel that may change the way the world perceives "safe" electrical power.¹² With alarming recognition, hydroelectric power does have a substantial effect on the natural environment as well as the human environment.¹³ This Comment explores the motives and needs of Hydro-Quebec and the New York Power Authority, parties which have agreed to build an electrical power line extending from St. James Bay, Quebec, Canada, to New York City.¹⁴ In addition, this Comment assesses selected environmental concerns through the world which relate to the Hydro-Ouebec case in conjunction with disputes settled by international law.¹⁵ The adverse environmental effects, both upon humans and the natural ecosphere are then analyzed.¹⁶ This Comment also examines relevant international law and policy which embraces the environmental concerns¹⁷ and, subsequently, recommends changes.¹⁸ This Comment concludes that the effects of the Hydro-Quebec electrical line should have been analyzed more carefully and with heightened respect for international environmental law.¹⁹

11. Cliffe, Hydro, supra note 1, at 18.

13. See generally id.; see also, Cliffe, Hydro, supra note 1, at 16.

14. See infra notes 21-48 and accompanying text (discussing the background information surrounding the Quebec-New York agreement).

15. See infra notes 52-88 and accompanying text (discussing international dilemmas spanning Corfu to Houston).

16. See infra notes 96-123 and accompanying text (discussion the impact of the Hydro-Quebec Line on nature and man).

17. See infra notes 124-163 and accompanying text (discussing both U.N. resolutions, multinational agreements, and bilateral treaties).

18. See infra notes 166-181 and accompanying text (discussing possible methods of eliminating "ex post facto" decision-making in the environmental law realm).

19. See infra notes 182-184 and accompanying text (discussing the solutions to the

⁵⁰ years old. ASE, *supra* note 4, at 53. As a result of their age, the power plants need a great deal of upgrading to meet demands. *Id*. The "great equalizer" was the oil crisis which, if sustained over a long period of time, would lend support to the capital outlays necessary to renovate old hydroelectric plants and to begin work on new structures.

^{9.} See generally Flavin, Electricity in the Developing World, 29 ENV'T, Apr. 1987, at 12. In fact, between the years 1980 and 1990, the hydroelectrical capacity of the Third World will almost double, rising from 141,000 megawatts to 218,000 megawatts. *Id.* at 15 [hereinafter Flavin].

^{10.} Rheem, Environmental Action: A Movement Comes of Age, Christian Sci. Monitor, Jan. 15, 1987, at 18, col. 1 [hereinafter Rheem]; see infra notes 95-122 and accompanying text (discussing the environmental effects of hydroelectric power, in particular, the Hydro-Quebec lines from St. James Bay to New York City).

^{12.} See generally New York State Powerlines Project Scientific Advisory PANEL, FINAL REPORT, BIOLOGICAL EFFECTS OF POWER LINE FIELDS (1987) [hereinafter Bio-LOGICAL EFFECTS].

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II. The Agreement

By 1996, New York City will have more electricity supplied to its offices, residences, and stores than ever before;²⁰ a substantial portion will be provided by a hydroelectric dam at St. James Bay, Quebec.²¹ After lengthy negotiations, Hydro-Quebec agreed with the New York Power Authority in 1982 to initiate work on constructing the world's longest electrical line.²² In addition to examining several factors and the respective motivations of each of the signatories to that agreement; it is important to note the viewpoints of two of the more visible promoters of the Hydro-Quebec contract—Hydro-Quebec's president, Guy Coulombe and Canadian Premier, Robert Bourassa.

A. The Companies

1. Hydro-Quebec.—Essentially, Hydro-Quebec plays the role of exporter in this contract. Hydro-Quebec officials recognized the importance of innovation in the energy field in the 1950s²³ and, accordingly, constructed its first large scale hydroelectric dam in the Bersimis River.²⁴ Subsequent to regional success in hydropower, Hydro-Quebec looked to the tremendous potential of the La Grande River as an energy generating resource.²⁵ In 1972, work commenced on the dam under the guise of The Société d'énergie de La Baie James (SEBJ), in an effort to reduce the impact of the rising costs of oil imports.²⁶ Leadership at Hydro-Quebec recognized the need in the American market for less expensive sources of energy and, therefore, began to export this resource to the New England States in grand fashion.²⁷ Finally, in 1980, preliminary negotiations between the New York Power Authority (NYPA) and Hydro-Quebec were

Hydro-Quebec quagmire).

^{20.} The contract between Hydro-Quebec and the New York Power Authority stipulates that in 1995, New York will receive 500 megawatts of electricity, and in 1996 an additional 500 megawatts will be supplied. Telephone interview with inside source, New York Power Authority (May 27, 1988) [hereinafter NYPA Source]. As of May 27, 1988, both parties have agreed upon a January 6, 1988 letter of intent. *Id.*

^{21.} The actual ribbon-cutting ceremony of the Marcy South line for the low scale electrification of the line was in June, 1988. See NYPA Source, supra note 20. The Marcy South line conveys energy from Utica, New York to New York City. Id. See also Power Authority of the State of New York, Opinion No. 85-2, case 70126 (Issued: Jan. 30, 1985) at 8, 11.

^{22.} See generally id. at 1. The cable is designed to span 340 miles in New York and an additional 675 miles in Quebec. See NYPA Source, supra note 20. The construction on the line began in the mid-1970's in Canada and in the mid-1980's in New York. Id.

^{23.} HYDRO-QUEBEC, JAMES BAY: TAMING THE LA GRANDE RIVER 4 (1985) [hereinafter Hydro-QUEBEC, TAMING].

^{24.} Id. The dam is known as the Manic Outardes Complex. Id.

^{25.} Id. at 16. The drainage basin alone at LaGrande is $97,400 \text{ km}^2$ —more than twice the size of Switzerland. Id.

^{26.} Id. at 47; see supra note 7.

^{27.} See Terry, Will Quebec's Hydroelectric Bubble Burst?, BUS. WK., May 5, 1986, at 44 [hereinafter Terry].

initiated in an effort to provide harnessed hydroelectric power to southeastern New York State.²⁸

Although Hydro-Quebec's construction of the La Grande Complex was not expressly for compliance with the arrangement between NYPA and itself, the environmental consequences of the undertaking of this project are still highly relevant to the international aspects of this issue.²⁹ Prior to the ground breaking for the revamped dam, Hydro-Quebec recognized that the territory was fragile and that it would be difficult to maintain an adequate ecological balance in conjunction with the construction and implementation plans for the La Grande Complex.³⁰ Hydro-Quebec boasts that it met this challenge,³¹ but statistics support a contrary view.³² To survey in brief, for example, Hydro-Quebec drowned approximately ten million trees in filling a reservoir;³³ excavated 262,400,000 cubic meters of material and fill;³⁴ rerouted rivers;³⁵ built five airports; erected 215 dikes; laid hundreds of kilometers of roads for preconstruction;³⁶ and redeveloped lands surrounding the James Bay area-lands formally occupied by the Cree and Inuit Indians.³⁷ Finally, Hydro-Quebec has characterized its present activities with respect to the environment as "corrective."38 Indeed, this foreshadows Hydro-Quebec's perception of its responsibilities, or lack thereof, in the international environmental realm.

2. The New York Power Authority.—Regarding international duty owed to other nations, Hydro-Quebec is not the only suspect party to this environmentally damaging pact. The NYPA, although

34. Id. at 15. Hydro-Quebec boasts that this quantity of material taken from the landscape is "enough material to build the Great Pyramid of Cheops 80 times." Id.

35. Id. at 17.

38. Id. at 14.

^{28.} Hydro-Quebec interview, supra note 7.

^{29.} The actual environmental consequences of this particular contract and the electrical cable involved will be discussed *infra* at note 90-122, as they relate more directly to the international environmental scheme.

^{30.} HYDRO-QUEBEC, TAMING, supra note 23, at 12.

^{31.} Id. at 12, 13.

^{32.} Id. at 11, 13, 15.

^{33.} Id. at 13. Hydro-Quebec determined, quite astonishingly, that harvesting the drowned trees would be unprofitable. Additionally, the company proposed that they need not even clean up the trees because "over the long term, nature was as efficient at deforestation as man," and Hydro-Quebec need only wait until "wind, ice and currents uproot the trees and bring them to shore where all that needs to be done is collect them." Id. The company appears to be assuming a great deal of administrative power and skirting some serious environmental responsibilities.

^{36.} Id. at 15. It is important to note that the climate of the St. James Bay area is tiaga and not resilient to change.

^{37.} Id. at 11. Hydro-Quebec justified its taking by pointing out that "new possibilities for employment" for the 8,000 Crees "opened up" as a result of development. The Crees are a traditional tribe who exist by hunting, trapping, and fishing [how are they supposed to assimilate into Hydro-Quebec's plan?]. Id. The Crees and the Inuits were essentially "bought out" for \$225 million and all future claims were waived. Id. at 48.

its proposals have to be reviewed by the American court system, was ready and willing to deforest and develop in preparation for the line from Quebec.³⁹ In fact, the NYPA sought judicial acceptance of various statutorily prohibited routings of the electrical cable in an effort to reduce financial costs to the company.40 The contract for Hydro-Quebec's export of electricity to southeastern New York was a result of NYPA's search for less expensive non-oil-fired energy sources.⁴¹ To the benefit of Hydro-Quebec, tapping electricity from the La Grande Complex was New York's only feasible alternative to new construction.⁴² This view is held by at least two of Quebec's high level executives, Robert Bourassa and Guy Coulombe.43

The Primary Advocates **B**.

Quebec's Premier, Robert Bourassa, is perhaps the most concerned observer to the Hydro-Quebec - NYPA contract. To him, this agreement represents "billions of dollars of investment into his province," in addition to "creat[ing] thousands of jobs for Quebec workers."44 Bourassa stated that his goal is to "lock" the New England States, including New York, into long-term electric power contracts, thus insuring a healthy economy for Quebec.⁴⁵

The other major advocate of the Hydro-Quebec - NYPA contract is Guy Coulombe, president of Hydro-Quebec.⁴⁶ Coulombe expressed the strategy of his company: "We want to encourage them [the United States] to import Quebec electricity rather than build new power generating stations."47 This seems to be precisely what New York is content to do, yet the environmental ramifications of such a decision to import electricity from over hundreds of miles may well be disastrous.48

III. Recent Environmental Mistakes and International Caselaw

Although the actual environmental effects of the Hydro-Quebec project will not be known for some time, one may hypothesize that

^{39.} See supra note 21.

^{40.} See, e.g. supra note 21, at 45-56.

^{41.} See supra note 21, at 3.

^{42.} Freeman, Hydro-Quebec to Seek Contracts for Power in U.S., Wall St. J., Mar. 19, 1986, at 14, col. 1 [hereinafter Freeman].

^{43.} Id.

^{44.} MacPherson, New York Power Connection, EMPIRE ST. REP., June 1986, at 10, 11 [hereinafter MacPherson].

^{45.} Terry, *supra* note 27, at 44. 46. Freeman, *supra* note 42, at 14.

^{47.} Id.

^{48.} The specific environmental consequences of the Hydro-Quebec line will be discussed infra 96-123. As to sovereign concerns. Experts have posited that increased reliance on foreign sources of energy will cause dependence and lead to a scenario similar to that during the oil crisis. See supra note 21.

the fate of the system may be analogous to that of similar projects throughout the world.⁴⁹ With this background of what is at stake, historical international legal precedent should be examined in order to better determine the global environmental law implications of the Hydro-Quebec - NYPA power line.⁵⁰ In addition, an analysis of a possible means of liability through a recent Texas case will be studied.⁵¹

A. Current Dilemmas Relating to Electrical Power

In a report by the World Bank, officials speculate that the most critical environmental problem in developing countries is "indiscriminate deforestation and land clearing."⁵² This has resulted in soil erosion, rapid water runoff and flooding, siltation in hydro power and irrigation projects, and agricultural losses.⁵³ The World Bank has been subjected to a great deal of scrutiny regarding its efforts in the developing world,⁵⁴ especially in India and Brazil.

In India, the Bank granted approximately \$500 million to construct a dam to begin a hydro power generating facility.⁵⁵ Fortunately, a study was compiled which maintained that the dam would flood 900 square kilometers of land, displace over two million people, and decimate 33,000 hectares of teak and bamboo forests.⁵⁶ This study also predicated that the diseases malaria, goitre, cholera, and viral encephalitis would increase significantly.⁵⁷ Although not dispositive, this study's accuracy was not questioned; nevertheless, the project has not been abandoned.

Similarly, in Brazil, the World Bank loaned \$450 million toward the costs of building a hydroelectric dam.⁵⁸ Soon after the project was initiated, one segment of the damming system was perceived as "an ill-conceived project which has had a substantial negative effect on the environment and on the AmerIndian population."⁵⁹ Ac-

51. See infra notes 61-68 and accompanying text.

52. C. Farnsworth, *Ecology Warning from World Bank*, N.Y. Times, September 20, 1985, a A9, col. 1 [hereinafter Farnsworth].

53. Id.; see Rheem supra note 10, at 18.

55. Id.

57. Id.

^{49.} See supra notes 52-63 and accompanying text (discussing current environmental dilemmas).

^{50.} See infra notes 62-88 and accompanying text (discussing ICJ standards which relate to international pollution).

^{54.} J. Bovard, The World Bank's Environmental Disasters, Executive Memorandum No. 167 (July 1, 1987) (available at the DICKINSON JOURNAL OF INTERNATIONAL LAW office) [hereinafter Memo].

^{56.} Id. The study was compiled by the Indian Council of Science and and Technology. Id.

^{58.} Id. Notably, results virtually identical to those maintained in the India case cited above did, in fact, occur. See supra note 9, at 15.

^{59.} Memo, *supra* note 54. The quote was proffered by the former World Bank president, A.W. Clausen, in June 1986. Similarly, Senator Bob Kasten (Rep. Wisconsin) stated that

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cordingly, the visionaries of the World Bank are sacrificing useable natural resources for speed and short-term benefits. Without proper environmental use, growth is forced and the long-term consequences of these hastily conceived panaceas will be realized.⁶⁰

In a recent Texas scenario, more closely analogous to the dilemmas encountered at St. James Bay, the Houston Lighting & Power Company was ordered to pay \$25 million in punitive damages for the risks to which it subjected school children in Houston Lighting & Power Company's construction of electrical lines over two school campuses.⁶¹ Although the Court of Appeals of Texas chose to overrule a lower court on the issue of damages, *Houston Lighting* represents the first time the United States' judiciary has recognized a cause of action for the environmental harm resulting from electrical cable lines.⁶² This case is of utmost importance to the legal proceedings which will most certainly result from the Hydro-Quebec -NYPA contract, as the Hydro-Quebec agreement encompasses far more territory over which electrical cables will lie and involves international boundaries.⁶³

B. A Basis for Jurisdiction

Two stalwart cases which have stood the test of time in international law are the *Corfu Channel Case*⁶⁴ and the *Trail Smelter Arbitration.*⁶⁵ International law contains neither common rules nor customary standards specifically regarding environmental protection,⁶⁶ but *Corfu* and *Trail Smelter* enunciate prominent doctrines which concern both international duty and responsibility⁶⁷ and territorial sovereignty.⁶⁸ These two principles are both relevant and inherent

62. ABC World News Tonight (ABC television broadcast, Nov. 9, 1987). The segment cited discussed electrical power lines and questions surrounding higher incidences of cancer.

63. See supra note 29; cf, infra note 65.

64. Corfu Channel Case (U.K. v. Alb.), 1949 I.C.J. 4 (Judgment of Apr. 9) [hereinafter Corfu].

65. Trail Smelter Arbitration (U.S. v. Can.), 3 R. Int'l. Arb. Awards 1905 (1949) [hereinafter *Trail Smelter*].

66. Knapp, Our Neighbors Keeper? The United States and Canada: Coping with Transboundary Air Pollution, 9 FORDHAM INT'L. L.J. 159, 172 [hereinafter Knapp].

67. Corfu, supra note 64; see infra notes 69-77 and accompanying text.

68. Trail Smelter, supra note 65; see infra notes 78-84 and accompanying text.

work in Brazil "has resulted in deforestation on an unbelievable scale." See Fransworth, supra note 52.

^{60.} See generally Elder, Environmental Impact Assessment in Alberta, 23 ALBERTA L. REV. 286 (1985) [hereinafter Elder].

^{61.} See generally Houston Lighting & Power Company v. Klein Independent School District, No. B14-86-002-CV (Tex. Ct. App. Nov. 5, 1987). The Appellate Court overruled the damages award not because Klein failed to prove with scientific certainty that the electrical lines had a significant health effect, rather, in a condemnation proceeding, as in *Houston Lighting*, punitive damages are not recoverable. The scientific evidence proffered in *Houston Lighting* will be addressed *infra* note 121 and accompanying text [hereinafter Houston Lighting].

within the purview of international environmental law, and therefore must be more fully considered.

1. Corfu and International Responsibility.—A fundamental principle of international law is responsibility.⁶⁹ The Corfu Channel Case should be interpreted as an invaluable judicial affirmation of the doctrine of state responsibility⁷⁰ and is indeed sufficiently analogous to the Hydro-Quebec scenario. Accordingly, in the international environmental law realm, Corfu represents the principle that there is an ". . . obligation of each state not to allow the nationals of other states to suffer pollution damage that might reasonably be prevented . . ." and warns of the ". . . liability of providing appropriate compensation to the injured party when that obligation is violated."⁷¹

The Corfu Channel Case involved two British destroyers which were damaged by mines in an Albanian controlled channel.⁷² Although Albania protested a subsequent mine sweeping action by Great Britain on sovereignty grounds,⁷⁸ Great Britain claimed its response was necessary and requested compensation.74 The International Court of Justice found Albania responsible,76 and in rendering its decision, posited that a State may not, with actual or imputed knowledge, permit its territory to be so used as to bring undesirable effects upon another State.⁷⁶ Hydro-Quebec and the NYPA know of the dangers⁷⁷ which may result to each other's respective countries.⁷⁸ If the Corfu doctrine is applied, absolute liability of this "unholy alliance" between Hydro-Quebec and the NYPA may cause additional International Court of Justice dispute resolution and also impose heavy burdens upon the environment of northeastern North America-burdens which, once assigned, may never be corrected. Taken alone, this stance is fair, but in conjunction with the doctrine of Trail Smelter, this reasoning is compelling.

71. J. BARROS & D.M. JOHNSON, THE INTERNATIONAL LAW OF POLLUTION 69 (1974) [hereinafter Barros].

- 77. See generally BIOLOGICAL EFFECTS, supra note 12; see supra note 21.
- 78. See supra notes 7, 19.

^{69.} I. BROWNLIE, PRINCIPLES OF PUBLIC INTERNATIONAL LAW 433-34 (3d ed. 1979) [hereinafter BROWNLIE].

^{70.} Note that decisions of the International Court of Justice are merely persuasive and not binding on parties external to the litigation. R. Sugarman, *The International Joint Commission and Principles of International Law*, address at a conference held at Banff, Alberta, Canada, March 19-21, 1981, *reprinted in* Canadian Bar Association, Environmental Law Section, COMMON BOUNDARY/COMMON PROBLEMS: THE ENVIRONMENTAL CONSEQUENCES OF ENERGY PRODUCTION 48-54 (1982) [hereinafter Sugarman].

^{72.} Corfu, supra note 64, at 57-59.

^{73.} Id. at 59-62.

^{74.} Id. at 59.

^{75.} Id. at 60.

^{76.} BROWNLIE, supra note 69.

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2. "Global Village"⁷⁹ and the Trail Smelter.—The term "global village" applies to the ever-increasing inter-dependence that each country shares with the other nations of the world. Thus, territorial sovereignty, once believed absolute,⁸⁰ is becoming tempered. The Trail Smelter Arbitration exemplifies this world-wide responsibility.

The *Trail Smelter* dispute arose when the United States alleged that sulfur dioxide fumes from an iron smelter at Trail, British Columbia, Canada, were causing damage within the state of Washington.⁸¹ Canada and the United States agreed to let a tribunal arbitrate this case⁸² which, based upon tenets of international law, concluded that:

Under the principles of international law, as well as of the law of the United States, no state has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persona therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.⁸³

The direct relevance of this holding to the circumstances of Hydro-Quebec is more clearly visible when the substantive law used by the International Court of Justice is scrutinized.⁸⁴ The award in the *Trail Smelter Arbitration* case was based upon United States case law and its precedents upon air and water pollution.⁸⁵ The importance of the tribunal's use of United States' precedent bring the *Houston Lighting & Power v. Klein*⁸⁶ dispute back into the international legal forum.

As there is no case law in the United States which specifically concerns electrical lines and their effects on both humans and the environment other than *Houston Lighting*, this case may be used as precedent in any international ruling by the International Court of Justice or any other tribunal.⁸⁷ The *Houston Lighting* litigation is not completed for Klein is seeking certiorari to the Texas Supreme Court in an effort to obtain \$25 million in punitive damages.⁸⁸ Thus,

^{79. &}quot;Global village" was coined by Marshall McLuhan, a notable Canadian politician.

^{80.} BROWNLIE, supra note 69.

^{81.} Trail Smelter, supra note 65, at 1941-48.

^{82.} Id.

^{83.} Id. at 1965. This language has been adopted by the international community under the 1972 Stockholm Declaration on the Human Environment. Report of the United Nations Conference on the Human Environment, U.N. Doc. A/Conf. 48/14 and Corr. 1 (1972), reprinted in 11 I.L.M. 1416 (1972) [hereinafter 1972 Declaration on the Human Environment].

^{84.} See, e.g., Knapp, supra note 66, at 177-78.

^{85.} Trail Smelter, supra note 65.

^{86.} Houston Lighting, supra note 61.

^{87.} Granted, the ruling as to money damages in the Houston Lighting case was reversed, but the cause of action was upheld. See id.

^{88.} See supra note 62.

the Houston Lighting decision may be of paramount significance to the future legal aspects of the Hydro-Quebec argument.

IV. The Unholy Alliance

The Hydro-Quebec - New York Power Authority contract is, in its simplest form, an agreement for Hydro-Quebec to provide 3,500 to 4,500 megawatts of electricity to southeastern New York State⁸⁹ from a hydroelectric plant capable of producing 10,282 megawatts of energy.⁹⁰ In exchange for Hydro-Quebec electricity, the New York Power Authority will not only pay for the energy supplied but will also provide a financial backing of approximately \$18 billion U.S. dollars so Hydro-Quebec can meet its goals for both New York and other New England states.⁹¹ From a purely "services-for-goods" viewpoint, this contract is easily justified. However, it is from an ethical and ecological standpoint that this Comment takes issue with the Hydro-Quebec - New York Power Authority contract.

A. The Costs

The monetary outlays of this project, though considerable, may be pale in comparison to the environmental costs the system will inflict upon both nature and humanity.⁹² In addition to the obvious considerations such as deforestation and land development, new factors enter into the equation as a result of the system's size.⁹³ The cable lines involved in this international transfer of energy are more than twice as expansive as others that have been constructed in the world.⁹⁴ Scientists are left to extrapolate to the regional as well as international effects.⁹⁵

B. The Consequences

1. The Consequences of the Hydro-Quebec Line on Nature.—Although without established proof regarding all of the ef-

^{89.} Freeman, supra note 42.

^{90.} Terry, supra note 27. To give the reader some appreciation of the power involved at the LaGrande Complex, 10,282 megawatts was approximately 10% of the entire hydro capacity of *all* of the nations of the Third World as of 1980. Flavin, supra note 9, at 15. The 10,282 megawatt figure is closer to 6% of the Third World's current capacity. *Id*.

^{91.} MacPherson, supra note 44, at 11, 12.

^{92.} See infra notes 96-123 and accompanying text (discussing the impact of Hydro-Quebec Lines on nature and man).

^{93.} Telephone interview with a New York State Environmental Department official (Sept. 21, 1987) [hereinafter New York interview].

^{94.} Hydro-Quebec interview, *supra* note 7. The simple fact that nothing of this size in this field has ever been developed leaves scientific evidence of environmental effects to conjecture at this point. *Id.* What *can* be said is that the effects on both man and nature will be greater than normal—perhaps four times that of a normal system's effects. *Id.*

^{95.} Id.

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fects that the Hydro-Quebec - NYPA cable network will have on nature, researchers can still point to early dilemmas which have arisen as a result of the St. James Bay dam reconstruction⁹⁶ and the initial stages of line construction through Quebec and New York.⁹⁷ As in the preliminary segments of construction, considerable deforestation on both ends of the cable route has destroyed a great number of trees.⁹⁸ This removal is not limited to the line's right-of-way. Access roads and clearing for construction machinery is also involved. Consequently, this development involves a great deal of destruction of the resources that animals require to survive.⁹⁹

At least two species of animals are affected by the cable lines. The population of the Poulamon, or tommy cod, of the Ste-Anne-De-La-Perde, Quebec, area is rapidly decreasing.¹⁰⁰ Although these fish were caught and sold by the locals of Ste-Anne, natural ecological balance kept the tommy cod at a productive level for sustained life.¹⁰¹ With the advent of the Hydro-Quebec's river rerouting and cable construction, the numbers of the tommy cod have fallen to dangerously low levels.¹⁰²

The caribou population of the northeast is also predicted to decline significantly.¹⁰³ Just as the construction of the Alaskan Pipeline caused more than 1,000 caribou to drown as a result of their crossing of swollen rivers to breeding grounds in the northwest, the caribou of the northeast have been predicted to suffer a similar fate.¹⁰⁴ This is, and will continue to be, wholesale killing of the caribou because the environmental departments of both of the contracting parties realize that the caribou deaths are inevitable.¹⁰⁵

The cable network will also affect the aesthetic beauty of the unspoiled region.¹⁰⁶ Granted, the majority of the land surrounding

^{96.} See supra notes 33-37 and accompanying text regarding deforestation; land evacuation; tiaga redevelopment; and Cree and Inuit Indian relocation.

^{97.} See infra notes 98-123 and accompanying text.

^{98.} Hydro-Quebec interview, supra note 7.

^{99.} Land is being reclaimed at an alarming rate which is leading to the rampant destruction of trees. The carbon dioxide that trees absorb and the oxygen that they emit is integral to sustaining human and animal life. New York interview, *supra* note 93.

^{100.} Hydro-Quebec interview, supra note 7.

^{101.} Id. Additionally, this will affect the fishing industry of the Ste-Anne-De-La-Peradi region economically. Id.

^{102.} Id. In fact, economists in the region estimate that the continued disappearance of the poulamon will cost the local economy approximately \$3 million in lost revenues, not to mention that the poulamon is a staple in the diet of the people of the Ste-Anne-De-La-Peradi region during the winter months. Id.

^{103.} New York interview, supra note 93.

^{104.} Id. The mass deaths of a species which is already not of a significant population to sustain an adequate ecological balance were a result of diverted river systems in the Alaska area. Id.

^{105.} Hydro-Quebec interview, *supra* note 7. 106. *Id*.

the cable easement is unpopulated by people¹⁰⁷ and, thus, there are no households to complain of nearby, unsightly wires. Fortunately for environmentalists, this is the precise reason there has been a growing uproar in communities such as the ones surrounding Grondines, Quebec.¹⁰⁸ The Grondine region is described as "breathtakingly pure,"¹⁰⁹ but Hydro-Quebec has planned to build generating towers and lines close enough to the area that they detract from this region's natural beauty.¹¹⁰ Additionally, Hydro-Quebec has planned to run its lines across Orlean's Island, an island ripe with seventeenth century architecture.¹¹¹ The aesthetic ramifications of this choice of cable locale has caused the Orlean's Island site to become a "hot issue."¹¹²

Finally, two more visibly global environmental consequences are in question: ice movement and water temperature increase.¹¹³ Although both dangers have been addressed by Hydro-Quebec and the New York Power Authority, their analyses have been cursory. With river diversion and damming, there will be changes in water flow.¹¹⁴ Will the damming of the La Grande River and St. James Bay result in changes in water temperatures? What effects will an increased water temperature have upon sea life? These questions and others need to be answered *before* the contract process, not after line electrification.¹¹⁵

2. The Consequences of Hydro-Quebec on Humans.—As mentioned above, the Cree and Inuit Indians will be drastically affected by the Hydro-Quebec project.¹¹⁶ But new scientific evidence posits that anyone living near the Hydro-Quebec - NYPA cables may also be affected — studies show an increase in cancer.¹¹⁷ The New York report has buttressed the hypothesis that there is an association between residential exposure to magnetic fields, like those in-

113. Id. Changes of this magnitude may cause some of the most catastrophic dilemmas in current history; for example, the flooding of the Great Lakes.

^{107.} Id. Few, if any, roadways were even in use in this area. Id.

^{108.} Id.

^{109.} Id.

^{110.} Id. This is one area, but there are several more like it in Quebec which will be subject to the same derogation of aesthetic appeal. Id.

^{111.} Id. Even Hydro-Quebec executives feel that this island should not have been so burdened. Id.

^{112.} Id. Accordingly, this author submits that aesthetics are no longer a secondary consideration, but instead, now constitute a valid cause for discontent.

^{114.} Hydro-Quebec, Taming, supra note 23, at 4.

^{115.} Hydro-Quebec interview, *supra* note 7. The source raised these questions to which researchers at Hydro-Quebec have no firm answers. *Id.* The source believes that studies are being initiated at Hydro-Quebec, but they will not be completed until after line construction is concluded. *Id.*

^{116.} See supra note 37.

^{117.} BIOLOGICAL EFFECTS, *supra* note 12. Note that this report was issued subsequent to the Hydro-Quebec - NYPA contract.
volved in energy transfer, and incidence of cancer in children and adults.¹¹⁸ The New York group examining this phenomenon found a positive correlation between distribution line wiring and increased cancer risk,¹¹⁹ specifically citing, *inter alia*, leukemia and brain tumors.¹²⁰ Additionally, the study postulates that there are a variety of behavioral and nervous system effects that may temporarily impact human function.¹²¹

The results of this study are not dispositive, yet they do afford great weight in conjunction with testimony of experts in *Houston Lighting & Power* who proffered similar consequences of exposure.¹²² On appeal, the New York study may change the result of the damages issue in *Houston Lighting*. Regardless of the final determination in *Houston Lighting*, the queries that the New York study raises must be analyzed and answered, for catastrophic results may occur without haste. Indeed, irrespective of the effect on humans, a power line of this magnitude will most certainly have deleterious impact upon animal and plant life.¹²³

V. Hydro-Quebec - NYPA and International Law and Policy

This contract between Hydro-Quebec and the New York Power Authority violates doctrines and resolutions on three levels—multilateral agreements, such as the Charter of Economic Rights and Duties of States¹²⁴ and the 1972 Declaration on the Human Environment;¹²⁵ bilateral treaties, such as the Great Lakes Water Quality Agreement;¹²⁶ and agreements specifically respecting nature, namely, the World Charter for Nature.¹²⁷ In addition to the

123. Albeit this is the author's own theory, but examination of this problem from a common-sense standpoint must result in the proposed conclusion.

124. Charter of Economic Rights and Duties of States, U.N. Doc. A/Res 3281 (XXIX) (1975) reprinted in 17 I.L.M. 251 (1975) [hereinafter Charter of Economic Rights].

125. 1972 Declaration on the Human Environment, supra note 80.

127. Resolution on a World Charter for Nature, U.N. Doc. A/Res. 37/7 (1982) [here-inafter World Charter for Nature].

^{118.} Id. at 9. The initial study which came to this conclusion was completed in Denver, Colorado. The New York study expounded upon the Denver results.

^{119.} Id. at 9-10, 72-86. Distribution line wiring simply describes low voltage overhead electrical wires.

^{120.} Id. at 10, 72-86.

^{121.} Id. at 10, 95-125. The New York panel reported several findings: increased proliferation of cancer cells in agar; alterations of intracellular calcium concentrations; significant decreases in the concentration of two neuro-transmitter metabolities in cerebral spinal fluid; increased susceptibility to seizures in rodents; aberrations in the circadian rhythms in squirrel monkeys; behavior alterations of rats exposed to electricity *in utero* and during first days of life; and lengthened cardiac interbeat interval in humans. See generally id.

^{122.} Houston Lighting, *supra* note 60. Dr. Nancy Wertheimer, an epidemiologist, testified that studies show a correlation between power lines and cancer; further, children living near electrified wires are two to three times more likely to get cancer than children who do not. *Id.*

^{126.} Great Lakes Water Quality Agreement, Apr. 15, 1972, U.S.-Canada 23 U.S.T. 302, T.I.A.S. No. 7312 reprinted in 11 I.L.M. 694 (1972) [hereinafter Great Lakes].

formal abridgments mentioned above, the activities between Hydro-Quebec and the NYPA are in derogation of international environmental common law, itself a mystical term of art.¹²⁸

A. Multilateral Melee

Two of the most fundamental global pacts are the Charter for Economic Rights¹²⁹ and the 1972 Declaration on the Human Environment.¹³⁰ The Charter of Economic Rights, though not promulgated specifically for the benefit of the environment, posits two considerations that must be evaluated prior to any international or national economic development.¹³¹ The Preamble of the Charter establishes that the document is "[D]esirous of contributing to the creation of conditions for . . . [t]he protection, preservation and enhancement of the environment."¹³² From this underlying principle, it can be inferred that economic development which fails to protect or preserve the environment is contrary to the United Nations' goals and, thus, should not be internationally condoned.

The language chosen in Article 30 of the Charter is more expansive and persuasive as doctrine.¹³³ Article 30 dictates that:

The protection, preservation and enhancement of the environment for the present and future generations is the responsibility of all States. All States shall endeavor to establish their own environmental and developmental policies . . . All States have the responsibility to ensure that activities within their jurisdictions or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. All States should cooperate in evolving international norms and regulations in the field of the environment.¹³⁴

The land and water development plan of Hydro-Quebec - NYPA must comply with the tenet of this mandate. To date, Hydro-Quebec's massive deforestation and animal displacement, not to mention the untold effects of its hydroelectricity on animals and plants, is in direct conflict with the basic components of the Charter for Economic Rights.¹³⁵ This is not, however, Hydro-Quebec - NYPA's only

^{128.} See infra notes 163-64 and accompanying text. Although international law, per se, does not yet exist on the hazards of electrical power and international duty, much of this material can be analogized to the Hydro-Quebec scenario.

^{129.} Charter of Economic Rights, supra note 124.

^{130. 1972} Declaration on the Human Environment, supra note 83.

^{131.} Charter of Economic Rights, supra note 124, Preamble (f), Art. 30.

^{132.} Charter of Economic Rights, supra note 124, Preamble (f).

^{133.} See generally Charter of Economic Rights, supra note 124, Art. 30.

^{134.} Id.

^{135.} In fact, the hydropower development initiated in Brazil and India as discussed earlier in this Comment also typify developed countries' exploitation of the environment in developing nations. *See supra* notes 52-60.

transgression in international policy.¹³⁶

The first environmentally protective international policy remains at the cornerstone of international environmental law.¹³⁷ The 1972 Declaration on the Human Environment proclaimed that "[t]he protection and improvement of the human environment is . . . the duty of all government[s]."¹³⁸ The Declaration is borne of the Corfu and Trail Smelter decisions by the International Court of Justice.¹³⁹ for the Declaration stipulates that responsibility be accepted by all those who transgress the environmental goals of this document.¹⁴⁰

Undoubtedly, the most oft-quoted passage of the Declaration is Principle 21,¹⁴¹ which reads:

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.142

The unifying concept expounded by this Principle is essentially: If one country destroys resources, it must be certain all effects stay within its legal jurisdictional boundaries.¹⁴³ Hydro-Quebec and the New York Power Authority may breach this tenet for, irrespective of caribou or tommy cod migration, the potential impact of shifting ice, raising water temperature, increased incidence of cancers, and regional deforestation¹⁴⁴ constitute ". . . activities [which] . . . cause damage to the environment of other States "145

Finally, Principle 18 of the Declaration urges that "[s]cience and technology, as part of their contribution to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind."146 Indeed, the alliance between Hydro-Quebec and the New York Power Authority is far from searching for solutions to environmental problems but, in-

^{136.} See, e.g., 1972 Declaration on the Human Environment, supra note 83 (specifically Principle 21).

^{137.} Id.

^{138.} Id. at Proclamation 2.

^{139.} See supra notes 64-65.

^{140. 1972} Declaration on the Human Environment, supra note 83, at Proclamation 7.

^{141.} Id. at Principle 21. 142. Id.

^{143.} Id.

^{144.} See supra notes 33-37 and 96-123.

^{145. 1972} Declaration on the Human Environment, supra note 83, Principle 21.

^{146. 1972} Declaration on the Human Environment, supra note 83, Principle 18. Although broad in scope, the key to Principle 18 with respect to the Hydro-Quebec - NYPA agreement is: ". . . identification, avoidance, and control of environmental risks" Id.

stead, seems to be perpetrating ecological disaster. Consequently, two major multinational agreements have been disregarded by Hydro-Quebec and the NYPA, and furthermore these two parties' infractions do not end here.

B. Bilateral Breach

In 1972, the United States signed a bilateral treaty with Canada which addressed the deterioration of the Great Lakes river system.¹⁴⁷ Concerned with preventing further pollution, the two countries signed the Great Lakes Water Quality Agreement¹⁴⁸ just prior to the 1972 Declaration Conference in Stockholm.¹⁴⁹ Thus, the Agreement came at a time of global concern over environmental issues.¹⁵⁰ The Great Lakes Agreement had an even broader significance than initially believed.¹⁵¹ As a general water quality provision, the Agreement requires that the system be "[f]ree from substances entering the waters as a result of human activity in concentrations that are . . . harmful to human, animal or aquatic life."¹⁵² Certainly, the rerouting, draining, and filling of the rivers which constitute part of the Great Lakes System should fall under this provision in addition to the possibilities for water temperature increase at the dam site and underwater cable crossings.¹⁵³ Both Quebec and the United States will breach the Great Lakes Water Quality Agreement if the cable system is electrified.

C. The Disaffirmance of the World Charter for Nature

A final document which the Hydro-Quebec - NYPA contract sidesteps is the World Charter for Nature.¹⁵⁴ Throughout its text, the World Charter for Nature recognizes the need for workable measures at both national and international levels to protect nature.¹⁵⁵ In particular, the World Charter is "[P]ersuaded that: . . . [L]asting benefits from nature depend upon the maintenance of es-

^{147.} Great Lakes, supra note 126.

^{148.} Id. One of the stated purposes is to prevent "further pollution of the Great Lakes System owing to continuing population growth, resources development and increasing use of water; . . . " Id.

^{149.} Id. The Agreement was entered into force April 15, 1972. Id.

^{150.} Bilder, Controlling Great Lakes Pollution: A Study in United States-Canadian Environmental Cooperation in LAW, INSTITUTIONS & THE GLOBAL ENVIRONMENT 294 (J.L. Hargrove ed. 1972) [hereinafter Bilder].

^{151.} Id.

^{152.} Great Lakes, supra note 126, Art. II(d).

^{153.} Hydro-Quebec interview, *supra* note 7. Studies are currently being completed, albeit retrospectively, on the actual temperature increases involved in running the cables under the St. Lawrence River.

^{154.} World Charter for Nature, *supra* note 127. Here it is important to note that the U.S. was the only country of 112 voting members that disfavored adoption of the World Charter. *Id.*

^{155.} See generally id.

sential ecological processes and life-support systems and upon the diversity of life forms, which are jeopardized through excessive exploitation and habitat destruction by man."¹⁵⁶ The Charter additionally propounds that "[E]cosystems and organisms, as well as land, marine, and atmospheric resources that are utilized by man, shall be managed to achieve and maintain *optimum sustainable pro-ductivity*, but not in such a way as to endanger the integrity of those other ecosystems or species with which they coexist."¹⁵⁷ Finally, the World Charter for Nature condemns activities likely to cause irreversible damage to nature¹⁵⁸ or activities which pose a significant risk to nature.¹⁵⁹

Although precious little has been written on the implementation of these principles, they do appear facially simple and easily understood. In essence, the United States and Canada have infringed upon both the letter and the spirit of the World Charter. Hydro-Quebec and the New York Power Authority have exploited the environment and currently are destroying the natural habitat of the tommy cod and caribou;¹⁶⁰ they will fail to foster "optimum sustainable productivity" for either species;¹⁶¹ and they have reaped wholesale changes in the environment that will, indeed, be irreversible.¹⁶² As a result, the World Charter for Nature has become another powerless document issued by the United Nations.

With respect to Hydro-Quebec and the New York Power Authority's violations of the four above-cited legal agreements, it is not mystery why international environmental law is an ineffective tool for dispute resolution. Critics of international law say that international law does not exist, for the international world will always lack the vision necessary to promulgate enforceable and effective standards.¹⁶³ Therefore, it is clear that changes are needed in this system in an effort to create a more ecologically-respecting international community.¹⁶⁴

162. See supra note 32-36.

163. See generally Carroll, On Living Together in North America, 12 DEN. J. INT'L L. & POL'Y 35 (1982-1983) [hereinafter Carroll]; But cf. Judge Phillip Jessup's rallying cry that the concept of transnational concerns and law is "all the law which regulates action or events that transcend national frontiers . . . [it] includes both civil and criminal aspects . . . and . . . both public and private international law" P.C. Jessup, Transnational Law (Storrs Lectures on Jurisprudence, 1956).

164. See generally Carroll, supra note 163.

^{156.} Id. at ANNEX.

^{157.} Id. at General Principles 4 (emphasis added).

^{158.} Id. at General Principles 11(a).

^{159.} Id. at General Principles 11(b).

^{160.} See supra notes 100-105.

^{161.} Id.

VI. Changes Needed in International Environmental Law

Theorists have proffered several hypotheses as to what will cure international apathy concerning the environment.¹⁶⁵ These theories range from changes in implementation¹⁶⁶ to changes in pre-construction evaluation,¹⁶⁷ to changes in ideological thought.¹⁶⁸ Viable alternatives to the current global state of affairs concerning effective international environmental law may be exacted from these postulations, whether one course of action or all three methods of transformation are selected.

A. Implementation Modification

In 1985, Canadian lawmakers contemplated an environmental pollution control which would create criminal liability in the event of a breach of this obligation.¹⁶⁹ Perhaps this suggestion should be implemented internationally, creating a cause of action for global crimes against the environment. Some would view this measure as excessive,¹⁷⁰ but it may well be the only way in which to change current thought, or lack thereof, about international pollution.

Former Chairman of the United States section of the International Court of Justice, Robert Sugarman, sees the problem as lying in implementation at the judicial level.¹⁷¹ Sugarman confesses that the International Court of Justice (ICJ) is to blame in part, as its scope is broad, but its depth is shallow,¹⁷² thus affording only limited remedies in water-related controversies.¹⁷³ "The ICJ has no direct authority to either implement or enforce its recommendations,"¹⁷⁴ and this has become a major problem of international cooperation in

169. Prabhu, supra note 166 at 14. As of November, 1987, the Canadian proposition has yet to be adopted.

170. Id. at 15.

172. Id. at 48-49.

173. Id. at 49, 53.

^{165.} See infra notes 166-84.

^{166.} Bilder, supra notes 150; Sugarman, supra note 70; see generally Prabhu, Canada's Proposed Legislation on Crimes Against the Environment, 28 ENV'T June 1986, at 14 [hereinafter Prabhu].

^{167.} Somers, Transboundary Pollution and Environmental Health, 29 Env't June 1987, at 6 [hereinafter Somers].

^{168.} J. Roberts, Transboundary Pollution: Canada's Concerns and Expectations, address at conference held at Banff, Alberta, Canada, March 19-21, 1981, reprinted in Canadian Bar Association, Environmental Law Section, COMMON BOUNDARY/COMMON PROBLEMS: THE ENVIRONMENTAL CONSEQUENCES OF ENERGY PRODUCTION, 10-14 (1982) [hereinafter Roberts]; Chananie, Reverence for Life and Rights for Nature 3 PACE L.R. 689 (1982-1983) [hereinafter Chananie].

^{171.} See generally Sugarman, supra note 70. Sugarman continues to view the ICJ as effective but still lacking in enforcement power.

^{174.} Bilder, supra note 150 at 388. "There is no obligation upon either government to actually implement the Commission's recommendations, even if approved, and their subsequent impact is hard to determine." *Id.*

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the environmental field.¹⁷⁵ The power of this tribunal is essentially emasculated; without a clear granting of additional powers, perhaps by resolution, the viability of the ICJ is suspect.

B. Phasing Out Ad Hoc Decision-making

The majority of environmental disputes between the United States and Canada are currently resolved on an *ad hoc* basis.¹⁷⁶ Although an *ad hoc* dispute resolution does provide flexibility in the decision-making process,¹⁷⁷ the major complaint regarding *ad hoc* evaluation is unpredictability of future concerns.¹⁷⁸ Theorists shun this *ad hoc* approach and instead rely upon international accord.¹⁷⁹ They posit that the decision-making should be completed before a dilemma can arise.¹⁸⁰ Briefly, the three-part tier of the international accord requires parties to: evaluate the nature and size of the pollution potential; estimate the risks involved; and set up international programs for risk management.¹⁸¹ Thus, the accord will enable international leaders to initiate a particular strategy for pollution and environmental damage before the affecting events transpire.

C. Change in Thought about the Environment

As citizens of the world we must rid ourselves of the thought that nature is somehow inferior to man and separate from man.¹⁸² This homocentric—or human-centered—attitude is founded on a vision that nature exists solely for the benefit of man, and nature has no inherent worth in and of itself.¹⁸³ People must understand that single actions, such as constructing a hydroelectric dam and laying hundreds of miles of cables can cause irreparable harm to the environment. Man's incessant upset of the balance of nature creates ever-increasing dangers to his own well-being.¹⁸⁴ Perhaps international re-education about the importance of the environment to sustained human life will disengage man from his homocentric view of the world. The promulgation of homocentric dogma must end if the citizens of the world are to respect the international environment.

^{175.} Id.

^{176.} Carroll, supra note 163, at 35. Ad hoc decision-making refers to results which are fashioned from "whatever is immediately available." WEBSTER'S NINTH NEW COLLEGIATE DICTIONARY 56 (9th ed. 1987).

^{177.} Id. at 40-41. This is the classic reason offered for ad hoc dispute resolution. See id.

^{178.} Id. at 41.

^{179.} Somers, supra note 167, at 7.

^{180.} Id. at 32. One may also find fault with this rationale for it requires those signing the accord to be soothsayers and accurate predictors of future environmental harm.

^{181.} Id.

^{182.} Chananie, supra note 168, at 691.

^{183.} Id. at 689.

^{184.} Id. at 704.

VII. Conclusion

By the mid-1990s, Hydro-Quebec will provide huge quantities of electricity to energy-hungry New Yorkers. The costs to the environment will be substantial: deforestation, animal deaths and forced migration, aesthetic ruin, increased risks of cancer, possible ice shifts, and higher water temperatures in the northern latitudes. Who will be responsible for these costs? In theory, the international doctrine of responsibility would hold Hydro-Quebec and the New York Power Authority culpable, but with the gradual derogation of international environmental law, it is likely that no entity will be held accountable.

Changes are needed in this system if humanity is to survive. Indeed, once the environment has been affected by a project such as this, postscriptive measures will be inadequate. Accordingly, societies of the world must, in unison, voice their concern in an effort to effectuate useful international environmental law. Without this awareness, companies such as Hydro-Quebec have a *de facto* license to destroy the ecological system upon which our lives depend. Further study must be taken and analyzed *before* a project such as the Hydro-Quebec - New York Power Authority contract is initiated. For once ravaged, the environment will never be the same.

Ian Mark Paregol

United Nations calls for methyl mercury mitigation at Muskrat Falls

David Maher (david.maher@thetelegram.com) **Published:** Jun 07, 2019 at 9:15 p.m.

UN special envoy on human rights calls on federal government to review methylmercury mitigation efforts

ST. JOHN'S, N.L. — The United Nations has called on the federal government to "prevent the release of methylmercury" at Muskrat Falls.

Baskut Tunach, the United Nations special rapporteur on human rights and hazardous substances and wastes, was in Canada from May 24 to June 6, and issued a wide-ranging statement on Indigenous people and their treatment by public bodies in the country.

Muskrat Falls gets a specific mention by Tunach, who spoke with land and river protectors during his visit:

"Concerns were raised regarding the absence of meaningful consultation afforded to two affected First Nations, the risk of methylmercury releases contaminating traditional foods and impacting health, the unaddressed risk of dam failure and the flooding of sites containing toxic military waste," wrote Tunach.

"It was alleged that the vast majority of the affected community would either suffer from extreme food insecurity or be forced to eat contaminated food if the dam is constructed without proper clearance of the reservoir. I urge the federal government to use its leverage as the largest investor in the project to review whether UNDRIP compatible procedures were followed for all affected Indigenous peoples, and to prevent the release of methylmercury."

UNDRIP refers to the UN declaration on the Rights of Indigenous Peoples.

Roberta Frampton Benefiel, of the Grand Riverkeepers, says the statement from the United Nations means a lot to those concerned about risks associated with methylmercury.

"My first thought: thank god, someone is finally listening. We wouldn't have had to go to the United Nations if we had anyone in this territory representing us or anyone in St. John's representing aboriginal concerns – or anyone in Ottawa, for that matter," said Benefiel.

Α

"For me, the methylmercury issue, it seems to government – both the federal and provincial – that it's just the cost of doing business. To them, it's like nothing."

Methylmercury is the major source of naturally occurring mercury, but can be toxic if left to accumulate in the environment. In hydroelectric reservoirs, methylmercury is released by organic material left to rot underwater, particularly from submerged soil.

Benefiel says losing access to wild food downstream of Muskrat Falls, in the event of food consumption advisories, amounts to a cultural genocide.

"What are we doing to Indigenous people's livelihoods? They get together and go out on the ice to fish for salmon and trout, they do that in the spring to get out on the ice for seal meat," said Benefiel.

"What they're doing is destroying a part of the culture. It's like when the residential schools took the kids away from their parents and forced them to speak English instead of their own language. It's a cultural genocide. Taking them off the food source that makes them who they are and who they've been for centuries is another form."

In late October 2016, Premier and Labrador and Indigenous Affairs Minister Dwight Ball held a marathon meeting with Indigenous leaders that resulted in an agreement to appoint an independent experts advisory committee to provide oversight for the project, specifically the methylmercury issue.

In April 2018, the Independent Experts Advisory Committee gave four recommendations to the provincial government. The fourth point addressed methylmercury directly: "The IEAC recommends that Nalcor Energy undertake targeted removal of soil and capping of wetlands in the future reservoir area before impoundment."

Only three of the four Indigenous groups agreed to the measure. The Nunatsiavut Government, Nunatukavut Community Council, Innu Nation, and affected municipalities agreed with capping wetlands in the area, while the Innu Nation disagreed on targeted removal of soil.

In a statement from the Office of the Premier, Ball says the government has been trying to arrange a meeting with Indigenous leaders to discuss soil removal and wetland capping, after weather and schedule issues thwarted earlier attempts at a meeting. The meeting will take place next week.

"With respect to progress to date, water monitoring has been in place for almost three years, and has shown that methylmercury levels have at no time represented a risk to public health. The current monitoring regime was agreed upon by all parties and applauded by the IEAC for its design. Since then, over 1,200 tests for methylmercury levels in the reservoir, downstream, and in Lake Melville have been conducted," reads the statement.

"Government agrees with the Indigenous groups on the importance of continued monitoring."

The Premier's Office statement goes on to affirm the safety of the water and country food in the downstream area of Muskrat Falls.

"The IEAC also did valuable work in confirming that current practices relating to the consumption of country foods and water are safe," reads the statement.

United Nations calls for methyl mercury mitigation at Muskrat Falls | Local | News | The Telegram

"As a condition of release from the environmental assessment process, the province required the production of a human health risk assessment by Nalcor. Upon acceptance, the province directed that compensation will be provided if consumption advisories are ever issued."

The federal government is expected to speak on the matter on Monday.

Also on Monday, a protest in favour of mitigating methylmercury at Muskrat Falls will happen as the House of Assembly opens for the first time after the 2019 general election.

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Nfld. & Labrador

Broken promise: Nunatsiavut president, premier clash over Muskrat Falls water levels

Dwight Ball, Nalcor say engineers were concerned about erosion after water levels lowered

Geoff Bartlett · CBC News · Posted: Sep 19, 2017 1:02 PM NT | Last Updated: September 19, 2017



Johannes Lampe, president of the Nunatsiavut government, says a promise was made to lower water levels in the Muskrat Falls reservoir but the commitment was not honoured. (Katie Breen/CBC)

The president of Nunatsiavut says the Newfoundland and Labrador government is breaking a promise made to end hunger strikes against the Muskrat Falls hydroelectric project last fall.

"The commitments made are not being honoured," Johannes Lampe told CBC Television's *Here* & *Now.*

Lampe said Crown energy corporation Nalcor was supposed to lower water levels in the reservoir this spring, something he said Premier Dwight Ball promised following an all-night meeting in October to address protests over methylmercury contamination.

• N.L. government, Labrador leaders make 'significant' Muskrat Falls progress

"We have always said that the only way measures or research can be done is when the water levels are lowered," Lampe told CBC's *Labrador Morning* on Tuesday. "So with the water levels high we cannot do that."



In October 2016, Premier Dwight Ball and aboriginal leaders announced an agreement to end protests — including hunger strikes — at Muskrat Falls. (CBC)

In a statement Tuesday, Nalcor said it lowered water levels from 22.5 metres to 20.3 metres in June, but did not go further when engineers expressed concern that some of the reservoir banks were eroding.

The company said it did not lower the water level further "in the interest of public safety." It noted that the average water level in the reservoir during spring conditions is 20 metres.

Nalcor said in its statement that about 40 hectares of trees were cleared from the reservoir over the summer. Protesters had asked for clearcutting to remove vegetation that might decompose and push mercury levels up.

Everyone in the loop

Both Ball and Nalcor said all stakeholders, including Nunatsiavut, had been kept informed about decisions made on water levels.

"In light of our efforts to ensure the Nunatsiavut government is fully engaged, it is disappointing that they are calling our commitment to partnership into question," Ball wrote in a statement issued Monday night.



In a statement to media, Premier Dwight Ball says the Nunatsiavut government has been fully in the loop through the entire decision-making process when it comes to water levels at the Muskrat Falls resevoir. (John Pike/CBC)

Lampe said the slope erosion issue was raised only this summer, and said the premier needs to do a better job of explaining, especially if there are possible health and safety risks.

"The premier is supposed to be the first to know about any risks or any other factors that concern the Muskrat Falls project," he said.



Nalcor says when it lowered water levels in the Muskrat Falls reservoir in June, engineers expressed concern about erosion. (Nalcor)

Ball said an independent committee has been asked to review the latest engineering reports on the impact of flooding. He said Nunatsiavut, along with other stakeholders, will be updated every step of the way.

"The leadership of the Nunatsiavut government have been engaged in an open and transparent matter on all issues surrounding the Muskrat Falls project," he wrote.

Nalcor, meanwhile, said it met with the advisory committee Sept. 8 and is awaiting further guidance about what other mitigation measures are required.

With files from Labrador Morning

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COMMENTARY NO. 528

Dammed If You Do: How Sunk Costs Are Dragging Canadian Electricity Ratepayers Underwater

Canada has three mega-projects underway to generate hydroelectricity. But a comparison of their costs relative to the alternatives raises the question of whether it's time to pull the plug on them.

A.J. Goulding with research support from Jarome Leslie

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V) aniel Schware

Daniel Schwanen Vice President, Research

The Study In Brief

The push towards renewable energy sources has prompted major investments in mega-projects to generate hydroelectricity. However, government decisions to make such large investments in generating capacity must be scrutinized for economic soundness – particularly relative to the costs of alternatives for producing this power.

Canada has several large hydroelectricity projects presently under construction including three that are the subject of this paper: Site C on the Peace River in northern British Columbia, Keeyask on the Nelson River in Manitoba, and Muskrat Falls on the Churchill River in Labrador. Each of these projects represents a multi-billion dollar upfront investment by public entities in long-lived generation capacity.

This study examines the cost-effectiveness of these hydro projects by comparing the costs of equivalent generation from carbon cost adjusted combined cycle natural gas turbines (CCGT). The analysis demonstrates that the levelized costs from the Site C and Keeyask projects may exceed the costs of alternative CCGT generation. The study notes that risks of building large generation capacity in anticipation of uncertain future demand for electricity and contends that, relative to large hydro projects, the roll-out of CCGT generation can be more flexibly timed (and paired with environmental initiatives) to meet demand as it materializes.

Even building-in the likely costs of cancellation, the author concludes that present economics would favour cancelling Site C and Keeyask and replacing the respective capacity with equivalent dispatchable CCGT generation capacity. The study shows that replacing Site C or Keeyask with equivalent CCGT capacity is cost effective even when applying a lower discount rate.

While an emphasis on renewables generation has motivated these major hydroelectric projects, the analysis shows that Site C exceeds the levelized cost of a CCGT alternative that faces a \$50/tonne carbon price. Moreover, drawing from results in recent renewable energy procurement, the study observes that wind generation can provide a much lower levelized cost of zero-emission electricity than such large-scale hydro projects.

This study concludes by recommending that provinces re-examine the economics of these projects and consider cancelling projects which have more cost effective alternatives. To avoid uneconomic projects in the future, the report also recommends strengthening institutional independence – in particular, by ensuring independent regulatory review for mega-projects and leveraging greater private-sector discipline for the design and delivery of major electricity projects.

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Several large-scale Canadian hydro projects now under construction face significant cost overruns and will potentially be uneconomic for decades if completed.

While cancellation of one or more of these projects may be the best choice economically, political calculations make termination difficult. To prevent such mistakes in the future, provinces need to strengthen independent, apolitical regulatory and market institutions, adopt a more rigorous analytical process in evaluating such large-scale projects and expand the role of the private sector in risk-sharing, project ownership and delivery. This *Commentary* demonstrates that a combination of dispatchable (on demand) and non-dispatchable energy sources procured in smaller sizes closer to the period of demonstrated need, would be more cost-effective.

We begin with an overview of the current status of three large hydro projects, then describe how sunk costs need to be a major factor in decisionmaking. This discussion is followed by an examination of the project-completion levelized cost of energy (LCOE)¹ vis-à-vis replacement with natural-gas fired resources. It also examines the case for project deferral due to delays in actual power needs. Finally, we address the common arguments of project proponents and make policy recommendations to prevent these costly mistakes.

SEVERAL POTENTIALLY UNECONOMIC PROJECTS ARE CURRENTLY UNDER CONSTRUCTION

Three large-scale Canadian power-sector projects currently under construction stand out for their potentially poor economic prospects. These include the Site C project in British Columbia, the Keeyask project in Manitoba, and Muskrat Falls in Newfoundland and Labrador. Others under construction or proposed projects may face financial challenges as well.

Site C: The Site C Clean Energy Project, owned and operated by BC Hydro, will include a dam and a 1,132 megawatt (MW) hydroelectric generating station on the Peace River in the northeast of the province.² The project will join an existing river system consisting of the W.A.C. Bennett Dam and Peace Canyon Dam. Construction on Site C commenced in July 2015, with total expenditures amounting to \$2.1 billion, approximately 25 percent of the original budget as of December 2017.³ However, latest estimates place projected total costs at \$10.7 billion with an expected completion date of

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¹ The LCOE is an industry-accepted measure for detailed analysis and decisionmaking that represents price for plant output that, over the plant's life, will be sufficient to provide owners with a return on their capital while covering all operating costs.

² BC Hydro. Reply Submission 2017. Table B-3-2"Project Overview." *Site C.* https://www.sitecproject.com/about-site-c/project-overview.

³ BC Hydro. Site C Clean Energy Project – Annual Progress Report No. 2. March 2018.

Table 1: List of Acronyms			
Acronym	Definition		
AEO	Annual Energy Outlook		
AESO	Alberta Electric System Operator		
BC	British Columbia		
BC Hydro	British Columbia Hydro and Power Authority		
BCUC	British Columbia Utilities Commission		
CAD	Canadian Dollar		
Cal-ISO	California Independent System Operator		
CCGT	Combined cycle gas turbine		
CEC	California Energy Commission		
CONE	Cost of New Entry		
CPCN	Certificate of Public Convenience and Necessity		
CPUC	California Public Utilities Commission		
EIA	Energy Information Administration		
EIM	Energy Imbalance Market		
EV	Electric vehicle		
GWh	Gigawatt hour		
HVDC	High Voltage Direct Current		
ICAP	Installed capacity		
IESO	Independent Electricity System Operator		
IRENA	International Renewable Energy Agency		

2024 – up from \$7.9 billion and 2020, respectively, as initially forecasted in 2010.^{4, 5,6}

Meanwhile, BC Hydro forecasts a need for new capacity by 2023 in tandem with a need for new energy by 2028.⁷ Should the project be axed, the termination and site remediation costs are estimated to be \$1.8 billion.⁸

Acronym	Definition
IPP	Independent power producer
ISO	Independent System Operator
ISO-NE	ISO New England
ITMO	Internationally transferred mitigation outcome
kW	Kilowatts
LCOE	Levelized cost of energy
LEI	London Economics International
MB	Manitoba
MH	Manitoba Hydro
MPUB	Manitoba Public Utilities Board
MISO	Minnesota Independent System Operator
MW	Megawatt
MWh	Megawatt hour
NL	Newfoundland and Labrador
NL Hydro	Newfoundland and Labrador Hydro
O&M	Operations & maintenance
OIC	Order-in-Council
PPA	Power Purchase Agreement
USD	US Dollar
WACC	Weighted average cost of capital

Keeyask: The Keeyask Project, a 695-MW hydroelectric generating station, will be located on the Nelson River, 725 kilometres north of Winnipeg. The project is being developed by the Keeyask Hydropower Limited Partnership, led by Manitoba Hydro and four Manitoba First Nations.⁹ Since construction commenced in July 2014, expenditures have totaled \$4.2 billion, nearly

4 Ibid.

- 5 BC Hydro. Site C Capital Cost Estimate. 2014.
- 6 "Province announces Site C Clean Energy Project." *Site C.*
- 7 BC Hydro. BC Hydro Reply Submission. 2017. (p. 15)

9 "Keeyask Generating Station." Manitoba Hydro.

⁸ British Columbia Utilities Commission. British Columbia Utilities Commission Inquiry Respecting Site C: Executive Summary of the Final Report to the Government of British Columbia. November 2017. (p. 3)

Figure 1: Selected Large Hydro Projects



half of the target budget as of December 2017.^{10,11} However, the latest projected total costs are some \$8.7 billion, with a completion date of August 2021, compared to \$5.6 billion and 2019, respectively, as forecasted in 2011).^{12,13}

Recent load forecasts indicate no need for new

generation for domestic load before approximately 2033.¹⁴ Based on a 2017 Manitoba Hydro analysis, estimated cancellation costs of Keeyask were approximately \$1.35 billion.¹⁵

Muskrat Falls: Nalcor Energy's Muskrat Falls

¹⁰ Keeyask Hydropower Limited Partnership. Construction Begins on Keeyask Generating Station. July 2014.

¹¹ Manitoba Hydro. Manitoba Hydro 2017/18 & 2018/19 General Rate Application: GSS-GSM/MH I-3a-c. September 2017. (p. 5)

¹² Keeyask Hydropower Limited Partnership. Control Budget for Keeyask Generating Station Revised 2017. March 2017.

¹³ Keeyask Hydropower Limited Partnership. \$5.6 Billion Keeyask Generating Station Announced. June 2011.

¹⁴ Keeyask Hydropower Limited Partnership. Control Budget for Keeyask Generating Station Revised 2017.

¹⁵ Cancellation costs include Manitoba Hydro costs associated with managing the ramifications resulting from cancelling the project such as demobilization and salvage, short-term employee contract buyouts, breakage fees from various contracts, site and environmental remediation, long term environmental monitoring, interest and escalation. See Manitoba Hydro. *Manitoba Hydro 2017/18 & 2018/19 General Rate Application: GSS/GSM/MH I-4*. September 2017(p. 6).

Project, located in Labrador's interior, will include an 824-MW hydroelectric generating facility, approximately 1,600 kilometres of transmission lines across the province and an additional transmission line connecting Newfoundland and Labrador.¹⁶ While construction on the project began in 2013, it was 88 percent complete as of November 2017, at which point total expenditures amounted to \$8.1 billion or approximately 64 percent of the target budget.¹⁷ Following numerous budget revisions, the latest projected total cost is \$12.7 billion, with the project expected to generate first power by 2019, compared to \$6.2 billion and 2017, respectively, as predicted in 2012.^{18,19,20}

Newfoundland and Labrador Hydro load projections have deteriorated substantially since the project was approved in 2012. In that year, load expectations in 2020 were in excess of seven terawatt hours (TWh) but, as of May 2016, that level is not expected until 2036.²¹

To date, termination costs have not been quantified. According to Nalcor CEO Stan Marshall, "the costs were so high, and the consequences so painful, that such an undertaking wasn't even worth" his time.²² Concerned about the monumental cost overruns, the Newfoundland and Labrador government commissioned an inquiry in November 2017 but did not explicitly state cancellation costs as an item to be considered in their Terms of Reference. At time of writing this *Commentary*, the inquiry was set to be completed on or before December 31, 2019.²³ For our part, we have calculated cancellation costs for Muskrat at \$1.47 billion, based on the estimated average cancellation cost per kW of Site C and Keeyask. (Details of these calculations are provided in online Appendix 3.)

SOUND DECISIONMAKING DEPENDS ON A PROPER UNDERSTANDING OF SUNK COSTS.

To determine whether to proceed with each of the aforementioned projects, the going-forward costs need to be compared on a levelized basis against alternatives.²⁴ Such an analysis, properly performed, requires ignoring expenditures to date, or sunk costs, that are irreversible. Policymakers often justify proceeding with uneconomic projects due to the significant amount of money that has already been spent. However, the decision whether to proceed

^{16 &}quot;Project Overview." Nalcor Energy.

¹⁷ Nalcor Energy. Muskrat Falls Project Update. November 2017. January 16, 2018. (p. 4, 11)

¹⁸ For fuller discussion, see Nalcor Energy. Muskrat Falls Project Update. June 2017. (p. 11); "Muskrat Falls Generating Project," Nalcor Energy. https://muskratfalls.nalcorenergy.com/project-overview/muskrat-falls-hydroelectric-generationfacility/; and "Lower Churchill Project to Become a Reality" Government of Newfoundland and Labrador. http://www. releases.gov.nl.ca/releases/2010/exec/1118n06.htm.

^{19 &}quot;Muskrat Falls Generating Project." *Nalcor Energy*. <https://muskratfalls.nalcorenergy.com/project-overview/muskrat-fallshydroelectric-generation-facility/>.

^{20 &}quot;Lower Churchill Project to Become a Reality." Government of Newfoundland and Labrador.

²¹ Nalcor Energy. Muskrat Falls Project Update. July 24, 2016.

^{22 &}quot;NDP calls for study into cost of halting work on Muskrat Falls powerhouse." Nalcor Energy. 2016. http://www.cbc.ca/ news/canada/newfoundland-labrador/muskrat-falls-ndp-1.3659518.

²³ Newfoundland and Labrador Regulation 101/17. Commission of Inquiry Respecting the Muskrat Falls Project Order. November 20, 2017.

²⁴ While this *Commentary* focuses on comparing completion costs with the costs of gas turbines, imports and renewables with storage, the analysis should also take a broad view of variables, including demand response, energy efficiency and distributed energy resources, using an integrated resource-planning process. In the case of BC imports, while these may violate the "self-sufficiency" requirement of the province's *Clean Energy Act*, this self-imposed restriction could be amended.

Box 1: Exploring the Concept of Sunk Costs

A simple example, Investment A, may be helpful. Suppose someone has invested \$100 and their cost of funds is 5 percent. Now, assume that they have been told that they can either abandon the investment and receive nothing, or they can invest an additional \$100 and receive \$2 per year in income in perpetuity. Clearly, to recover at least the cost of the incremental funds, the follow-on investment would need to yield \$5 per year; the investor should decline to make any further investments in the venture and take the loss.

	Investment A	Investment B
Initial investment	\$100	\$100
New investment	\$100	\$100
Return	\$2	\$8
Write down	\$O	\$100
New investment return	2%	8%
Initial investment return	0%	0%

Let us extend the example further with Investment B. Suppose simultaneously the investor was offered a different opportunity – to invest \$100 in a new venture that would yield \$8 per year in perpetuity. While this second investment is evidently higher yielding than continuing in the first, and should be the obvious choice, many investors might wrongly choose Investment A and shun Investment B to avoid admitting the loss. Yet by choosing Investment B, they would have an extra \$6 in perpetuity to spend.

with a project should be determined by the yetto-be-spent costs, instead of costs already spent.²⁵ Factoring sunk costs into decisionmaking results in a phenomenon known as the "sunk-cost fallacy."

Politics make the decision to cancel (or defer) a project even more difficult as some politicians

perceive project terminations as an admission of failure. Alongside the funds spent, politicians invest their reputation and electability. BC Premier John Horgan has justified completing Site C by saying, "We will not ask British Columbians to take on \$4 billion in debt with nothing in return for the people

25 Regulators in similar circumstances have allowed amortization of cancellation costs to avoid rate shock, and regulators who do not currently allow such practices should adjust them accordingly. The benefits of the cancellation accrue to future ratepayers in the same way that the costs would have, had it been built. Immediate expensing of cancellation costs leads to intergenerational equity issues. For example, the Public Utilities Board of Manitoba approved the recovery of \$380 million of sunk costs related to the cancelled Conawapa Generating Station in a regulatory deferral account with amortization of the costs on a straight-line basis over a 30-year-period beginning on April 1, 2018. See Public Utilities Board of Manitoba. *Order No. 59–18.* May 1, 2018. p.22. of this province."²⁶ However, careful economic analysis suggests that BC ratepayers may, in fact, end up paying more by the project continuing than they would if they simply paid off the debt already incurred and pursued an alternative path. As we will see, continuing with construction on some of Canada's large-scale hydro projects may result in a similar loss of welfare for the ratepayers who will ultimately pay the bill.

LEVELIZED COSTS FOR THE SUBJECT PROJECTS ARE DRIVEN BY SUBSTANTIAL CAPITAL COSTS

To determine whether the decision to continue construction is rational, we first calculated the LCOE for each of the three plants examined here based solely on so-called "go-forward" costs. We then compared these go-forward LCOEs to alternative approaches to meeting current needs, factoring in the cost of negative externalities. In addition to the go-forward costs, key assumptions for calculating the LCOE include the amortization period, the cost of capital, fixed and variable operating and maintenance costs, and expected annual production. While point estimates are provided below, they are tested against a range of possible outcomes in a subsequent section.

Go-forward capital costs: These costs (Figure 1) are based on recent announcements regarding amounts remaining to be spent on each of the projects, although it is likely that pressure for ongoing expenditure to create "facts on the ground"

Table 2: Go-forward Costs for Each Project and Date of Assessment

Values in C\$ billion	Site C	Keeyask	Muskrat Falls
Current budget	10.7	8.7	12.7
Current expenditures	2.1	4.2	8.2
Go forward costs	8.6	4.5	4.5
Date of assessment	31-Dec-17	31-Dec-17	28-Feb-18

Sources: BC Hydro. Site C Clean Energy Project – Annual Progress Report No. 2. March 2018; Manitoba Hydro. Undertaking #57. February 2018; Nalcor Energy. Muskrat Falls Project, Monthly Report – February 2018. April 20, 2018. p. 8.

will make it more difficult to cancel the projects, the costs remaining are based on the most recent data available.²⁷ Assumed go-forward costs appear in Table 2. We include the costs of transmission because of the location-constrained nature of these specific hydroelectric resources.

Amortization: A key component of the LCOE is the length of the period over which capital costs are recovered. We have used a 60-year amortization period, which is consistent with the longest power purchase agreement (PPA) offered to hydroelectric independent power producers (IPP) in Canada.²⁸ While hydro assets are long lived, components require periodic maintenance and replacement, and experience suggests that parts of civil works may need to be replaced as well after several decades of use.

- 26 "Government will complete Site C construction, will not burden taxpayers or BC Hydro customers with previous government's debt". BC Gov News. December 11, 2017.
- 27 This *Commentary* is based on the most recent data available at the time of drafting (May 2018). Due to the nature of this analysis, the economics of these projects improves as more capital is sunk. However, if we assume significant additional expenditure at Site C, our calculations suggest it would still be unfavourable. As noted previously, analysis using more recent data appears in the addendum.
- 28 BC Hydro issued a 61-year PPA to Capstone Infrastructure Corporation for its 16-MW Sechelt hydro project. See BC Hydro. Independent Power Producers (IPPs) currently supplying power to BC Hydro. November 2012. In Ontario, PPAs for hydroelectric power were signed for up to 50 years under its Hydroelectric Energy Supply Agreement procurement program. See IESO. Progress report on contracted supply. June 2015.

Cost of capital: A fundamental principle of corporate finance is that the cost of capital should reflect the risks of the project itself, rather than the generalized cost of funds available to the investor. Given that a substantial portion of the output of these three projects is earmarked for export markets with the risk of volatile prices, the cost of capital, in theory, could be as high as that for a merchant generator; i.e., one which has limited access to long-term PPAs as hedges. This position is partially offset by access to a domestic retail hedge provided by provincial load. Taking both these factors into account, we have assumed that the projects are financed using 70 percent debt at 4.08 percent²⁹ and 30 percent equity at 7.58 percent. The cost of debt was based on the yield of 30-year Canadian A-rated corporate bonds, while the cost of equity was calculated using the capital asset pricing model and based on Canadian power sector comparators.³⁰ We assume a tax rate of 0 percent, given that BC Hydro, Manitoba Hydro and Nalcor Energy are exempted from paying federal and provincial taxes.³¹ The cost of capital was calculated as 5.13 percent. Details of the methodology are described in online Appendix 1.

Fixed and variable O&M costs: We used the US Energy Information Administration's (EIA) 2018 Annual Energy Outlook (AEO) estimates for fixed and variable operation and maintenance (O&M) costs of a new 500-MW hydropower project with a 2021 in-service year and located in the US northwest. This resulted in \$50.70/kW/year in fixed costs and \$1.68/kWh in variable O&M costs.³² These estimates are consistent with ranges provided by the World Bank's International Finance Corporation, which include the major equipment replacement that would be required during the lifespan of hydropower facilities.³³

Output: Assumptions for the output of each plant are shown in Figure 1.

Results: Using the assumptions above, we developed a levelized cost for each of the plants, based solely on their go-forward costs. The outcome is as follows and is presented in more detail in online Appendix 2:

Site C: \$100.41/MWh; Keeyask: \$64.89/MWh; and Muskrat Falls: \$59.25/MWh.

32 AEO cost estimates were converted to Canadian dollars at a rate of 0.79 USD = 1.00 CAD.

²⁹ It is not appropriate to use the cost of public debt as the basis for calculating the appropriate discount rate. The province is effectively investing on the behalf of taxpayers in an enterprise that is more risky than the province's sovereign debt. Assuming 100-percent debt financing at the province's cost of funds would suggest that investing in a large-scale hydro project was no more risky than investing in sovereign debt, which is clearly not the case. For example, the Trans Mountain Pipeline project did not become less risky after it was acquired by the federal government, suggesting that assigning a lower cost of capital due to public ownership would be inappropriate in valuing it.

³⁰ For the cost of debt, we took the average coupon rate of 30-year, A-rated corporate debt bonds issued by Canadian companies since January 1, 2017.

³¹ In lieu of federal and provincial income tax exemptions, the three Crown corporations make payments to provincial governments in the form of water rentals, capital taxes, debt-guarantee fees and other taxes or grants. In 2019, BC Hydro, Manitoba Hydro and Nalcor Energy are forecasted to make provincial payments of \$433 million, \$589 million and \$8.2 million respectively. These amounts represent 12.2 percent, 19.3 percent and 0.3 percent of projected gross revenues. See Manitoba Hydro. PUB-MFR-44. February 1, 2018. p.3; BC Hydro. Fiscal 2017 to Fiscal 2019 – Revenue Requirements Applications. August 17, 2016. p.80 & 182; Newfoundland and Labrador Hydro. 2017 General Rate Application. July 28, 2017. p.206.

³³ World Bank Group – International Finance Corporation. Hydroelectric Power – A Guide for Developers and Investors. February 2015.

THESE PROJECTS ARE UNECONOMIC BY SEVERAL METRICS

Replacement natural gas fired capacity is cheaper

To explore whether the decision to continue construction on the three projects is in the public interest, we considered the costs of alternatives. First, we considered the levelized cost of building a combined cycle gas turbine ("CCGT") in each province.³⁴ In addition to the above key assumption categories, we also incorporated the cancellation costs of the current hydro projects, as well as natural gas plant costs and carbon costs. For comparison, we also delayed the in-service date of the replacement capacity to be consistent with identified needs, discounted to the present using the previously established cost of capital.

Capital costs: We based capital costs on estimates from the US National Renewable Energy Laboratory's 2017 Annual Technology Baseline and the Alberta Electric System Operator's 2017 Proposed Gross Cost of New Entry & Net Cost of New Entry Calculation Approach report. These sources provide a range of overnight capital cost estimates from \$1,270/kW to \$1,950/kW. While this range may be reasonably applied to BC and Manitoba, the development of natural gas infrastructure in Newfoundland and Labrador would be required in addition to the cost of a new CCGT. It is not necessary to include transmission costs since a new gas-fired resource can be situated close to existing infrastructure. (A high-level geographical analysis suggests that at least 1,000

kilometres of natural gas pipelines are located within 25 kilometres of transmission lines in BC and Manitoba.)

Heat rate: We assumed a heat rate (the amount of fuel burned per unit of output) of 6,300 Btu/kWh, consistent with the performance of the reference CCGT plant in a recent study by PJM, a regional transmission body for 13 US states, and the US EIA 2018 Annual Energy Outlook.^{35,36}

Amortization: We used a 20-year capital recovery period for CCGTs. This is consistent with the capacity market assumptions of PJM and ISO New England, another regional transmission network. Furthermore, this time-frame is also consistent with North American experience regarding the average CCGT retirement age, which is 21 years. While our shorter assumed lifespan suggests earlier replacement than for a hydro station, we do not believe that the levelized replacement cost at that time would be significantly higher than that assumed for the first 20 years, given that technological improvements and existing site benefits can be expected to offset some of the impact of inflation.

Cost of capital: We utilized the same capital structure and cost of capital for the CCGTs as for the hydro projects.³⁷ The projects would face the same counterparty risks, and while natural gas plants face commodity price risk, this risk is more hedgeable than hydrology.

Fixed and variable O&M: For fixed and variable O&M, we used the average of recent

³⁴ While some have argued that it is impossible to site a CCGT in some of the provinces, we believe that a project undertaken with appropriate consultation and unequivocal government backing would be feasible within the required time frame.

³⁵ PJM. Cost of New Entry - Combustion Turbines and Combined-Cycle Plants with June 1, 2022 Online Date. April 19, 2018

³⁶ EIA. Annual Energy Outlook. 2018.

³⁷ The idea that "private" discount rates should not be used to evaluate "public" assets built for the public gives rise to a number of poor public policy choices. Discount rates are neither public nor private; they are intended to reflect the underlying risks of the project. Hydrology risk doesn't disappear because the project is public, nor do cost overruns or market risks. Governments are investing ratepayers' and taxpayers' money, and if higher-yielding investments exist elsewhere, both groups will be better off if the government eschews lower-yielding options.

determinations by various Independent System Operators ("ISOs") associated with the Cost of New Entry ("CONE"). This resulted in estimates of \$31.3/kW/year in fixed costs and \$5.3/MWh in variable O&M costs.

Output: For each province, we assumed that the CCGT was sized to match the output of the planned new hydro facility.³⁸ Because the CCGT has a higher capacity factor – assumed to be 85 percent in these calculations – than the hydro it replaces, the size of the facility in each province would differ. (See Table 3.)³⁹ Both hydroelectric and gas-fired resources provide option value. Spinning gas reserves are arguably nearly as nimble as reservoir hydro in responding to changes in demand, whereas non-spinning resources will lag by the start-up time required. Overall, the marginal difference in option value is likely to be small.

We also examine like-for-like capacity replacement if an equally sized CCGT were procured while maintaining the same expected level of output. This scenario overstates the levelized cost of CCGTs when matched for hydro capacity, as a CCGT could run at a higher capacity factor than that indicated if it simply matched the energy output of the hydro plant it replaces. Assuming a higher capacity factor would lower the overall

Table 3: Replacement Capacity Required forGas Alternative if Matching Energy Output

	Site C	Keeyask	Muskrat Falls
Hydro capacity [MW]	1,132	695	824
Hydro capacity factor	53%	72%	68%
Annual generation [GWh]	5,268	4,400	4,900
Gas capacity factor	85%	85%	85%
Implied gas capacity required [MW]	707	591	658

Sources: Authors' calculations.

LCOE for capacity matching.

Cancellation costs: To assess the costs of replacing existing hydro projects with CCGTs, we also need to include the cancellation costs of the existing projects in the calculation. To do so, we took the most recent estimated cancellation costs and levelized them over the lifetime of the cancelled plant, using the allowed returns incorporated into existing rate structures.⁴⁰ Matching the amortization period of cancellation costs with the would-be lifetime of the asset maintains intergenerational equity. The levelized cancellation

³⁸ It is inappropriate to match the plants on an installed-capacity basis. The hydro facilities do not have excess capacity. The ability to dispatch at full capacity will be dependent upon the condition of their reservoirs, which will differ annually and seasonally. For the hydro comparators to receive full capacity credit, they will need to be able to deliver their full capacity at any time on short notice. In Alberta, the Alberta Electric System Operator (AESO) assumes dispatchable hydro has an unforced capacity capability of 81 percent of its installed capacity. This is also consistent with the approach taken by North American capacity markets that derate hydroelectric resources.

³⁹ Incremental capacity can be procured more cheaply, and is of greater value closer to the location of need. In the case of BC, Site C's capacity could be replaced at much lower cost.

⁴⁰ Site C and Muskrat Falls cancellation costs were amortized using an approved return on rate base of 3.47 percent and 6.82 percent, respectively. Keeyask's cancellation costs were discounted using the capital cost of 5.13 percent. See BC Hydro. Fiscal 2017 to Fiscal 2019 – Revenue Requirements Applications. August 17, 2016. p.576; Newfoundland & Labrador Board of Commissioners of Public Utilities. Order No. P.U. 49. Use of different discount rates for the regulatory asset created relative to that used for the cancelled project is appropriate because the nature of the cash flows is different. While using the weighted average cost of capital (WACC) as the basis for determining the termination costs would increase the Site C recovered amount by \$4.99/MWh, we do not believe that such an analysis is appropriate, given the different nature of the cash flows. Furthermore, doing so would not change the fundamental conclusions.

costs of Site C, Keeyask and Muskrat Falls were calculated as \$14.06/MWh, \$16.56/MWh and \$20.65/MWh, respectively. The calculations performed are provided in online Appendix 3. This levelized cost is added to the cost of the CCGT.

Natural gas prices: To explore the impact of natural gas prices on the LCOE, we started by taking Henry Hub gas price projections from the EIA's 2018 AEO Reference Case⁴¹ and examining the price over the 2018-2037, 20-year amortization period. Then, using the same 5.13 percent discount rate as for the CCGT itself, we determined the levelized natural gas price to be \$4.97/MMBtu over the 20-year period. Next, we determined the three-year historical monthly locational price differentials between Henry Hub and Kingsgate for BC, Emerson for Manitoba and Iroquois Waddington for Newfoundland and Labrador. Kingsgate and Emerson traded at average discounts of \$0.51 and \$0.11 respectively, while Iroquois Waddington traded at a premium of \$0.72. These differentials were applied to the levelized gas price and are provided in greater detail in online Appendix 4. In BC, an adder of \$0.38 was included to account for the motor fuel tax. We assume that CCGT facilities connect directly to existing gas transmission networks.

Carbon costs: Carbon costs were added to the variable operating costs of the CCGT coming online in 2021, using the announced policies of the various provinces as described Table 4.⁴² In BC,

Table 4: Carbon Price Adder

	BC	MB	NL
Level of administration	Provincial	Provincial	Federal
Carbon price [\$/tonne]	50	25	40
CO2 content of natural gas [lbs/MMBtu]	120	120	120
CCGT heat rate [Btu/kWh]	6,300	6,300	6,300
Carbon price adder [\$/MWh]	17.15	8.58	13.72
Source: EIA; Author analysis.			

we used the 2021 carbon tax price of \$50/tonne.⁴³ In Manitoba, we applied a carbon tax of \$25/tonne, which is assumed to be flat until 2022.44 Pending the announcement of a plan from Newfoundland and Labrador, the province is assumed to follow the federal carbon pricing backstop and is assigned the 2021 cost of \$40/tonne.⁴⁵ Given the carbon content of natural gas of 120 lbs/MMBtu and the thermal efficiency of new CCGTs at 6,300 Btu/kWh, the overall carbon price additions were \$17.15/MWh in BC, \$8.58/MWh in Manitoba and \$13.72/ MWh in Newfoundland and Labrador.^{46,47} In the deferral case, we used a carbon tax of \$50/tonne for all three projects, the high-end of the federal carbon pricing backstop. This corresponds to a carbon price add-on of \$17.15/MWh.

- 41 The AEO presents prices at Henry Hub, Louisiana, which is the location generally used as the starting point for gas projections given its liquidity. Canadian gas has generally traded at a discount to Henry Hub in the recent past and is expected to do so in the future.
- 42 2021 in-service year takes into account three years of construction lead time. See EIA. Annual Energy Outlook. 2018.
- 43 "British Columbia's Carbon Tax." Government of British Columbia. https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax.
- 44 Government of Manitoba. Made-In Manitoba Climate and Green Plan. March 2018.
- 45 Environment and Climate Change Canada. Technical Paper on the Federal Carbon Price Backstop. May 18, 2017.
- 46 "How much carbon dioxide is produced when different fuels are burned?" EIA.
- 47 PJM. Cost of New Entry Combustion Turbines and Combined-Cycle Plants with June 1, 2022 Online Date. April 19, 2018.

Results: Using the assumptions above, we developed a levelized cost for each of the CCGT replacement plants:

- British Columbia: \$87.60/MWh;⁴⁸
- Manitoba: \$81.65/MWh; and
- Newfoundland: \$96.09/MWh.

As discussed below, while we believe replacement with a CCGT could be delayed in BC, even if immediate construction were chosen, Site C should still be cancelled.

DELAYS IN NEED ALLOW COSTS TO BE DEFERRED

Further analysis of CCGT deferral shows that Keeyask should be cancelled as well. The economics of cancellation are further enhanced when taking into account the ability to build replacements only as needed in sizes more consistent with need. In BC, Site C is not needed for domestic load until three years after current target completion, according to BC Hydro's low-load growth scenario. In Manitoba, Keeyask is not needed for 13 years after current target completion.⁴⁹ Muskrat Falls, however, may be too far advanced to cancel based on relative economics.

Figure 2 shows the projected need dates and demand forecasts related to the three hydro projects.

With respect to the need for Site C, the demand forecast in the BC Hydro Submission on the British Columbia Utilities Commission Preliminary Report already assumes load from LNG Canada, Woodfibre LNG and FortisBC Tilbury Phase 2 materializes.

Results: Taking the projected need dates into account, we determined the discounted LCOE of a replacement CCGT for comparison purposes. We did this by projecting the LCOE of the replacement CCGT for the year of projected need, assuming construction commences three years in advance and then discounted that number to the present, using the CCGT discount rate. The outcomes for the energy replacement and capacity replacement scenarios are in Table 5.

As Figure 3 below shows, when replacement of cancelled capacity is deferred, ratepayers receive greater benefit from cancelling both Site C and Keeyask, in both the energy and capacity-matched scenarios We emphasize again that the capacity-matched scenario overstates the LCOE, as lower capacity factors are assumed to match the expected output from the hydro projects.^{50,51}

It is important to emphasize the value of optionality, which comes with the ability to build in smaller unit sizes. The North American power sector is changing rapidly: demand is slowing or

⁴⁸ Site C's completion could be justifiable under a carbon price of more than \$100/tonne. However, higher carbon prices also make any of the more granular zero-emission resources a more economic choice.

⁴⁹ In the September 2016 Boston Consulting Group review of Bipole III, Keeyask and Tie-Line, Manitoba Hydro stated the earliest consistent need for new generation would be 2027 and noted the need may not arise until as late as 2034. See The Boston Consulting Group. Review of Bipole III, Keeyask, and Tie-Line Projects, p. 4. September 19, 2016.

⁵⁰ While we believe the use of a lower WACC is inappropriate, WACC sensitivities do not dramatically change the conclusions. Using a WACC of 4.13 percent and holding other input assumptions constant, Site C is still uneconomic. While its LCOE falls from \$100.41/MWh to \$86.29/MWh, the LCOE of its cancellation and deferred energy replacement is \$81.40/MWh. However, in this scenario Keeyask is economic as its LCOE falls from \$64.89/MWh to \$56.02/MWh, as compared to the LCOE of its cancellation and energy replacement of \$60.13/MWh.

⁵¹ To examine like-for-like capacity replacement, procuring an equally sized CCGT in lieu of hydro at the same capacity factors still shows ratepayers receive greater benefit from cancelling both Site C and Keeyask. Specifically, deferred replacement results showed: Site C replacement LCOE of \$92.98/MWh, below its completion LCOE of \$100.41/MWh, and Keeyask replacement LCOE of \$62.60/MWh, below its completion LCOE of \$64.89/MWh. An even more cost-effective approach to match both capacity and energy would be to build a mix of CCGT and open-cycle gas turbines.



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Table 5: Deferred Energy and Capacity Replacement LCOEs				
Province	Energy Replacement		Capacity Replacement	
	LCOE [C\$/MWh]	Capacity factor	LCOE [C\$/MWh]	Capacity factor
British Columbia	81.40	85%	92.98	53%
Manitoba	60.13	85%	62.60	72%
Newfoundland & Labrador	92.80	85%	97.60	68%
Source: Authors' calculations.				

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Figure 3: Comparison of Hydro and Deferred CCGT LCOE

negative, behind the meter production and storage is gradually becoming more economic. At the same time, decentralized power grids are becoming more feasible. Large-scale, centralized, long leadtime investments like hydro stations run the risk of becoming stranded assets (assets which are no longer able to recover their costs) before they are even brought online, depending on the pace of technological change. Having the option to build something smaller and later means that provincial utilities can better tailor future investments to updated power sector dynamics, while being able to take advantage of intervening technological changes. Furthermore, the ability to spread these investments across the grid may enhance reliability and resiliency.

EXAMINATION OF SENSITIVITIES REINFORCES THE CONCLUSIONS

While it is important to recognize that each of the variables has a range of plausible outcomes, we believe that the best way to explore this span is to assess how the variables interact with one another. To assess the sensitivity of assumptions to changes in combinations of key variables, we examined the outcomes using Monte Carlo analysis, a mathematical technique that generates random variables on the basis of a probability distribution to be used for modelling risk or uncertainty. Within determined input ranges, 1,000 trials were drawn following a normal distribution. For each trial, we compared the LCOEs of completing the hydro project to the LCOEs of deferred gas replacement combined with the levelized cost of cancellation.



For all three projects, input ranges were determined for the weighted average capital cost (WACC), levelized gas price, carbon cost and remaining completion costs. The input ranges for each variable are as follows:

- WACC: We tested values ranging from 4.13 percent to 6.13 percent within 100 basis points of the calculated WACC of 5.13 percent. LCOE comparisons in each trial apply the same WACC to both alternatives (project completion versus project replacement).
- Natural gas prices: In terms of the levelized gas price, we tested values ranging from \$3.85/ MMBtu to \$7.70/MMBtu based on the high and low-case EIA forecast from its 2018 AEO.
- **Carbon costs:** For carbon costs, we tested values ranging from \$20 per tonne to \$100 per tonne to include ranges from provincial and federal carbon pricing plans, and a significant margin.
- **Completion costs:** We examined the impact of variation in the completion capital costs for the

three hydro projects. We tested bounds of +10 percent and – 5 percent for each project, resulting in a \$8.1 billion to \$ 9.4 billion range for Site C, \$4.3 billion to \$5.0 billion for Keeyask and \$4.2 billion to \$4.9 billion for Muskrat Falls.

As seen in Figure 5, cancellation and deferred gas replacement was cheaper in 96 percent of Monte Carlo trials conducted for Site C, 61 percent of trials conducted for Keeyask and 0 percent of trials conducted for Muskrat Falls.

PRICES IN EXPORT MARKETS ARE EXPECTED TO BE DEPRESSED

Cross-border electricity flows between Canada and the US are almost as old as the North American electricity grid, with the opening of the first transmission line between the two countries in 1909.⁵² These flows are taken for granted to such an extent that they are used to justify investment

52 "History of electricity." Canada Electricity Association. https://electricity.ca/learn/history-of-electricity/.

Figure 5: Results of Monte Carlo Analysis of Sensitivities



decisions in new hydroelectric facilities in Canada. However, North American power markets are evolving rapidly: load growth has fallen, cheap natural gas has reduced wholesale power prices substantially and targeted local renewables incentives have increased US power supplies.

As a result, US export markets are likely to be significantly less lucrative in the future.⁵³ This is a function both of the depressed price of natural gas – which, as discussed above, is not expected

to increase dramatically over the forecast horizon – and of significant state (and expiring Federal) initiatives to encourage development of domestic large-scale renewable-energy assets.

As Figure 6 shows, combined energy and capacity prices⁵⁴ in the target regions are expected to be below the levelized cost to complete Site C. While prices in export markets are expected to increase over the forecast period, they are not expected to reach historic levels. Essentially, this

⁵³ Declining export profits are evident today. BC Hydro's \$643 million in 2016 gross electricity export revenues was its lowest in over a decade with an average price of \$43.65/MWh. This contrasts with \$2.29 billion in 2009 at an average price of \$70.45/MWh. Manitoba Hydro earned \$460 million in gross electricity export revenues in 2017, 61 percent of the \$750 million earned in 2005.

⁵⁴ Capacity prices are converted to \$/MWh by dividing them by the total number of hours in a year. This process is necessary to allow for calculation of capacity revenues to resources that are assumed to be derated.



Source: LEI Continuous Modelling Initiative 2017 Q2 reports.

means that when exporting electricity, Canadian ratepayers will be subsidizing US consumption, rather than profiting from it.⁵⁵

Furthermore, Figure 5 assumes that new Canadian hydro facilities are granted full production-weighted capacity credit. But capacity is generally based on deliverability. Transmission deliverability needs to be available for the full amount of claimed capacity, performance penalties may apply and capacity credits may be derated.⁵⁶

Indeed, in the cases of Site C and Keeyask, adding the levelized cancellation costs to the export

market price were sufficient transmission available, would make it cheaper (even accounting for transmission costs) for Canadian utilities to cancel the specified projects and import from the US. For example, adding Site C's cancellation cost of \$14.06/MWh to the levelized price of energy and capacity from the California Independent System Operator (CAISO) is cheaper than the LCOE of finishing Site C until 2037. Importing allows for an even more granular approach to addressing future needs and, given the much larger market areas to which the provinces are linked, it offers a wide

⁵⁵ This is already happening in Ontario, which has provided more than \$57.5 million in benefits to US ratepayers since 2010 as a result of surplus baseload generation. See IESO. Hourly intertie schedule and flow data. 2010-2017; IESO. Hourly Ontario Energy Price data. 2010-2017.

⁵⁶ While export contracts are in place to cover a portion of the output of the new projects, it is important to note that these contracts cover only a portion of the new projects' useful lives and could be profitably unwound by meeting the obligations with cheaper qualifying local replacement power.



diversity (including zero-emission sources) of supply.

CALIFORNIA WON'T SAVE US

In the case of Site C, some have argued that the unique characteristics of the California electricity market will help to justify its construction. In fact, the opposite may be true. Those unique aspects make it less likely that California will need energy or capacity from Site C. First, California policies targeting increased renewables have resulted in an oversupply of power over many hours of the day. Indeed, California's motivation for launching the Western Energy Imbalance Market is to export, not to import. In a presentation before the California Energy Commission, CAISO noted that the

Western Energy Imbalance Market helped avoid curtailment of renewables, by 586,277 MWh as of the first quarter of 2018.^{57,58} Second, as Figure 7 shows, California is aggressively contracting for in-state storage resources to balance existing and new renewables. Third, continued growth in behind-the-meter renewable energy resources and substantial energy-efficiency efforts have resulted in reduced load growth. Recent California Energy Commission projections for peak demand are increasing only 0.9 percent per year.⁵⁹ Furthermore, a review of relevant California dockets shows no meaningful reference to Site C. Taken together, these factors suggest that the California market may not be nearly as robust an export destination as BC planners would wish it to be.

⁵⁷ CAISO. IEPR Workshop – Renewable Integration. May 12, 2017.

⁵⁸ CAISO. Western EIM Benefits Report - First Quarter 2018. April 20, 2018.

⁵⁹ California Energy Commission. The California Energy Demand 2018-2030 Revised Forecast. January 22, 2018.



THERE ARE CHEAPER WAYS TO MEET **EMISSIONS GOALS**

Comparison of large Canadian hydro completion costs to the CCGT alternatives has been criticized on the basis that, while CCGTs would pay carbon costs, they would nonetheless have actual emissions that would make it more difficult for Canada to meet its Paris climate agreement commitments. While there are other ways to accomplish this objective when building CCGTs (for example, committing to a verified offset program),⁶⁰ building

large-scale hydro is not the only way to obtain zero emissions power. Falling costs of large-scale wind power, coupled with more efficient wind-power storage, are both potentially more cost effective and, like CCGTs, can be deferred until need is apparent and sized accordingly. In fact, the first round of the Alberta government's Renewable Energy Program procured approximately 600 MW of wind power under 20-year contracts at \$37/MWh, well below the cost to complete any of the hydro stations examined, even when considering the need to balance the associated intermittency.⁶¹ Deferring investment

⁶⁰ Article 6 of the Paris Agreement permits applying internationally transferred mitigation outcomes toward nationally determined contributions. These outcomes are voluntary and are to be authorized by the participating parties. See UNFCCC. Paris Agreement. November 2015.

⁶¹ Contract recipients receive an indexed renewable energy credit that represents the difference between the clearing price of \$37/MWh and the AESO market pool price. As such, contract recipients receive true-up payments from the government when pool prices are low and pay the surplus when pool prices are high. See "Renewable Electricity Program." AESO. < https://www.aeso.ca/market/renewable-electricity-program/>
also allows for technological improvements and cost reductions. In its 2017 report, the International Renewable Energy Agency predicted that the installed costs of battery storage systems could fall by 50 percent to 66 percent by 2030.⁶² As such, the combination of wind and storage may be cheaper by the time it is actually needed.

LIMITING THE ROLE OF INDEPENDENT Regulators results in False Expediency

In each of the three provinces, limited regulatory authority undermined reviews of their respective megaprojects. Large hydroelectric generation investments on the scale of Site C, Keeyask and Muskrat Falls, which amount to multi-billion dollar undertakings, must be vetted with corresponding due diligence.

Site C: British Columbia Utilities Commission

In British Columbia, the *Utilities Commission Act* ("UCA") gives the BC Utilities Commission (BCUC) powers to regulate public utilities. Under Section 45 of the UCA, in most instances, construction of new electricity generating facilities cannot begin without the Commission issuing a Certificate of Public Convenience and Necessity, which is granted if the proposed facility is "necessary for the public convenience and properly conserves the public interest."⁶³ Despite this provision, Site C was exempted from BCUC scrutiny under the province's *Clean Energy Act*.⁶⁴ Energy Minister Bill Bennett justified this decision stating: "The reason why we didn't send it to the BCUC is back when the *Clean Energy Act* was passed (2010), there was a decision made that if government was to build Site C, it would be a monumental decision in terms of energy policy that only duly elected officials have a right to make, as opposed to an organization like the BCUC that is made up of bureaucrats and lawyers."⁶⁵

But monumental projects are precisely those that require additional scrutiny. Instead, Site C was subject to a compressed nine-month long environmental assessment conducted by a large team reporting to a three-person Joint Review Panel. This panel recommended that the project be referred to the BCUC, but this did not occur.⁶⁶ BCUC's involvement came after the decision to go ahead was made. Construction began in 2015, whereas the BCUC review report was released in November 2017.

Muskrat Falls: Newfoundland and Labrador Board of Commissioners of Public Utilities

Under *Newfoundland and Labrador's Public Utilities Act*, RSNL-1990: "A public utility shall not proceed with the construction, purchase or lease of improvements or additions to its property where (a) the cost of the construction or purchase is in excess of \$50,000; or (b) the cost of the lease is in excess

- 62 IRENA. Electricity storage and renewables: Costs and markets to 2030. October 2017.
- 63 British Columbia Utilities Commission. *Inquiry Respecting Site C Final Report to the Government of British Columbia*. November 1, 2017. (p. 12)
- 64 Legislature of British Columbia. Clean Energy Act Chapter 22. Section 7, Subsection 1 (Exempt projects, programs, contracts and expenditures).
- 65 "Site C Dam will not be diverted to B.C. Utilities Commission" *Alaska Highway News*. 2015. http://www.alaskahighwaynews.ca/site-c/site-c-dam-will-not-be-diverted-to-b-c-utilities-commission-1.2076979> Bennet maligns the capabilities and purpose of an independent regulator; massive public investment undertakings putting ratepayer money at risk need to be scrutinized outside of the political sphere by experts who can opine on need and alternatives in a fact-based process.
- 66 University of British Columbia. Regulatory Process for the Site C Project. May 2016.

of \$5,000 in a year of the lease, without the prior approval of the board."⁶⁷

Following an environmental assessment, the Lower Churchill Hydroelectric Generation Project was reviewed by a four-person Newfoundland and Labrador Board of Commissioners of Public Utilities panel to address whether the Muskrat Falls generation facility and the Labrador-Island Link transmission line represented the least-cost option for the supply of power to Island Interconnected customers over the 2011-2067 period when compared to the isolated Island development scenario. The review took place over a nine-month period; "[t]he Board's report on the Reference Question was initially required to be provided to the Minister of Natural Resources by December 30, 2011. This date was later extended to March 31, 2012 as a result of delays in receipt of critical documentation from Nalcor. This significantly impacted the Board's process and ability to answer the Reference Question as key procedural steps had to be changed or eliminated in order to meet the March 31, 2012 deadline."68

Subsequently, the Newfoundland and Labrador Board of Commissioners of Public Utilities conducted a review of the Muskrat Falls project in 2012. In the proceeding's final report to government, the Board notes the woeful lack of due diligence regarding budget-impacting components of the project, stating: *"There were gaps in Nalcor's information and analysis [in its decision to approve the development scenario and to commence detailed design], including: i) AC integration studies were not done; ii) probabilistic reliability studies to compare the two options were not done; iii) there is uncertainty with respect to adherence to NERC standards, and* *iv) the design return period for the HVDC overland transmission line is not in accordance with accepted standards and best practice.*⁵⁶⁹ The load forecast provided by Nalcor to the public utilities board was approximately two years old and was not updated during the review.

Keeyask: Manitoba Public Utilities Board

Under the *Manitoba Crown Corporations Public Review and Accountability and Consequential Amendments Act*, "No change in rates for services shall be made and no new rates for services shall be introduced without the approval of The Public Utilities Board."⁷⁰ No authority, explicit or implied, requiring the review and approval of capital expenditure is granted to the Manitoba Public Utilities Board (MPUB), but inclusion of such expenditure in rates is not guaranteed. However, the Manitoba government issued an Order-in-Council providing the MPUB with special authority to access information on Manitoba Hydro's financial health and capital expenditure plans during the 2017/18 General Rate Application process.⁷¹

WHERE DO WE GO FROM HERE?

It's Not Too Late to Reconsider

For projects like Site C and Keeyask, it is not too late to cancel. The sooner provinces face reality and begin negotiating reasonable cancellation programs, the better off ratepayers will be. Similar analyses may be applied to decisions like nuclear refurbishment. Provinces should consider hiring skilled negotiators to review all existing contracts

71 Government of Manitoba. Order in Council. April 5, 2017.

⁶⁷ Legislature of Newfoundland and Labrador. Public Utilities Act. 1990.

⁶⁸ Newfoundland and Labrador Board of Commissioners of Public Utilities. *Review of two generation expansion options for the least-cost supply of power to island interconnected customers for the period 2011-2067*. March 30, 2012. (p. 4)

⁶⁹ Newfoundland and Labrador Board of Commissioners of Public Utilities. *Review of two generation expansion options for the least-cost supply of power to island interconnected customers for the period 2011-2067*. March 30, 2012. (p. 6)

⁷⁰ Legislature of Manitoba. The Crown Corporations Public Review and Accountability and Consequential Amendments Act. 1988.

and develop a pathway toward minimizing cancellation costs, identifying ways to recover value and exploring means of appropriately compensating key stakeholders such as First Nations. Given the lack of near term domestic need, provinces can focus on efficient project closure before exploring how best to meet long-term needs. However, the answer to that question almost certainly incorporates a portfolio of smaller-scale, shorter lead time, clean-resources dispersed geographically and temporally procured under a mix of ownership structures.

Institutional Independence Must be Strengthened

The nature of our parliamentary system means that governments with strong majorities can make quick changes to laws, restructuring regulatory institutions, changing their mandates, and enhancing or diminishing their powers. Regulators are often bypassed, meaning that large investment decisions can be undertaken based on the political whims of the moment. It is critical that Canadian provinces develop a commitment to well-resourced, independent and empowered regulators. Processes for review of large-scale publicly owned projects should not be ad hoc, nor should provinciallyowned entities be given a free pass from review. Commitments to independent review increase as past projects are shown to be uneconomic. However, memories fade, the lure of a new ribboncutting becomes too much and regulatory bodies are bypassed again. To the extent possible, a commitment to stronger, independent regulation should be embedded in legislation, along with a set of procedures that make it more difficult to circumvent that promise in future laws.

Greater private sector participation may increase discipline

Privatization is not a panacea; it needs to be accompanied by clear regulation and sound market rules. However, private sector involvement comes in a wide range of forms; indeed, Canada has been a leader in forms of inclusive privatization, which enable participation by pension funds, First Nations, and unions in the newly private entity. Large hydro sites could be auctioned or leased to private-public partnerships to improve price discovery and risk allocation, for example. In the Canadian context, where Crown corporations using ratepayer money become instruments of public policy, increasing private sector involvement can help prevent provinces from making costly mistakes.

Canadian provinces have significant capital locked up in mature industries in which private investment is common elsewhere in the world. Ironically, Canadian pension funds are among the leading investors in such assets outside of Canada. Provincial funds that are currently devoted to the utility sector can be recycled into activities where government investment provides a greater catalyst to growth and private investment is less available. Criticisms of recent privatizations, such as that of Hydro One, almost always miss the point that governments have funding constraints in other infrastructure areas that have higher social returns.

Even if the independence of Canadian regulatory institutions were strengthened, governments are notoriously bad at regulating themselves. Increasing private sector involvement in turn increases the independence of the regulator, because the regulator's rulings have greater consequences shareholders losing money tend to put pressure on their boards to change their behaviour. Crown corporations losing money (or not making as much as they should) may be tolerated for a much longer period of time. Private entities would have been less likely to continue to greenlight further expenditures as cost overruns soared and market conditions deteriorated. Regulators would also have been better able to order reviews of imprudent investments by private utilities. For projects that cannot be cancelled, or are past the point of economically doing so, the respective provincial

governments should at least explore the value that the private sector would put on the project going forward to determine whether any new risk-sharing arrangements are feasible.

SHORT-TERM PAIN FOR LONG-TERM GAIN

While the decision to cancel projects is politically difficult, clever regulatory accounting may enable more muted rate increases than those that have already been announced. For example, longer amortization of cancellation costs, coupled with avoidance of future costs, should enable demonstrable ratepayer benefits to be achieved. Provincial utilities sometimes point to current low rates as meaning that rate increases have limited impact. Yet those rate increases, when arising due to uneconomic choices, erode the competitive advantage of those provinces. This advantage is already under threat from lower US tax rates and falling US wholesale power prices as a result of low natural gas prices and substantial renewables production.

Cancelling uneconomic projects now is the right choice. Enshrining regulatory independence and private-sector participation will help shield ratepayers from future bad decisions.

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ARTICLE

Mapping the world's free-flowing rivers

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Free-flowing rivers (FFRs) support diverse, complex and dynamic ecosystems globally, providing important societal and economic services. Infrastructure development threatens the ecosystem processes, biodiversity and services that these rivers support. Here we assess the connectivity status of 12 million kilometres of rivers globally and identify those that remain free-flowing in their entire length. Only 37 per cent of rivers longer than 1,000 kilometres remain free-flowing over their entire length and 23 per cent flow uninterrupted to the ocean. Very long FFRs are largely restricted to remote regions of the Arctic and of the Amazon and Congo basins. In densely populated areas only few very long rivers remain free-flowing, such as the Irrawaddy and Salween. Dams and reservoirs and their up- and downstream propagation of fragmentation and flow regulation are the leading contributors to the loss of river connectivity. By applying a new method to quantify riverine connectivity and map FFRs, we provide a foundation for concerted global and national strategies to maintain or restore them.

Rivers are essential sources of environmental health, economic wealth and human well-being. For millennia, rivers have provided food, contributed water for domestic use and agriculture, sustained transportation corridors and, more recently, enabled power generation and industrial production¹. These goods and services generally require built infrastructure, and society has addressed this demand by constructing an estimated 2.8 million dams (with reservoir areas $>10^3 \text{ m}^2$)², regulating and creating over 500,000 km of rivers and canals for navigation and transport^{3,4} and building irrigation and water-diversion schemes. As a result, rivers are exposed to sustained pressure from fragmentation and loss of river connectivity, constraining their capacity to flow unimpeded, affecting many fundamental processes and functions characteristic of healthy rivers⁵ and leading to the rapid decline of biodiversity and essential ecosystem services⁶.

The capacity of rivers to flow freely is governed by the connectivity of pathways that enable the movement and exchange of water and of the organisms, sediments, organic matter, nutrients and energy that it conveys throughout the riverine environment. River connectivity extends in four dimensions: longitudinally (up- and downstream in the river channel), laterally (between the main channel, the floodplain and riparian areas), vertically (between the groundwater, the river and the atmosphere) and temporally (seasonality of flows)^{7,8}. River connectivity is also spatially and regulating hydrological, geomorphic and ecological processes in river networks and providing the aquatic medium for matter and species to move along the river and into adjacent habitats¹⁰. Humans have altered natural river connectivity in

multiple ways, either directly, by placing structures into the longitudinal or lateral flow paths, such as dams and levees, or indirectly, by altering the hydrological, thermal and sediment regimes of the river^{11,12}.

Although it is inherently complex to quantify the value of services provided by FFRs or to measure the devaluing effect of impeding infrastructure, many examples exist that underline the importance of connectivity for the provision of natural riverine ecosystem functions and processes. For instance, floodplains are among the most productive and diverse riverine ecosystems globally¹³, and their disconnection from the upstream catchment or river channel alters ecosystem services such as natural flood storage, nutrient retention and flood-recession agriculture¹⁴. Built river infrastructure has also been linked to declines in terrestrial and freshwater species^{11,15–17}, and sediment capture by dams may cause the alteration of the geomorphic dynamics of rivers and the shrinking of river deltas worldwide¹⁸. Although advances in the socio-economic valuation of river connectivity have emerged-for example, inland fisheries provide the equivalent of all dietary animal protein for 158 million people globally, particularly for poor and undernourished populations¹⁹—more comprehensive and detailed studies are needed²⁰

Acknowledging the importance of river connectivity, a decade ago the Brisbane Declaration²¹ called for the identification and conservation of "a global network of FFRs", and in 2015 the world's governments committed to "protect and restore water-related ecosystems" under the United Nations' Sustainable Development Goals (target 6.6). Nevertheless, continued and accelerating declines in river connectivity, aquatic biodiversity and associated ecosystem services remain a

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global challenge. The rising demands for energy, water supply and flood management increasingly call for engineering solutions such as the construction of dams, levees and other water-diversion structures. Indeed, more than 3,700 hydropower dams (>1 MW) are currently planned or under construction worldwide²². Asia is a hotspot for dam construction with over 15 GW capacity added in 2016, and the Balkans, the Amazon, China and the Himalayas are facing major booms in hydropower construction^{23,24}. Furthermore, several countries are either planning or building extensive inland water-transfer and navigation schemes (for example, India, China and Brazil), which require river dredging, channelization or the instalment of locks and dams²⁵.

Paramount to the conservation and restoration of FFRs is the availability of a comprehensive global information system that allows assessing the current state and monitoring future trends of river connectivity. Previously, fragmentation and flow regulation by dams were either quantified worldwide at relatively coarse spatial scales^{26,27} providing snapshot assessments for large river basins only²⁸, or relied on spatially inexplicit surrogates for dam impact, such as dam density¹⁷. Recent improvements in the accessibility and resolution of global hydrological data have allowed more detailed and comprehensive assessments of rivers, including the development of advanced metrics of fragmentation at the river-reach scale²⁹. Building on these advances, we provide the first high-resolution and replicable global assessment of the location and extent of FFRs.

Without an existing scientific definition of FFRs, practitioners and scholars have in the past used the term 'free-flowing' to describe rivers that are 'unimpounded' or 'unregulated' by the presence of dams or by flow alterations downstream of reservoirs^{27,28,30}. Expanding on this traditional view, which focused mostly on longitudinal connectivity, we here propose a more comprehensive definition based on four dimensions of connectivity, explicitly recognizing that connectivity is necessary within all of those dimensions for a river to flow freely.

We define FFRs as rivers where ecosystem functions and services are largely unaffected by changes to the fluvial connectivity, allowing unobstructed movement and exchange of water, energy, material and species within the river system and with surrounding landscapes. Fluvial connectivity encompasses longitudinal (river channel), lateral (floodplains), vertical (groundwater and atmosphere) and temporal (intermittency) components (Box 1) and can be compromised by (i) physical infrastructure in the river channel, along riparian zones or in adjacent floodplains; (ii) hydrological alterations of river flow due to water abstractions or regulation; and (iii) changes to water quality that lead to ecological barrier effects caused by pollution or alterations in water temperature.

Following this definition, we identified five pressure factors to represent the main human interferences within the four dimensions of fluvial or river connectivity: (1) river fragmentation (longitudinal); (2) flow regulation (lateral and temporal); (3) sediment trapping (longitudinal, lateral and vertical); (4) water consumption (lateral, vertical and temporal); and (5) infrastructure development in riparian areas and floodplains (lateral and longitudinal). There are additional pressures that would merit inclusion, such as temperature alterations, changes in hyporheic flows under and alongside rivers, and pollution. However, owing to the lack of suitable datasets at the global scale, we are unable to include them in this assessment.

To quantify each of the five pressure factors, we compiled and constructed six representative proxies, that is, pressure indicators, informed by available global data and numerical model outputs (Extended Data Table 1). The analyses were conducted using a high-resolution (500 m) river network model³¹ that comprises about 8.5 million individual river reaches, with an average reach length of 4.2 km. For the purpose of this paper, we define a 'river reach' as a cartographic—rather than a functional—unit, represented by the smallest spatial element of our river network, that is, the line segment between two neighbouring confluences; a 'river stretch' as two or more contiguous reaches, but not the entire river; and a 'river' as the aggregation of river reaches that form a single-threaded, contiguous flow path from the headwater source to the

Box1 Hydrographic framework and definition of free-flowing rivers

We propose a definition of free-flowing rivers (FFRs) that expands beyond previous efforts and is based on five pressure factors that relate to four connectivity dimensions. Our methodology uses global datasets of hydrography and pressure indicators to create an integrated connectivity status index (CSI). Only rivers with high levels of connectivity in their entire length are classified as freeflowing. For further details see Extended Data Figs. 1, 2.

Hydrographic framework. River reach: smallest element in the river network and unit for the calculation of the CSI. River: linear feature that consists of multiple river reaches. Tributaries form new rivers. Free-flowing status is determined at the scale of the entire river.

Connectivity dimensions. Four dimensions are considered to determine the CSI of river reaches: (1) longitudinal (connectivity between up- and downstream), (2) lateral (connectivity to floodplain and riparian areas), (3) vertical (connectivity to groundwater and atmosphere) and (4) temporal (connectivity based on seasonality of flows).

FFR status. Free-flowing river status is determined on the basis of CSI. Only rivers with high levels of connectivity (CSI \geq 95%) throughout their entire length are considered FFRs.



river outlet (that is, the river's mouth at the ocean, an inland depression or a confluence with a larger river). Guided by published literature and expert judgement, we applied a set of weights within a multi-criteria model to derive a novel, integrated connectivity status index (CSI) that quantifies connectivity ranging from 0% to 100%, which was applied to every individual river reach. Finally, we defined FFRs as those rivers with a CSI at or above 95% over their entire length from source to river outlet (Box 1) and then mapped their distribution and quantified their extent.

Global river connectivity at river-reach scale

About half of all river reaches globally show diminished connectivity (CSI < 100%; Fig. 1), and almost 10% of analysed global river reaches (more than 1.1 million kilometres) have a CSI value below 95%, indicating major losses of connectivity. Large contiguous river networks with intact natural connectivity (CSI = 100%) remain only in remote regions of the Arctic, in the Amazon Basin and, to a lesser degree, in the Congo Basin.

Dams and reservoirs and their up- and downstream propagation of fragmentation and flow regulation are the leading contributors to major connectivity loss in global river reaches (Fig. 2). The fragmentation effect of dams is the dominant pressure factor in more than two-thirds



Fig. 1 | Connectivity status index of the world's river reaches. Of all river reaches in the database, 48.2% (by number) are impaired by diminished river connectivity to various degrees (CSI < 100%). The blue

shades represent the magnitude of river discharge for river reaches with CSI = 100% (that is, darker shades for larger rivers).



Fig. 2 | **Dominant pressure indicator for global river reaches below the CSI threshold of 95%.** The dominant pressure indicator—the most important pressure indicator for river reaches with CSI < 95% contributed the most to the final CSI value after applying the weighting scheme. Pressure indicators include the DOF (degree of fragmentation), DOR (degree of regulation), SED (sediment trapping), USE (consumptive water use) and URB (urban areas). The RDD (road density) does not occur as a dominant pressure indicator on the map. The inset shows the number and proportion of river reaches per dominant pressure indicator at the global scale.

Table 1 | Number and length of the world's free-flowing rivers (FFRs) and non-free-flowing rivers (NFFRs)

· .	Short (1	10–100 km)	Medium	(100–500 km)	Long (5	00–1,000 km)	Very lor	ıg (>1,000 km)	Total
Continent	FFRs	NFFRs	FFRs	NFFRs	FFRs	NFFRs	FFRs	NFFRs	
Number of FFRs and NF	FRs								
Africa	34,402	440	2,663	369	129	51	27	31	38,112
Asia	68,472	4,676	3,246	958	113	90	23	46	77,624
Australia	26,889	273	1,045	117	40	20	3	2	28,389
Europe	25,882	1,639	1,344	699	33	66	3	22	29,688
North America	46,504	1,674	2,325	725	43	83	11	33	51,398
South America	78,556	1,234	2,410	414	95	50	23	22	82,804
Total	280,705	9,936	13,032	3,282	453	360	90	156	308,015
% of category	97	3	80	20	56	44	37	63	
Accumulated length (×10 ³ km) of FFRs and NFFRs									
Africa	1,028.2	22.4	468.4	80.0	83.4	34.1	42.1	52.0	1,810.6
Asia	1,900.6	166.1	556.2	188.0	74.4	62.1	41.7	100.0	3,089.1
Australia	629.6	11.3	177.7	23.8	28.3	14.1	4.9	4.3	893.9
Europe	809.0	74.7	221.0	140.8	20.6	47.1	4.4	37.4	1,354.9
North America	1,364.1	72.7	376.9	145.6	28.9	55.8	14.3	62.0	2,120.2
South America	1,837.7	47.6	413.8	86.1	61.8	34.4	40.2	42.8	2,564.4
Total	7,569.1	394.8	2,214.0	664.3	297.3	247.5	147.7	298.4	11,833.1
% of category	95	5	77	23	55	45	33	67	
Number of FFRs and NF	FRs connected	I to the ocean							
Africa	851	37	244	60	16	19	3	14	1,244
Asia	3,355	477	281	172	18	16	8	18	4,345
Australia	5,447	73	345	53	27	9	1	1	5,956
Europe	2,962	323	207	181	9	28	2	14	3,726
North America	5,122	87	462	56	19	29	6	12	5,793
South America	2,468	146	283	118	15	20	1	11	3,062
Total	20,205	1,143	1,822	640	104	121	21	70	24,126
% of category	95	5	74	26	46	54	23	77	

of impacted river reaches below the 95% threshold, followed by flow regulation, affecting one quarter, and sediment trapping, affecting almost 5% of river reaches. Consumptive water use and infrastructure development in riparian areas and floodplains, including roads, urbanization and levees, are important in rivers where dams are less widespread—for example, in highly irrigated regions of India and China—and in densely urbanized areas in western Europe. These pressure factors affect less than 5% of impacted river reaches combined.

Remaining FFRs

By number, 63% of the world's very long rivers (>1,000 km) are no longer free-flowing (Table 1), representing 41% of the global river volume²⁶. Both very long and long FFRs (>500 km) are largely absent from the mainland United States, Mexico, Europe and the Middle East, as well as parts of India, southern Africa, southern South America, China and much of Southeast Asia and southern Australia (Fig. 3). The remaining very long and long FFRs are restricted to the northern parts of North America and Eurasia, the Amazon and Orinoco basins in South America, the Congo Basin in Africa and to only a few areas in Southeast Asia, including the Irrawaddy and Salween basins. For example, eight of the ten longest FFRs in South America are located within the Amazon Basin (Supplementary Table 1).

FFRs still connected to the ocean exhibit similar patterns; those that remain are found predominantly in the Arctic, in a few areas in Southeast Asia and in the neo- and afrotropics. Source-to-sea connections have been severed in 77% of very long rivers (>1,000 km) and in 54% of long rivers (500–1,000 km).

Within rivers that are classified as non-free-flowing owing to one or more impacted reaches (CSI < 95%) along their course, there can be

extensive stretches that maintain high levels of connectivity. Among non-FFRs worldwide, a total of 542,000 km of river reaches can be classified as having a 'good connectivity status' (CSI \geq 95%), with 98 contiguous river stretches longer than 500 km, including substantial parts of the Brahmaputra (India and Bangladesh), Orinoco (Venezuela and Colombia) and Amur (Russia) (Fig. 3, Extended Data Table 2).

Validation, limitations and scalability

Our global results suggest that the degree of river connectivity increases with decreasing river length. A total of 56%, 80% and 97% of rivers with lengths of 500-1,000 km, 100-500 km and 10-100 km, respectively, are identified as free-flowing (Table 1). This pattern can be partially attributed to the biased global distribution of small rivers that occur preferentially in the remote, water-rich and relatively unaffected regions of the Amazon and Congo basins. However, it is also important to carefully interpret the status of short rivers, recognizing the limitations of underpinning global datasets in representing pressure factors, particularly the lack of georeferenced data on small dams, barriers and diversions. Our study considers more than 20,000 dams, as provided by global databases^{2,32}; yet countless small dams exist worldwide³³. Therefore, we expect that numerous short rivers are false positives and are classified as free-flowing despite impeding infrastructure projects that are not currently included in global datasets, such as in highly developed regions of Europe and North America. This fundamental data limitation underscores the need for governments and global institutions to fund the acquisition of high-resolution geographic water infrastructure data.

To further corroborate the applied weightings and thresholds, we performed scenario analyses and conducted benchmarking and



Fig. 3 | **Map of the world's free-flowing rivers.** This map shows the global distribution of FFRs, contiguous river stretches with good connectivity status and impacted rivers with reduced connectivity. Rivers that are not free-flowing over their entire length (that is, partially below the CSI threshold) are divided into stretches with good connectivity status

(that is, the connectivity status remains above the threshold throughout the stretch; green colours) and stretches where the connectivity status is below the CSI threshold (red colours). A list of FFRs longer than 500 km is given in Supplementary Table 1.

sensitivity assessments to test the robustness of our results, and we quantified the modelled upstream effects of fragmentation, which represent a particularly novel and uncertain aspect (see Methods). Our evaluations generally indicate that the proposed indices are adequate surrogates for the selected pressure factors at the global scale. However, we advise careful interpretation of the results at smaller scales, unless additional confirmation through local validation is achieved, and we propose that national or regional studies use adjusted parameter settings informed by local knowledge.

To guide the development and test the performance of our global approach at different scales, we conducted three case studies for large (Tapajos, Brazil), medium (Luangwa, Zambia) and small (headwaters of Ganges, India) river basins, where we piloted the methodology with additional local information. Empirical application of our methods in these regions helped to improve the identification and evaluation of FFRs worldwide, in particular for short rivers. The results from these case studies indicate that our global methodology is robust for long rivers and scalable to regional and local studies if additional data are available.

The CSI and FFR methodologies presented here provide metrics for evaluating river connectivity as one of the fundamental components of ecosystem health^{17,34,35}. However, a comprehensive evaluation of river health should include other components—such as water quality, land use and an assessment of biological and ecological conditions, including invasive species—that also shape ecosystem integrity³⁶. Nonetheless, the river connectivity metrics provided here are considered to be key components in any future comprehensive investigation of river health, locally and globally. Furthermore, it should be noted that artificial increases in connectivity, such as those caused by inter-basin canal systems and water-transfer schemes or by constant water release from dams in naturally intermittent streams, can also compromise ecosystem health³⁷ or favour the spread of invasive species³⁸.

A global conservation challenge

With their numbers reduced to 37%, very long FFRs (>1,000 km) have become increasingly rare and remain prevalent only in remote areas of the world that are difficult to exploit economically (for example, the Arctic), in rivers too large to be developed by current technology (although this is changing as engineering techniques advance) or in less developed regions (for example, the Congo region). Of special concern is the loss of connectivity of very long and long rivers to the sea because they are of vital importance for the exchange of water, nutrients, sediments and species with deltas, estuaries and the ocean. Some remaining long FFRs deliver disproportionately high levels of certain ecosystem services, most notably inland and floodplain fisheries, sediment transport and biodiversity^{18,19,24}. For example, the last two remaining very long FFRs in Southeast Asia-the Irrawaddy and Salween rivers-are critical sources of protein from inland fisheries, providing more than 1.2 million tonnes of catch annually³⁹, and their flow regimes maintain extensive floodplain agriculture in a region inhabited by more than 30 million people.

Given the importance of FFRs, plans to rapidly develop new infrastructure in basins around the world should be accompanied by comprehensive strategic and transboundary impact assessments and consider alternative development pathways to minimize harmful consequences^{40,41}. In a world of accelerating hydropower development⁴² and a shift to low-carbon economies, forward-looking systemscale approaches to energy and hydropower planning, including multiobjective trade-off analyses, are required to minimize loss of river functions while meeting energy targets⁴³. Equally important is the need to find sustainable solutions to close the gap between irrigation demand and extreme water stress⁴⁴. Our data, methods and results can play a critical part in such efforts, prioritizing rivers with high conservation value for protection and optimizing the informed selection of low-impact infrastructure developments. In a decision-making context at national or basin scales, we recommend applying the proposed methods using finer-resolution or higher-quality data (for example, measured instead of modelled discharge), replacing proxy indicators with more explicit substitutes (for example, levees and culverts instead of urbanization and roads), using additional information on variables not available at the global scale (for example, location and storage volume of small dams, operating rules of reservoirs) and adjusting pressure-indicator settings and weightings to better reflect their local importance (for example, by considering known migratory pathways of fish).

In addition, by using more detailed local or regional data, our framework could be applied to target restoration interventions towards locations or methods that improve connectivity most effectively^{45,46}. New and existing algorithms could assist in finding strategies to restore or retrofit affected river systems, such as by minimizing flow regulation, strategic removal of dams or levees (especially where they are obsolete or where maintenance is disproportionately costly) or designing and constructing more effective fish passages that would deliver the greatest return in terms of increasing CSI as well as offering some assurance of effectiveness^{47,48}.

The CSI is a novel metric that offers a range of opportunities for future application. It provides a comprehensive characterization of every individual river reach, unlike previous efforts that focused primarily on the assessment of longitudinal dam impacts or provided metrics only at lumped-basin scales. Although the role of dams in river fragmentation and flow regulation has been shown to be prevalent (Fig. 2), the CSI also accounts for other factors that disrupt the longitudinal, lateral, vertical and temporal components of connectivity. On the basis of the CSI, our novel and integrated method for quantifying connectivity enables the assessment of rivers across multiple scales, from individual reaches of less than one kilometre length to rivers longer than 1,000 km, with discharges spanning more than seven orders of magnitude.

Looking forward

Global environmental change, including climate and land use change, will further increase the pressure on rivers and their connectivity through alterations in flow patterns and intermittency, modifications in the frequency, magnitude and timing of droughts or floods, and changes to water quality and biological communities³⁰. FFRs may increase the resilience of aquatic and riparian ecosystems under these added stresses because they provide open pathways for species movement to suitable habitats in other parts of the basin in response to rising temperatures or other changing conditions⁴⁹. To maintain this resilience, infrastructure planning and decision making should maintain connected networks of rivers and include scenarios of future environmental change in development plans.

The international community is committed to protecting and restoring rivers under Agenda 2030 for Sustainable Development, which calls on all countries to track, at a national scale, the spatial extent and condition of water-related ecosystems⁵⁰. The present study delivers methods and data necessary for defining the baseline and for tracking changes in the connectivity status of rivers, and comprehensively identifies the distribution and extent of globally remaining FFRs. Given the current status and future perspective, action is needed to protect or restore these threatened fluvial systems, which provide some of the most diverse and dynamic environments worldwide.

Online content

Any methods, additional references, Nature Research reporting summaries, source data, statements of data availability and associated accession codes are available at https://doi.org/10.1038/s41586-019-1111-9.

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METHODS

Overview. The methodology of our assessment was collaboratively developed over the course of three years by a group of over 30 scientists, conservation practitioners and industry representatives, in an attempt to update an earlier global assessment of FFRs⁵¹. The main steps are detailed below and depicted in Extended Data Fig. 1. We first developed a comprehensive definition of FFRs (step 1) including multiple aspects of connectivity. Next, we identified five major pressure factors (step 2) that influence river connectivity according to an extensive literature review. These pressure factors are: (1) river fragmentation, (2) flow regulation, (3) sediment trapping, (4) water consumption (surface or groundwater abstractions) and (5) infrastructure development in riparian and floodplain areas. We selected these factors to cover the full spectrum of impacts on river connectivity while attempting to avoid inter-correlation among factors—although we acknowledge that some level of inter-correlation is inherent owing to the general global drivers of human population densities and economic development.

To quantify each pressure factor, we calculated six proxy indicators (step 3) using data from available global remote-sensing products, other data compilations, or numerical model outputs, such as discharge simulations (Extended Data Table 1). The pressure factor for infrastructure development in riparian and floodplain areas has two pressure indicators to more broadly cover the different types of infrastructure development in these areas. We specifically chose indicators that we expect to have substantial influence on connectivity and can be generated using robust global datasets of sufficient quality and consistency between countries and regions. All pressure indicators were calculated for every river reach of the global river network.

Guided by literature reviews and expert judgement, we then developed a weighting model to combine the six pressure indicators (step 4). We developed 100 weighting scenarios and tested different thresholds to yield a best match between the resulting FFRs and a benchmarking dataset of reported FFRs compiled from literature resources and expert input.

The final selection of weights was applied in a multi-criteria average calculation to derive the CSI for every river reach (step 5). The CSI ranges from 0% to 100%, the latter indicating full connectivity. Only river reaches with a CSI of \geq 95% were considered as having good connectivity status whereas river reaches below 95% were classified as impacted (step 6). Finally, river reaches were aggregated into rivers, that is, contiguous flow paths from the source to the river outlet. If a river is at or above the CSI threshold of 95% over its entire length it is declared to be an FFR. Otherwise, the river is declared not free-flowing, yet it can maintain a mix of stretches with good connectivity status and stretches that are impacted.

Hydrographic framework. We integrated all indicator datasets in our modelling framework using the spatial units of the HydroSHEDS database. HydroSHEDS is a hydrographic mapping product that provides river and catchment information for regional and global-scale applications in a consistent format³¹, including catchment areas and discharge estimates. For this study, we extracted a global river network from the provided drainage direction grid at 500 m pixel resolution by defining streams as all pixels that exceed a long-term average natural discharge of 0.1 m³ s⁻¹ or an upstream catchment area of 10 km². We refrained from including streams below these thresholds as they are increasingly unreliable in their representation through global datasets. These selection criteria resulted in 8,477,883 individual river reaches (that is, line segments between confluences) with an average length of 4.2 km (s.d. = 4.8 km), totalling 35.9 million kilometres of river network. Each river reach is linked to a polygon of its contributing hydrological sub-catchment, with an average area of about 12 km².

For the purpose of this paper, we define a 'river reach' as a cartographic—rather than a functional—unit, represented by the smallest spatial element of our global river network, that is, the line segment between two neighbouring confluences; a 'river stretch' as two or more contiguous reaches, but not a full river; and a 'river' as an aggregation of river reaches that form a single-threaded, contiguous flow path from the headwater source to the river outlet. The river outlet can represent the river mouth at the ocean, a terminal inland depression or the confluence with a larger river (Extended Data Fig. 2). It should be noted that although we used the full river network to conduct the initial calculations, we removed all rivers from the statistical analyses and reported results that were shorter than 10 km, showed an average annual river flow of less than 1 m³ s⁻¹ or were in hot or cold deserts according to existing physiographic maps, to exclude increasingly uncertain results of smaller rivers. These selection criteria resulted in 308,015 distinct rivers with a total length of 11.7 million kilometres globally.

For every river reach, estimates of long-term (1971–2000) discharge averages have been derived through a geospatial downscaling procedure²⁹ from the 0.5°-resolution runoff and discharge layers of the global WaterGAP model (version 2.2 of 2014)⁵². WaterGAP is a well documented and validated integrated waterbalance model that simulates both natural discharge (that is, without human modifications) and anthropogenic discharge; for the latter, consumptive water use—that is, total water abstractions minus return flows—are calculated for agricultural (mostly irrigation), industrial and municipal sectors⁵³. A validation of the downscaled discharge estimates against observations at 3,003 global gauging stations⁵⁴, representing river sizes from 0.004 to 180,000 m³ s⁻¹, confirmed good overall correlations for long-term average discharges ($R^2 = 0.99$ with 0.2% positive bias and a symmetric mean absolute percentage error sMAPE⁵⁵ of 35%, improving to 13% for rivers \geq 100 m³ s⁻¹).

For all network calculations, we applied the global river routing model HydroROUT²⁶, which is built upon the HydroSHEDS database and features a nested, multi-scale model approach and advanced implementation of connectivity and uses a novel object-oriented vector data structure in a graph-theoretical framework. HydroROUT was implemented in this study to calculate indicators at the river reach scale as described below.

Pressure indicators. *Degree of fragmentation (DOF).* River fragmentation indices typically measure the degree to which river networks are fragmented longitudinally by infrastructure, such as hydropower and irrigation dams. Fragmentation prevents effective ecological processes that depend on longitudinal river connectivity, including transport of organic and inorganic matter and upstream and downstream movements of aquatic and riparian species. Although passive movement (drifting) may be impeded primarily in the downstream direction, active movement (for example, fish migration) operates in both the up- and downstream directions, and considerable evidence points to the upstream effects of dams, such as reported changes in fish assemblage structure associated with stream bank destabilization⁵⁶, increased richness of fish macrohabitat generalists⁵⁷, decreased juvenile fish survival⁵⁸ and decreased native fish diversity⁵⁹ in streams above reservoirs.

For this study, we developed the DOF as a new index at the river-reach scale intended to characterize the magnitude and spatial extent of reduced longitudinal connectivity due to anthropogenic barriers in the river channel. It identifies river reaches up- and downstream of a dam or impoundment as being fragmented, and it assigns levels of fragmentation based on the 'distance' from the impact location, which we determine by measuring the dissimilarity of river sizes in terms of flow quantities.

We suggest that: (1) river discharge can serve as a coarse proxy for the occurrence of species assemblages that utilize a certain range of river flow⁶⁰; (2) discharge can also serve as a proxy for 'distance' in the traditional (spatial) sense (that is, greater differences in discharge are expected at larger distances from a given location), and increasing distance allows amelioration effects of the fragmentation impact (for example, through continued water and sediment influx from new tributaries and local contributing areas); and (3) differences in discharge can serve as a proxy for environmental disparity and natural discontinuities because river stretches with highly dissimilar discharges, such as the confluence of a small tributary into a major river, are assumed to be less representative of continuous environmental conditions. We thus based the conceptual approach of calculating the DOF on the similarity of river sizes determined by their discharges. The DOF assumes that the fragmentation effect diminishes as river sizes become increasingly dissimilar from the river size at the barrier location in both the up- and downstream directions (Extended Data Fig. 3).

Guided by the involved expert group and the explicit examination of case studies from the Tapajos, Luangwa and Ganges rivers, we tested several options (Extended Data Fig. 3c) and finally applied a fivefold (that is, half order of magnitude) increase or decrease in discharge as the maximum discharge range (dr) in which impacts of the DOF would appear (that is, dr = 5 in equation (1) below). A logarithmic, rather than linear, decay function was chosen to calculate the DOF values to better appropriate typical growth and decline rates of dendritic network structures. The DOF was scaled to values between 0% and 100% and was calculated for an individual barrier in both the up- and downstream directions as:

$$DOF_{j} = 100 - \frac{|\log_{10} d_{bloc} - \log_{10} d_{j}| \times 100}{\log_{10}(dr)}$$
(1)

where DOF_j is the DOF at river reach *j* up- or downstream of the barrier, *d_j* is the natural average discharge of river reach *j*, *d_{bloc}* is the natural average discharge at the location of the barrier under investigation and dr is the maximum discharge range beyond which no fragmentation effects are expected. In reaches where DOF values of multiple barriers overlap, the maximum value is applied.

For the DOF analysis we included 6,849 large dams (\geq 15 m high and \geq 0.1 km³ storage capacity, with few exceptions) as compiled in the Global Reservoir and Dam (GRanD) database² after removing a small number of dams with undefined status. We also added 13,195 dams from the GlObal geOreferenced Database of Dams (GOODD)³² representing medium-size dams that are visible on global remote-sensing imagery and that we confirmed against existing reservoir polygons of the HydroLAKES database⁶¹. An additional 76 dams were added to account for the construction of large dams in key rivers since the publication of the databases.

Also, for the first time in a global study, the natural fragmentation effect of waterfalls was taken into account by incorporating a global database of 4,055 waterfalls⁶². After removing records that were flagged as uncertain, 2,436 waterfalls were

geo-located to our river reaches. The underlying premise is that waterfalls act as natural discontinuities, hence the fragmentation effect of artificial dams should not extend beyond the existing barrier; for example, a dam just downstream of a waterfall should not be considered to affect the river upstream of the fall. Because the barrier effect from waterfalls accounts primarily in the upstream direction, the DOF algorithm was modified to stop extending upstream if encountering the location of a waterfall, whereas no waterfall effect was assumed in the downstream direction.

Degree of regulation (DOR). The DOR provides an index to quantify how the storage of water in a dam or set of dams can alter the natural flow regime of downstream river reaches^{2,63}. While fragmentation (DOF) measures the longitudinal effects caused by barriers, flow regulation (DOR) affects primarily lateral and temporal connectivity as, for example, the reduction of peak flows impedes species movement and exchange of materials and energy to and from floodplains. Furthermore, temporal connectivity can be altered due to delayed release patterns and resulting shifts in the timing of flow events.

The concept of the index is based on the relationship between the storage volume of a reservoir and the total annual river flow volume at the dam's location, and is expressed as the percentage of river flow volume that can be withheld in the dam's reservoir, represented by:

$$\text{DOR}_{j} = 100 \times \frac{\sum_{i=1}^{n} \text{svol}_{i}}{d_{\text{vol}}}$$
(2)

where DOR_j is the DOR at river reach *j*, svol_i is the storage volume of any reservoir *i* upstream of river reach *j*, *n* is the total number of reservoirs upstream of river reach *j*, and d_{vol} is the natural average discharge volume per year at river reach *j*. The underlying assumption is that a large reservoir on a river with low annual discharge will generally have a larger regulatory effect on the natural flow regime than a small reservoir on a river with higher flow rates.

In this study, we capped the DOR at 100%, which limits all multi-year reservoirs to the same maximum DOR. We used the same selection of 20,120 dams for DOR calculations as described for the DOF above. Reservoir storage capacities were either taken directly from the available GRanD records or, in the case of GOODD, estimated from reservoir areas (as provided by HydroLAKES) using statistical approaches².

Sediment trapping index (SED). Sediment connectivity is a key driver for morphodynamic processes in small upland streams, as well as in large lowland rivers^{64,65}, which eventually form the physical template for fluvial ecosystems. Dams have been shown to capture large amounts of sediments in their reservoir impoundment⁶⁶, with the amount of sediment being trapped determined by dam design and operation and by the spatial heterogeneity of natural sediment flux in the river network⁴¹. This sediment capture can trigger a cascade of impacts on fluviogeomorphological dynamics and processes far downstream, and reduce sediment delivery for floodplains and deltas alike⁶⁷, ultimately impacting coastal morphology and leading to increased rates of delta subsidence and coastal erosion^{18,68,69}.

Owing to data limitations, the deterministic modelling of sediment transport processes in individual river reaches is currently limited to regional scales^{70,71}. Here we developed a novel global index, SED, as a proxy of dam impacts on longitudinal sediment fluxes in a river network. The SED quantifies the proportion of potential sediment load (PSL) trapped by dams at any given point in the river system (see Extended Data Fig. 4). It focuses on suspended load because there are currently not enough observations to build a model for the partitioning between bed-load and suspended load on global scales⁷². The SED therefore provides a lower-bound estimate for dam impacts on river sediment budgets, not considering the trapping of around 1%–5% of the total sediment load (for large rivers) transported as bed-load⁷².

Because the PSL in rivers is driven by sediment supply, we used a highresolution (250 m) global erosion map as a proxy to calculate the sediment supply to rivers. The erosion map combines natural forcing factors—such as erosivity, topographical conditions of the hill slopes and soil properties with land use, cropping systems and conservation practices⁷³—and considers mobilization of sediment from sheet and rill erosion, but neglects denudation and fluvial conveyance processes. Despite these limitations, the spatially explicit estimates of sediment displacement represent an indicator to quantify the potential spatial variability in sediment supply within basins.

We used the erosion map in our global routing model to quantify the accumulated sediment load in the river system at each river reach, and we accounted for both natural and artificial sediment trapping in lakes and reservoirs by multiplying the accumulated sediment loads with respective trapping efficiencies. The PSL values were calculated in a recursive process from upstream to downstream reaches as:

where
$$PSL_j$$
 is the PSL of reach *j*, PSL_i is the PSL of each directly contributing upstream reach *i* after lake trapping, *n* is the number of directly contributing upstream reaches, ss_j is the sediment supply from local erosion in the sub-catchment of reach *j* and TE_{lak,j} is the trapping efficiency of all lakes located on reach *j*.

We then calculated the modified sediment load (MSL), which represents the sediment load after trapping in reservoirs, again using a recursive upstreamto-downstream approach, as:

$$MSL_{j} = \left| \left(\sum_{i=1}^{n} MSL_{i} \right) + ss_{j} \right| \times (1 - TE_{lak + res,j})$$
(4)

where MSL_j is the MSL of reach *j*, MSL_i is the MSL of each directly contributing upstream reach *i* after lake and reservoir trapping, *n* is the number of directly contributing upstream reaches, ss_j is the sediment supply from accumulated erosion of reach *j* and TE_{lak+res,j} is the trapping efficiency of all lakes and reservoirs combined on reach *j*.

Trapping efficiencies for lakes and reservoirs were calculated following the method proposed by Brune⁷⁴, using storage volumes provided by GRanD and HydroLAKES and described for the DOR above. Brune's method is widely applied and has been found to provide reasonable estimates of long-term mean trapping efficiencies^{66,75,76}. It is expressed as:

$$TE_j = 1 - \frac{0.05}{\sqrt{\Delta\tau_j}}$$
(5)

with

$$\Delta \tau_j = \frac{\operatorname{svol}_j}{d_j} \tag{6}$$

where TE_{*j*} is the trapping efficiency of lakes and/or reservoirs located on reach j, $\Delta \tau_j$ is the local residence time change at river reach j in years, svol_j is the total storage capacity of all lakes and/or reservoirs on reach j and d_j is the discharge at the mouth of reach j.

Finally, we calculated the SED as a percentage value between 0% and 100% for every river reach:

$$\text{SED}_{j} = \frac{\text{PSL}_{j} - \text{MSL}_{j}}{\text{PSL}_{i}} \times 100 \tag{7}$$

To test the quality of our global sediment model results, we compared the PSL estimates against reported data of observed sediment transport at 398 gauging stations globally^{64,77–79}. Our estimates were able to explain 64% of global and 65% of continental variance in observed sediment load and more than 83% for three continents (North America, Asia and Europe). However, the intra-basin variance is most relevant to derive a plausible indicator for natural sediment origins and spatial patterns of sediment connectivity within individual river basins. Within three river basins with multiple observations (Blue Nile and Niger in Africa and Amazon in South America) and for four Asian river basins (Mekong, Irrawaddy, Salween and Red River), the modelled PSL explains on average 81% of the observed intra-basin variance, indicating a reasonable performance of our global sediment model.

To test the results of the modelled sediment trapping, we compared our results against 34 reported values for major global rivers (including Yangtze, Madeira, Mekong) as found in the literature^{70,74,80–85}. Our index was able to explain 76% of the variance indicating that the SED is a suitable proxy for dam impacts on sediment fluxes in global river networks.

Consumptive water use (USE). Water consumption for irrigation, industry, municipal uses and water transfer to other river systems may affect lateral connectivity as reduced flows limit access to riparian areas, and has implications on vertical connectivity through changes in groundwater recharge and evaporation. The timing and seasonality of water abstractions (for example, for irrigation purposes) can also alter temporal connectivity, and in cases where all water is consumed and rivers fall dry, even longitudinal connectivity is impeded, as evidenced by rivers such as the Colorado failing to reach the ocean owing to over-use.

Using downscaled outputs from the WaterGAP model (for details, see section 'Hydrographic framework'), we calculated water consumptive loss for our highresolution river network. The results provide for every river reach the long-term average reduction of river discharge due to anthropogenic water consumption as a percentage of natural flow:

$$\mathrm{PSL}_{j} = \left(\sum_{i=1}^{n} \mathrm{PSL}_{i} + \mathrm{ss}_{j}\right) \times (1 - \mathrm{TE}_{\mathrm{lak},j}) \tag{3}$$

$$USE_{j} = 100 \times \frac{d_{\text{nat}} - d_{\text{ant}}}{d_{\text{nat}}}$$
(8)

where USE_j is the consumptive water use at river reach *j*, d_{nat} represents the natural long-term discharge without human influences and d_{ant} represents the average long-term discharge after human abstractions and use.

Road density (RDD). Road density is a proxy for lateral disconnection from floodplains and longitudinal loss of connectivity at intersections with streams, in particular culverts. We used the vector dataset produced by the Global Road Inventory Project (GRIP, version 3)⁸⁶. The classified road categories 'freeways', 'primary', 'secondary' and 'tertiary' were treated as equally important in our density calculations, whereas the category 'local, residential and urban roads' was excluded to avoid collinearity effects with the urban areas (see below). We summarized the road density within a 1-km buffer around each river reach to produce an estimate of average road density (in percentage of surface area covered, assuming an average road width of 50 m) per river reach.

To eliminate isolated outlier effects on short river reaches (which in some instances can show disproportionally high road density values owing to geometric artefacts, rather than to real situations), we applied a customized geospatial filter for all river reaches <3 km in length: we compared every river reach value with its direct upstream and downstream neighbouring river reach; if the centre river reach showed a value that differed greatly (>15%) from the (length-weighted) average of the two neighbouring values, the centre value was replaced with that average. We applied these adjustments to the road density and nightlight intensity layers (see below), resulting in corrections of 0.0003% and 0.006% of affected river reaches, respectively.

Urban areas (URB). Urban areas and cities can affect lateral connectivity by reducing floodplain access owing to paving and urban infrastructure, as well as through artificial channelization or levee construction that confines the river bed and/or affects river meandering⁸⁷. Several studies on urbanization and rivers show that about 10% of contiguous impervious area within a catchment typically causes an observable and probably irreversible river degradation and loss of ecosystem functions^{88–90}. It should be noted that the URB is considered to be only a weak indicator for levee construction, yet no explicit and comprehensive data on levees or dykes exist globally.

As a proxy for urban effects on lateral river connectivity, we opted to use the global dataset of nightlight intensity data (DMSP-OLS version 4)⁹¹, which blends information on the degree of urbanization and the level of economic development⁹². We accounted for the 'light-bleeding' effect into adjacent areas⁹³ by clipping the nightlights dataset using a MODIS-based urban extent layer⁹⁴. We summarized the data within the contributing sub-catchment of each river reach to produce an average nightlight intensity for each river reach and applied the outlier correction as described in section 'Road density (RDD)'.

Determination of CSI. *Index calculation.* The conceptual approach to calculate a combined CSI for every river reach is to produce a weighted average of the six individual pressure indicators, each defined within a range of 0%–100%, and to subtract it from the maximum of 100%:

$$CSI_{j} = 100 - \frac{\sum_{i=1}^{n} x_{i,j} w_{i}}{\sum_{i=1}^{n} w_{i}}$$
(9)

where CSI_j is the CSI at river reach j, $x_{i,j}$ is the value of pressure indicator i at reach j, w_i is the weight applied to the pressure indicator i and n is the number of pressure indicators (in our case, 6). We prescribe the sum of w_i to be 100%, hence the resulting CSI values can range from 0% (not connected) to 100% (fully connected). For each pressure indicator, values below 0.1% were set to 0% so that rivers with only minimal impacts remain fully connected. For example, small DOR values below 0.1% occur in large downstream rivers affected by small and far-away headwater dams.

For the pressure indicators RDD and URB, we applied a modification that allows amplification of the indicator by a factor that is proportional to the extent of floodplains around the river, assuming that roads and urban development within floodplains are particularly likely to affect latitudinal connectivity. We used the long-term maximum inundation extent provided in the global inundation map GIEMS-D15⁹⁵ and allowed a maximum increase of the indicator by a factor of 1.5 (with a cap at 100%) if all roads or urban areas are inside floodplains:

$$\mathbf{x}_{i,j} = \widetilde{\mathbf{x}}_{i,j} \times \left(1 + \frac{f_j}{2}\right) \tag{10}$$

where $x_{i,j}$ is the value of pressure indicator *i* (RDD or URB) at river reach *j* after floodplain amplification, $\tilde{x}_{i,j}$ is the value of pressure indicator *i* (RDD or URB) at river reach *j* without floodplain amplification, and f_j is the fraction of floodplain extent within the contributing sub-catchment of river reach *j*.

The approach of calculating CSI as a weighted average poses the challenge of finding appropriate weights for each pressure indicator. To achieve this, we first created a representative sample of 100 random and unique scenarios where the six

weights oscillated freely in 5% intervals (minimum, 5%; maximum, 75%). For the final weight selection, we considered all scenarios that best reproduced the FFR status of a set of benchmark rivers that were reported to be free-flowing (for more details, see section 'Benchmarking and weighting'), and among those we chose the one with the most reasonable weightings on the basis of a literature review and expert judgement.

Benchmarking and weighting. The purpose of benchmarking was to identify pressure indicator weights that, in combination with a given CSI threshold, best match the FFR status of rivers which are well known for their unaffected connectivity (as determined by expert opinion or existing assessments). For this purpose we created a reference database of benchmark FFRs using sources from Nilsson et al.²⁷ and from expert knowledge. The reported 160 rivers were distributed across the world and ranged from 20 km to 3,300 km in length (for a complete list see Supplementary Table 2).

To compare different weight settings, as well as to test the sensitivity of the results to those settings, we explored 100 different weighting scenarios (see Supplementary Table 3). We assigned varying weights to the individual pressure indicators and produced statistics and maps for visual inspection. To determine the level of agreement between scenario results and benchmarking rivers, we calculated the percentage of rivers which were correctly classified as free-flowing. It should be noted that all 100 scenarios applied a CSI threshold of 95% below which a river reach is declared non-free-flowing. This threshold was determined through additional scenario assessments (not shown here) and its validity was tested in a subsequent sensitivity analysis (see section 'Sensitivity analysis').

In general, the benchmarking analysis showed high levels of agreement between the modelled and reported free-flowing status of rivers. The range of scenarios matched between 78.1% and 97.5% of benchmark FFRs, and several scenarios produced agreements of close to 97% or higher ($\geq\!\!155$ out of 160 rivers matching; see Extended Data Table 3), which we considered equally good given the inherent model uncertainties. To choose the most plausible scenario among them, we took into account known responses of river systems according to literature. For this, we used documented evidence to identify a plausible range of limits for each individual pressure indicator beyond which that indicator alone should cause a river reach to be declared impacted; we termed this limit the 'single pressure limit' (SPL). For example, a sediment trapping of 30% or more has been linked to negative effects on aquatic ecosystems due to fluvio-geomorphological changes (Extended Data Table 4a) and can thus serve as a reasonable SPL value. An SED weight of 15%, combined with a CSI threshold of 95%, will trigger all river reaches with an SED indicator of 33.3% or higher (that is, values well aligned with the SPL range) to be non-free-flowing even if no other pressure exists; hence this weight setting is considered plausible. Guided by this approach, we chose scenario 11 as the most plausible on the basis of the following observations:

Scenario 11 results in a total of approximately 269,000 river reaches being impacted, that is, falling below the free-flowing threshold (CSI < 95%). The weight settings of this scenario are 30%, 30%, 15%, 15%, 5% and 5% for the DOF, DOR, SED, USE, RDD and URB indicators, respectively, leading to the corresponding SPL values shown in Extended Data Table 4b and discussed below.

Given the novelty of the DOF approach and the lack of comparable studies that measure fragmentation in a similar way, we cannot corroborate the associated SPL of 16.7% as being within existing literature ranges. Nonetheless, the scenario is well placed within an expert-estimated SPL range of 10%–50% (Extended Data Table 4a), and the relatively high weight is in line with the postulated wide-ranging longitudinal fragmentation effects of dams. As a result, approximately 242,000 river reaches were declared impacted owing to the DOF alone, representing 90% of all impacted river reaches (Extended Data Fig. 5a).

As for the DOR, scenario 11 assigns the same weight as for the DOF (30%). Other studies have determined effects from river regulation as low as 2%-15% (Extended Data Table 4a), fitting well with our SPL value of 16.7%. As a result, over 131,000 river reaches (49% of impacted river reaches) are impacted because of the DOR alone, making flow regulation the second most common pressure factor (Extended Data Fig. 5b).

Our literature review showed that rivers with sediment trapping as low as 30% are associated with severe losses of essential river functions, such as reduced floodplain storage and accelerated delta subsidence, ultimately leading to delta flooding and shoreline retreat (Extended Data Table 4a). Hence the weighting of the SED (15%) and the associated SPL value (33.3%) are considered plausible. A total of approximately 101,000 river reaches (38% of impacted river reaches) are impacted by the SED alone (Extended Data Fig. 5c).

For the USE, the same weight is applied as for the SED (15%) and the associated SPL value (33.3%) falls within the cited range of 10%–50% for consumptive water use as a general indicator of water stress or compromised environmental water requirements (Extended Data Table 4a). However, given that water consumption is an important factor only in relatively dry areas of the world, and that only about 20% of the river reaches affected by water consumption showed a value larger than

10%, the overall importance of this factor is relatively low, with roughly 18,000 river reaches (7% of impacted river reaches) being impacted owing to the USE alone (Extended Data Fig. 5d).

Scenario 11 assigns a low weight (5%) and accordingly high SPL threshold (100%) for the RDD, meaning that only high road densities within floodplains can cause a reach to be designated as impacted by the RDD alone. Literature sources indicate that a lower SPL value of 5%–30% may be applicable (Extended Data Table 4a), yet the lower weight of scenario 11 reflects in part the decreasing level of confidence in this proxy and the increasingly indirect effects of roads on the free-flowing status of rivers. As a result, even though roads are widespread and penetrate even remote areas, we did not identify river reaches where the RDD alone was causing a river reach to become not free-flowing. Nevertheless, the RDD does contribute to lowering the CSI values of affected river reaches (Extended Data Fig. 5e).

Because the confidence in the proxy of nightlight intensity in urban areas is similarly low as for RDD, the low weight (5%) and high SPL threshold (100%) assigned by scenario 11 to the URB are considered in line with general ranges found in literature (Extended Data Table 4a). In contrast to the RDD, however, areas with increased nightlight intensity are much more extensive than areas with high road density, so the URB alone marked about 3,900 river reaches as impacted, representing 1% of all impacted river reaches (Extended Data Fig. 5f).

It should be noted that in the final CSI calculations the individual pressure indicators can overlap or complement each other to reduce the CSI below the 95% threshold, hence the total number of impacted river reaches is not the sum of the individual values stated above, but all factors together impact a total of approximately 269,000 river reaches (Extended Data Table 4b). Given the cautious selection of the CSI threshold and weights, we believe that overall our conservative settings tend more towards under- than overestimation of the extent of impacted river reaches.

Sensitivity analysis. A thorough uncertainty analysis could not be performed at this point owing to the lack of information about the complex uncertainties of underpinning global datasets, such as erosion, water use, roads and urban areas. Instead, we conducted three basic sensitivity analyses to assess the robustness of our settings and findings.

First, we assessed the CSI distributions and boundaries by calculating the minimum, maximum, mean, range and standard deviation of the CSI values across all 100 scenarios for each individual river reach, and added these statistics to the final river reach dataset. We then averaged the individual standard deviations into bins of 5% CSI ranges (Extended Data Fig. 6a). We found that higher CSI ranges generally have lower standard deviations and that the standard deviations in the two bins around the chosen CSI threshold (95%) are below 4%, indicating that our results are robust around the CSI threshold that we chose to determine the free-flowing status of rivers.

Second, we calculated multiple iterations of scenario 11 with CSI thresholds varying from 80% to 100% (Extended Data Fig. 6b) to test the sensitivity of the CSI threshold setting. The results show that the agreement with benchmark FFRs is stable up to a CSI threshold of 95%, yet deteriorates quickly for higher CSI values. This finding indicates that a threshold setting above 95% (that is, triggered by very small fragmentation effects) is too strict and identifies too many rivers as non-free-flowing. By contrast, thresholds below 95% (triggered only by higher fragmentation effects) identify an increasing number of rivers as free-flowing, including all benchmark FFRs. This analysis corroborates our CSI threshold of 95% to be a meaningful setting, marking the transition spot between being too strict and too loose.

Third, as our understanding of the propagation of fragmentation impacts from dams in the upstream direction is particularly limited, we tested the importance of the upstream part of the DOF. We found that if upstream effects of the DOF were excluded, the CSI increased in about 25% of impacted river reaches, representing 2.2% of all analysed reaches globally. However, the number of rivers that regain FFR status amounts to only 1,468 (about 102,000 km) and is restrained mostly to short rivers. Nevertheless, we recommend that the parameters defining the magnitude and extent of the DOF index be further investigated.

Identification of FFRs. Using the backbone concept described in section 'Hydrographic framework' (Extended Data Fig. 2) and considering a CSI threshold of 95%, we classified the river network into:

1. FFRs: rivers that are above the CSI threshold from their source to the river outlet.

2. Good connectivity status: a river reach or a stretch of a river that is above the CSI threshold, but other river reaches or stretches of the same river are below the CSI threshold.

3. Impacted: any river reach, stretch or entire river that is below the CSI threshold.

In some cases, a major river may have a few river reaches or short stretches below the CSI threshold (for example, owing to a small fragmentation in a remote headwater location), which, according to our definitions, would render the entire river as non-free-flowing. To limit these minor artefacts, we excluded impacts of small reaches or stretches that affect less than 0.1% of the total flow of the river (in terms of average natural discharge). Globally, this filter only affects 431 river reaches or stretches with an approximate length of 1,800 km.

Data availability

The geometric dataset of the global river network and the associated attribute information for every river reach—that is, the values of all pressure indicators (DOF, DOR, SED, USE, RDD and URB)—as well as the main results of the study—that is, values for the CSI, the dominant pressure factor and the FFR status— are available at https://doi.org/10.6084/m9.figshare.7688801 under a CC-BY-4.0 license. The dataset can be used together with the published source code (see 'Code availability') to recalculate the main study results and to run existing and new scenarios. The databases of dams required to calculate the DOF, DOR and SED indicators are not in the data repository owing to licensing issues, but are freely available at http://www.globaldamwatch.org. Original data that supported the study—that is, raw datasets of roads, urban areas, water use, waterfalls, erosion data and floodplain information—and their sources are summarized in Extended Data Table 1. Additional higher-resolution maps of Figs. 1–3 are available at http:// www.hydrolab.io/ffr.

Code availability

The source code of the main tools, scripts and algorithms used in this research is available under the GNU General Public License v3.0 at https://github.com/ggrill/ Free-Flowing-Rivers. Other procedures and GIS steps (as described in Methods) were conducted manually and are therefore not part of the code repository.

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Extended Data Fig. 1 | **Workflow for mapping FFRs.** Methodological steps to define and assess the CSI of individual river reaches (steps 1–5) and decision tree used to assess the free-flowing status of entire rivers (step 6 and following).

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Extended Data Fig. 2 | Schematic overview of river-related concepts used in this study. a-c, The baseline river network consists of individual 'river reaches' (1–32 in a), defined as line segments separated by confluences (black dots). River reaches can be aggregated into 'rivers' according to a 'backbone' ordering system, which classifies river reaches as the mainstem or a tributary of various higher orders (b). Following this system, the river network can be distinguished into distinct rivers (1–16 in c), defined as contiguous stretches of river reaches from source to outlet

on the mainstem or from source to confluence with the next-order river. **d**, CSI values for individual river reaches, as calculated with our model. If a value is at or above the CSI threshold (95%), the river reach is declared to have good connectivity status; if it is below the threshold, it is declared to be impacted. **e**, If an entire river (as defined in **c**) has good connectivity status, it is defined to be an FFR (blue). A river can be partly above the CSI threshold, and thus contiguous stretches can have good connectivity status (green).



Extended Data Fig. 3 | Conceptual approach of DOF calculation, and visualization for a river example. a, b, The DOF index ranges from 0% (no fragmentation impact) to 100% (completely fragmented) and is shown for the conceptual approach (**a**) and the river example (**b**) in the colour coding shown in **b**. It is calculated for all river reaches connected to the barrier location in both the up- and downstream directions (but tributaries to the mainstem downstream of the barrier are not considered affected). The impact is largest in connected river reaches that are similar in discharge to the barrier site and diminishes as rivers become increasingly dissimilar in size, that is, larger in the downstream or smaller in the upstream direction. **c**, DOF decay functions, as considered and evaluated by the expert group.



Extended Data Fig. 4 | Schematic representation of the approach used to calculate the SED. The SED ranges from 0% to 100%, assessing the degree to which sediment connectivity in any river reach is altered by upstream dams. **a**, River network with individual river reaches and

PSL ranges. **b**, The SED, which accounts for the relative contribution of tributaries to the total sediment budget of the river network, and its changes in response to changes in longitudinal sediment connectivity.





between indicators. The blue shades represent the magnitude of river discharge for river reaches with pressure values of 0% (that is, darker shades for larger rivers).



Extended Data Fig. 6 | Sensitivity analysis for CSI values and thresholds. a, Averaged CSI standard deviations for CSI ranges. **b**, Number of benchmark FFRs correctly classified at different CSI thresholds.

Extended Data Table 1 \mid Pressure factors and indicators used in this study

Pressure factor	Pressure indicator	Description	Connectivity aspect affected	Source data
River fragmentation	DOF	Degree of Fragmentation	Longitudinal	HydroSHEDS; Lehner et al. ³¹ , GRanD v1.1; Lehner et al. ² , GOODD v1.0; Mulligan et al. ³² , HydroFALLS; Lehner et al. ⁶²
Flow regulation	DOR	Degree of Regulation	Lateral, temporal	HydroSHEDS; Lehner et al. ³¹ , GRanD v1.1; Lehner et al. ² , GOODD v1.0; Mulligan et al. ³² , HydroLAKES; Messager et al. ⁶¹
Sediment trapping	SED	Sediment trapping index	Longitudinal, lateral, vertical	Erosion map; Borrelli et al. ⁷³ , HydroSHEDS; Lehner et al. ³¹ , GRanD v1.1; Lehner et al. ² , GOODD v1.0; Mulligan et al. ³² , HydroLAKES; Messager et al. ⁶¹
Water consumption	USE	Consumptive water use (abstracted from surface or groundwater)	Longitudinal, lateral, vertical, temporal	WaterGAP v2.2; Döll et al. ⁵² , Alcamo et al. ⁵³ , HydroSHEDS; Lehner et al. ³¹
	RDD	Road density	Lateral, longitudinal	GRIP v3; Meijer et al. ⁸⁶ , GIEMS-D15 ⁹⁵
Infrastructure development in riparian and floodplain areas	URB	Nightlight intensity in urban areas	Lateral	DMSP-OLS v4; Doll ⁹¹ , Urban areas; Schneider et al. ⁹⁴ , GIEMS-D15 ⁹⁵

Overview of pressure factors, related pressure indicators and their relationship with connectivity aspects, as well as datasets and data sources required to calculate the pressure indicators.

Extended Data Table 2 | River stretches with good connectivity status

'Good Connectivity Status' (number of stretches)							
10–100 km	100–500 km	500–1000 km	>1000 km	Total			
462	149	18	4	633			
2428	302	24	8	2762			
231	39	4		274			
1339	290	15	2	1646			
1480	248	5	1	1734			
860	164	10	7	1041			
6800	1192	76	22	8090			
	10–100 km 462 2428 231 1339 1480 860 6800	'Good Connection 10–100 km 100–500 km 462 149 2428 302 231 39 1339 290 1480 248 860 164 6800 1192	'Good Connectivity Status' (number of stretor) 10–100 km 500–1000 km 462 149 18 2428 302 24 231 39 4 1339 290 15 1480 248 5 860 164 10 6800 1192 76	'Good Connectivity Status' (number of stretches) 10–100 km 100–500 km >1000 km 462 149 18 4 2428 302 24 8 231 39 4 2 1339 290 15 2 1480 248 5 1 860 164 10 7 6800 1192 76 22			

b)	'Good Connectivity Status' (thousand km)						
	10–100 km	100–500 km	500–1000 km	>1000 km	Total		
Africa	18.2	31.7	12.9	4.9	67.6		
Asia	73.3	57.0	16.0	15.3	161.6		
Australia	8.0	8.2	2.5	0.0	18.7		
Europe	47.0	53.7	10.1	2.1	113.0		
North America	52.1	44.7	2.7	1.0	100.6		
South America	28.6	32.1	7.1	13.2	81.0		
Total	227.2	227.3	51.4	36.1	542.4		

Number (a) and length (b) of river stretches with good connectivity status (CSI \geq 95%).

Extended Data Table 3 | Characteristics and results of selected scenarios

SCE Weights (%)						Impacted reaches (< 95%)	Mean CSI	Benchmark rivers correct	Ν	lumber of b	reaches p y pressu	oredomi re indica	nantly itor *	affectec	I	
No.	DOF	DOR	SED	USE	RDD	URB	%	%	%	DOF	DOR	SED	USE	RDD	URB	Total
11	30	30	15	15	5	5	9.3	93.3	96.9	185,218	63,356	11,300	7,477		1,899	269,250
20	35	25	15	15	5	5	9.3	93.0	96.9	212,472	36,232	10,986	7,505		1,893	269,088
33	35	25	15	10	10	5	9.2	93.1	96.9	212,538	36,454	11,175	4,002	2	1,823	265,994
37	30	30	15	10	10	5	9.2	93.3	96.9	185,429	63,543	11,514	3,998	6	1,827	266,317
43	20	15	5	50	5	5	9.4	95.2	97.5	189,994	26,758	745	53,772		2,311	273,580

Key statistics of the five best scenarios, including scenario weightings, impacted reaches (CSI < 95%), mean CSI and number of reaches where a pressure indicator is dominant, and percentage of correctly predicted benchmark FFRs (see Supplementary Table 3 for all 100 scenarios). *Reaches are counted if the pressure indicator causes the strongest effect on the CSI index, taking into account multiple pressure indicators.

Extended Data Table 4 | Scenario weighting and corroboration

a) Overview of literature						
Pressure indicator	Range of values reported (%)	Relevant literature and case studies				
DOF	10-50	Pracheil et al. ⁶⁰ ; expert review; case studies in Tapajos, Luangwa and Upper Ganges River				
DOR	2-15	Richter et al. ⁹⁶ ; Nilsson and Jansson ⁹⁷ ; Nilsson and Berggren ¹¹ ; Lehner et al. ²				
SED	> 30	Syvitski et al. ¹⁸ ; Rubin et al. ⁶⁹ ; Vörösmarty et al. ⁶⁶ ; Gupta et al. ⁹⁸				
USE	10-50	Vörösmarty et al. ⁹⁹ ; Smakhtin et al. ¹⁰⁰ ; Pastor et al. ¹⁰¹ ; Brauman et al. ¹⁰²				
RDD	5-30	Blanton and Marcus ¹⁰³ ; Shuster et al. ¹⁰⁶				
URB	> 80 *	Booth and Jackson ⁹¹ ; Blanton and Marcus ¹⁰³ ; Schueler et al. ¹⁰⁵ ; Shuster et al. ¹⁰⁴				

b) Characteristics of selected scenario 11								
Pressure indicator	DOF	DOR	SED	USE	RDD	URB	Sum	
Weights (%)	30	30	15	15	5	5	100	
SPL (95%)	16.7	16.7	33.3	33.3	100	100	n.a.	
Number of river reaches predominantly affected by pressure indicator †	185,218	63,356	11,300	7,477	0	1,899	269,250	
Number of river reaches affected by pressure indicator alone ‡	242,446	131,259	101,241	18,357	0	3,906	n.a.	

a, Overview of literature used to corroborate the scenario weightings. b, Characteristics of selected weighting scenario. Scenario 11 was selected on the basis of benchmarking results, its SPL, as well as the corresponding weighting values⁹⁶⁻¹⁰⁵. *Index based on nightlights to represent urban effects, scaled. †Reaches are counted if the pressure indicator causes the strongest effect on the CSI index, taking into account multiple pressure indicators.

‡Reaches are counted if the pressure indicator causes any effect on them.

UNITED STATES INTERNATIONAL TRADE COMMISSION INVESTIGATION NO. 332-574



Part III B of III

August 14, 2020 Final Submittal of North American Megadam Resistance Alliance

Exhibit 15: July 29, 2020: British Columbia Utilities Commission, British Columbia Hydro and Power Authority, Site C Clean Energy Project, *Public Annual Report No. 4 and Quarterly Progress Report No. 18, and Quarterly Progress Report No. 19*

Exhibit 16: 2018 *Exposing the True Costs of a "Clean" Energy Megaproject in the Peace River valley* by Lianne C. Leddy

Exhibit 17: 2020 Commons British Columbia Comments



July 31, 2020

Mr. David M. Morton Chair and CEO British Columbia Utilities Commission Suite 410, 900 Howe Street Vancouver, BC V6Z 2N3

Dear Mr. Morton:

RE: British Columbia Utilities Commission (BCUC or Commission) British Columbia Hydro and Power Authority (BC Hydro) Site C Clean Energy Project PUBLIC Annual Report No. 4 and Quarterly Progress Report No 18, and Quarterly Progress Report No. 19

BC Hydro has voluntarily provided the BCUC with quarterly reports since the start of construction to be transparent about Site C's progress, accomplishments and challenges.

Today we are filing two reports: the 2019 Site C Annual Report No. 4, and Quarterly Progress Report No. 19.

As we did in 2018, we have combined the 2019 annual report and the quarterly progress report into one document for Annual Report No. 4, covering the period January 1 to December 31, 2019, including the quarterly results for the quarter ending December 31, 2019. The filing of Annual Report No. 4 was delayed due to Site C project team priorities shifting in recent months to actively respond to and manage the COVID-19 global pandemic.

We are also filing Quarterly Progress Report No. 19, covering the period January 1 to March 31, 2020. This report addresses some of the early impacts COVID-19 had on the project prior to March 31. Those impacts continue today and will do so for the foreseeable future.

Although the pandemic began at the end of the latest reporting period, it quickly became apparent that COVID-19 would result in significant impacts to the Site C project.

On March 18, 2020, BC Hydro announced it was substantially reducing certain work activities on the project in response to the increasing escalation of provincial measures to manage the COVID-19 pandemic.

Work at the dam site was scaled back to only those activities that were critical to achieve river diversion and essential services, such as site safety and security and environmental protection. This decision resulted in a reduction of people staying at site by about 50 per cent.



Work continued as planned in off-site project areas (i.e., Highway 29 realignment, transmission line and reservoir clearing work), as most of these workers don't stay in the camp and can more easily practice physical distancing on their work sites.

On May 14, 2020, BC Hydro announced it would begin safely increasing construction activities at the dam site in a gradual phased approach. The phased approach will see the number of workers staying at the worker accommodation increase over the summer and fall of 2020, as work continues to ramp up on the dam site. BC Hydro continues to closely monitor the situation so that any issues can be quickly addressed and compliance with current provincial guidance is maintained.

Prior to the escalation of the COVID-19 pandemic, the project remained on schedule for the first generating unit to go into service in late 2023 and a final in-service date in 2024.

While we remain on schedule to achieve river diversion in 2020, there is uncertainty with the project's schedule and in-service date. This is primarily due to our ability to re-start and accelerate work that was halted due to the pandemic.

BC Hydro has begun the process to re-baseline the project to determine the impact the COVID-19 pandemic has had on the project's schedule and budget.

Since the current project budget was approved in February 2018, and prior to scaling back work due to COVID-19, we acknowledge the project was already managing significant financial pressures due to:

- amendments to the main civil works contract;
- increased costs associated with reservoir clearing, transmission line construction and highway re- alignment work;
- additional labour resource requirements; and
- First Nations treaty infringement claims and an injunction application.

In addition to these financial pressures mentioned above, a project risk has materialized on the right bank. Towards the end of December 2019, investigations and analysis of geological mapping and monitoring activities completed during construction identified that some foundation enhancements would be required to increase the stability below the powerhouse, spillway and future dam core areas.

By the end of the March 31 reporting period, we had learned more about these geological challenges. Based on further engineering analysis of the proposed mitigation measures, the foundation enhancement costs are anticipated to be more substantial than initially expected in January.

BC Hydro continues to work with the independent Site C Technical Advisory Board and the Project Assurance Board to determine the appropriate enhancement measures. The estimated cost and schedule impacts will be better understood once the enhancement measures are selected.



Pandemic-related delays will present further cost pressures on the budget. As the evolution of the pandemic is uncertain and the date of resolution is unknown, various cost and schedule impact scenarios continue to be assessed and refined as part of the re-baselining process.

In these reports, we acknowledge specific areas of concern that have impacted the overall health of the project. For these reasons, in our Project Status Dashboard, we classified the overall health of the project in both reports as "red", or having serious concerns, specifically regarding schedule, scope and budget.

As noted earlier, work to re-baseline the project is underway to determine the impacts of COVID-19. Once this process is completed, we will provide the Commission an update later this fall.

Yours sincerely,

Chris O'Riley President and Chief Executive Officer **BC Hydro**

Enclosure



Site C Clean Energy Project

Annual Progress Report No. 4

(Combined with Quarterly Progress Report No. 18)

January 2019 to December 2019

PUBLIC



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PUBLIC Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18) – January 2019 to December 2019

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1 Executive Summary

Site C will be the third dam and hydroelectric generating station on the Peace River in northeastern British Columbia (B.C.). Once complete in 2024, Site C will provide 1,100 megawatts of capacity, and produce about 5,100 gigawatt hours of energy per year – enough to power the equivalent of 450,000 homes per year in B.C.



After an extensive environmental assessment process, BC Hydro received an Environmental Assessment Certificate from the Province of British Columbia and an Environmental Decision Statement from the Government of Canada in October 2014. These approvals collectively contain more than 170 conditions and thousands of sub-conditions. In addition, BC Hydro is required to apply for multiple provincial permits, water licences, leaves to commence construction and federal authorizations related to the Project. In total, approximately 450 permits and authorizations will be required by the time the Project completes construction.

Construction on Site C began on July 27, 2015.

During the fourth full year of construction on the Project, dam-site construction activities accelerated substantially, particularly the roller-compacted concrete placement work on the spillways buttress and the tunnel excavations required in advance of river diversion in 2020. The roller-compacted concrete buttress for the Site C spillways was completed on October 31, 2019, seven months ahead of schedule. Breakthrough on the excavation in the first diversion tunnel occurred in June 2019, and in the second tunnel in July 2019. The excavation for both tunnels was completed in December 2019. The Project encountered some challenges through the year including excavation delays in the diversion tunnels, and lower than planned excavation rates in the left bank core trench. BC Hydro and the contractor were able to mitigate the schedule impacts by resequencing the work and are forecasting to meet the associated key milestones. The Project continues to be on track for river diversion in September 2020.

In Project areas away from the dam site, work accelerated on the Highway 29 realignment, in reservoir clearing activities and along the transmission line. The first of 405 transmission towers was stood up in February 2019, and by year-end, 101 towers had been raised.

BC Hydro continued to secure the appropriate permits, authorizations and leaves to commence construction required to begin and advance work on the Project. In addition, work continued to advance in the areas of environmental monitoring and assessment; fish, wildlife, habitat, vegetation management and heritage programs; and Indigenous and community engagement activities.

In March 2019, BC Hydro partnered with the Northern Lights College to develop carpentry trades training and supporting the development of skilled workers in northeast British Columbia. The BC Hydro Trades and Skilled Training Award program is designed to assist students with tuition and other expenses for their skilled trade studies at Northern Lights College.

In June 2019, BC Hydro completed work to enhance the Peace River fish habitat in select areas near the Site C dam site. The fish habitat enhancement meets Site C Environmental Assessment Certificate and Federal Decision Statement conditions and is part of the Site C Fisheries and Aquatic Habitat Management Plan.

In November 2019, BC Hydro, the City of Fort St. John and BC Housing officially opened 50 new affordable housing units in Fort St. John. BC Hydro is committed to providing legacy benefits for the residents of Fort St. John and other communities in the Peace Region. The provision of additional affordable rental housing in Fort St. John is a condition of the Site C project's environmental approval and BC Hydro's Community Agreement with the City of Fort St. John.

The City of Fort St. John, BC Hydro, ATCO and the Salvation Army launched an innovative Food Donation Initiative in November 2019 to feed the city's most vulnerable populations with over 100 meals per day.

In 2019, BC Hydro distributed \$151,046 to 17 non-profit organizations in the Peace Region, as part of the Generate Opportunities (GO) Fund. Created in 2016, the \$800,000 GO Fund is being distributed quarterly over an eight-year period to non-profit organizations that provide services to vulnerable populations including children, families and seniors. As of December 31, 2019, BC Hydro had distributed \$437,691 to 49 projects.

From the beginning of the project, approximately \$390 million in Site C procurement opportunities have been awarded to Indigenous-designated companies.

Overall agricultural production in the Peace Region is expected to benefit from mitigation measures, including a \$20 million agricultural compensation fund that will support agricultural programs and projects such as irrigation and drainage improvements. This fund is governed by a regional decision-making board, responsible for overseeing the management and disbursement of the fund. In



December 2019, the board approved the first intake of the year with a total fund allocation of \$250,000.

2 Annual Report Structure

Consistent with the 2018 reporting, we have combined the annual report and the quarterly progress report into one document for Annual Report No. 4, covering the period January 1 to December 31, 2019, including the quarterly results for the quarter ended December 31, 2019.

3 Summary of Project – January to December 2019

3.1 Overview and General Project Status

Construction began on July 27, 2015 and is ongoing. Since the commencement of construction, the following work has been completed:

- Site preparation, including on-site access roads;
- Clearing of the left and right banks at the dam site and clearing of the lower reservoir area is substantially complete;
- Cofferdams on the left and right banks of the river;
- Construction of the worker accommodation lodge and Peace River construction bridge;
- Powerhouse excavation, and placement of 414,000 cubic metres of roller-compacted concrete in the powerhouse buttress;
- Spillways excavation, and the placement of 586,000 cubic metres of roller-compacted concrete in the spillways buttress;
- Construction of dam site access public roads;
- Construction of the Site C viewpoint;

- Excavation of the diversion tunnel inlet (upstream) and outlet (downstream) portals, allowing for the commencement of diversion tunnel excavations;
- Excavation of the right bank drainage tunnel, which will be used to monitor and drain the remaining excavations for the spillway and dam buttresses and will eventually be connected to services within the powerhouse;
- Completion of the bulk excavation of the two river diversion tunnels, which will be used to reroute a short section of the Peace River to allow for the construction of the earthfill dam;
- Clearing activities in the lower reservoir;
- Completion of the Peace Canyon 500 kV gas-insulated switchgear expansion to enable connection of Site C to the BC Hydro electrical system;
- Fish habitat enhancements downstream of the dam site; and
- The completion of 50 affordable housing units in Fort St. John.

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Significant Project updates that occurred between January 1 and December 31, 2019 include the following:

- At the end of January 2019, backfilling of adit 4 was completed. This is one of four tunnels and chambers located around the dam site that were excavated in the late 1970s and early 1980s during preliminary studies for the Project (a fifth adit was excavated in 2012). For more information, refer to section <u>3.2.1.1</u>.
- The right bank drainage tunnel was completed in February 2019. Refer to section <u>3.2.1.1</u> for more information.

PUBLIC Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18) – January 2019 to December 2019

 In February 2019, the first of more than 400 transmission towers was raised. These towers will support the two new 500 kV transmission lines leading from the Site C substation to Peace Canyon generating station. By the end of 2019, 101 towers had been raised and transmission line stringing had begun. For more information, refer to section <u>3.2.1.5</u>.

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- The generating station and spillways contractor began fabrication of the Site C penstocks in Fort St. John in February 2019. The first penstock sections arrived on site in April 2019. Refer to section <u>3.2.1.2</u> for more information.
- The Site C heritage program entered its tenth year in February 2019. The heritage resources management plan describes how the Project mitigates adverse effects on heritage resources. Refer to section <u>3.7.3</u> for further information.
- In March 2019, care of water became a challenge earlier than anticipated. Unseasonably warm temperatures in mid-March 2019 had site crews successfully managing water flows that are not usually seen until April. For further information, refer to section <u>3.7</u>.
- In March 2019, clearing activities were complete in the lower reservoir and substantially completed in the Moberly River drainage, north bank of the eastern reservoir and Cache Creek area, refer to section <u>3.2.1.7</u>.
- The request for proposals for the balance of plant contract the last major dam site contract to be awarded on the Project – was issued in April 2019. BC Hydro expects to award the contract in 2020. Refer to section <u>3.2.1.3</u> for further information.
- The first truss (roof structure) was installed in the main service bay in April 2019.
- Excavation of the spillways was completed in April 2019, with approximately 465,000 cubic metres of materials removed from the area since fall 2018. In

May 2019, roller-compacted concrete placements began on the spillways buttress, and the final placement took place in late October 2019 – seven months ahead of schedule. Refer to section <u>3.2.1.2</u> for more information.

- In April 2019, eight local Indigenous students completed the BC Hydro and Northern Lights College pre-carpentry skills pilot program, which was created to provide Indigenous candidates the necessary skills to pursue carpentry employment opportunities at Site C. Refer to section <u>3.8.3</u> for more information.
- In May 2019, the Site C community relations team in Fort St. John responded to the 10,000th public enquiry since construction began in July 2015. In total, BC Hydro has received more than 11,000 enquiries since August 2015. Refer to section <u>3.9.2.1</u> for more information.
- In June and November 2019, BC Hydro held community open houses in Hudson's Hope to provide updates on Site C construction, as well as plans underway to help mitigate the impacts related to the Project.
- In late June 2019 and early July 2019, the Site C Project completed the successful breakthroughs on the upper half of the two river diversion tunnels (known as the "crown"). By the end of the year, the bulk excavations were also complete on the lower half of the tunnels (knowns as the "bench"). For more information, refer to section <u>3.2.1.1</u>.
- The powerhouse bridge cranes were installed in the main service bay in June 2019. Refer to section <u>3.2.1.2</u> for more information.
- In July 2019, BC Hydro energized the new gas-insulated switchgear at the indoor substation at Peace Canyon, making it the first Site C asset placed into service. Refer to section <u>3.2.1.5</u> for further information.
- In July 2019, the phase 1 expansion of the worker accommodation lodge was completed, increasing the camp capacity from 1,600 beds to 1,750 beds.

 In December 2019, the first grant recipients of the BC Hydro Peace Agricultural Compensation Fund were announced, providing more than \$200,000 for Peace Region agricultural projects. For more information, refer to section <u>3.7.4</u>.

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- In August 2019, the total workforce peaked at 4,870 workers involved in the Project; the highest number to date since the start of the Project. Of these, roughly 76 per cent were residents of British Columbia. As of November 2019, there were 4,650 workers on the Project. For more information, refer to section <u>3.8.2</u>.
- In September 2019, testing of the five-kilometre-long till conveyor system for Site C began. The conveyor, which runs from the 85th Avenue Industrial Lands to the dam site, will carry glacial till, an impervious clay-like material that will form the core of the Site C dam. Refer to section <u>3.2.1.1</u> for further information.
- In September 2019, site preparation began for the construction of the Highway 29 realignment at Cache Creek East, and in November 2019, the Ministry of Transportation and Infrastructure awarded the contract to realign the highway and build a new bridge at Halfway River. Construction of this segment is expected to begin in January 2020 with completion in fall 2022. Refer to section <u>3.2.1.6</u> for further information.
- The Cache Creek East embankment fill (early works) contract was awarded by the Ministry of Transportation and Infrastructure in October 2019. Refer to section <u>3.2.1.6</u> for further information.
- A First Nations directed procurement was initiated for an embankment fill at Lynx Creek East, with the contract awarded in December 2019. Construction started in December 2019 and is expected to be complete in the summer of 2020. Refer to section <u>3.2.1.6</u> for further information.
- In 2019, 18 Peace Region non-profit organizations projects received more than \$150,000 in funding from the Generate Opportunities (GO) Fund. To date, more

than half of the \$800,000 fund has been distributed to 49 projects that support community-enriching services in the Peace Region.

- Throughout the year, construction advanced at the Site C powerhouse.
- At the end of December 2019, a project risk materialized on the right bank when investigations and analysis of geological mapping and monitoring activities during construction identified that some foundation enhancements would be required to increase the stability below the powerhouse, spillway and future dam core areas. Refer to sections <u>3.2.1.1</u> and <u>3.2.2</u> for more information.

A dashboard based on the Project's status as of December 31, 2019 is provided in <u>Table 1</u> below. The Project team, with direction from the Project Assurance Board, is committed to delivering the Project without compromising on safety, scope, and quality. While the Project remains on schedule to achieve river diversion in September 2020 and the Project in-service date, BC Hydro continues to experience significant cost pressures.

Since the current Project budget was approved in February 2018, significant financial impacts have been realized and described in previous Quarterly Progress Reports and Annual Progress Reports. During and subsequent to the reporting period of this report, additional financial impacts have occurred in the following areas:

 Subsequent to the reporting period, a contract amendment was executed on March 6, 2020 to the main civil works contract that is retroactive to December 23, 2019 resulting in an increase in the contract value of up to \$332 million over the duration of the contract, including investments in equipment to reduce the schedule risk for dam construction and a series of performance-based at-risk incentives for the contractor with the objective of maintaining schedule for diversion and first power. For more details, refer to sections <u>3.2.1.1</u> and <u>3.10.4</u>;

- Subsequent to the reporting period, the COVID-19 pandemic escalated significantly in British Columbia and has had a material impact on the Project. This Annual Report does not discuss the impacts of the COVID-19 pandemic as it is outside of the reporting period. BC Hydro's next Quarterly Progress Report, covering the period January to March 2020, will provide an update on the impacts of the COVID-19 pandemic on the Project;
- Additional labour resource requirements, the expansion and increased utilization of the on-site worker accommodations, as well as estimated site reclamation costs;
- First Nations treaty infringement claims and an injunction application which affected highways, transmission, and reservoir clearing work and impacted the planned sequencing of certain construction activities; and
- Costs associated with reservoir clearing, transmission line construction and highway re-alignment work are higher due to changes in scope as the designs have progressed.

As of December 31, 2019, BC Hydro had drawn approximately 71 per cent of Project contingency and continues to monitor and mitigate cost pressures. BC Hydro expects to request a draw on the Project reserve in fall 2020, as needed.

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	Table 1 Project Status Dashboard
•	On Target Oderate Issues At Risk
Status as of:	December 2019
Overall Project Health	 Overall Project health is red due to identified cost pressures. The Project continues to be on schedule at December 31, 2019, however, significant cost pressures continue to be assessed and monitored.
Safety	In August 2019, the workforce peaked with almost 4,900 workers engaged on the Project. This is the highest number since the start of the Project and is a 54 per cent increase compared to 2018. As a result of the increase in construction activities, there has been an increase in serious and non-serious safety incidents, regulatory inspections and orders, and some decline in safety performance frequencies. BC Hydro and Contractors continue to invest significant effort in safety prevention programs, incident investigations, and safety training.
Scope	At the end of December 2019, a project risk materialized on the right bank when investigations and analysis of geological mapping and monitoring activities during construction identified the need for additional scope to enhance the foundations of the structures on the right bank including the powerhouse, spillway and future dam core areas. This information was shared with the Project Assurance Board in early January 2020. BC Hydro continues to work with the independent Site C Technical Advisory Board and the Project Assurance Board to determine the appropriate enhancement measures.
Schedule	 As of December 31, 2019, the Project continues to be on track for river diversion (September 2020) and for the overall in-service date of 2024.
Cost	 Significant cost pressures have been identified, and are being assessed, monitored and managed to the extent possible.
Quality	The overall quality rating for the Project continues to be good, indicating that the work generally conforms to the requirements of the drawings and specifications. While there were initial challenges with the quality of the main civil works diversion tunnel concrete linings, corrective actions were developed and are being implemented.
Regulatory, Permits and Tenures	Permits are on track and are meeting schedule requirements. To date, the Project has obtained 77 per cent of its major required authorizations and the remaining authorizations are anticipated to be received as required to meet the overall Project schedule needs. Environmental Assessment Certificate Amendment approvals are progressing well, with all requested amendments approved to date. Wildlife installations are proceeding.
Environment	Environment Canada initiated an investigation on October 10, 2018 with regards to a rain fall event in September 2018. BC Hydro has subsequently increased the system capacity along with other actions to reduce the potential of future similar events. This investigation is still ongoing. Focus remains on minimizing sediment and erosion across the dam site, care of water, hydrocarbon management, wildlife attractant management and invasive weed control.
Procurement	 Procurement for the Project is proceeding as planned. Procurement for balance of plant is ongoing and BC Hydro continues to work with the Ministry of Transportation and Infrastructure for the work on the Highway 29 realignment.
Indigenous Relations	Six of 10 agreements are fully executed and in implementation. West Moberly First Nations withdrew from confidential discussions to seek alternatives to litigation related to Site C in August 2019 and filed an amended Notice of Civil Claim in September 2019. Discussions with Prophet River First Nation remain open.

Status as of:		December 2019
Litigation	•	In February 2019, the Province of British Columbia, BC Hydro, West Moberly First Nations and Prophet River First Nation agreed to enter into confidential discussions to seek alternatives to litigation related to Site C. West Moberly First Nations withdrew from the discussions in August 2019 and is continuing with its litigation. West Moberly First Nations filed an amended Notice of Civil Claim in September 2019, which, among other things, expands their original treaty infringement action, shifting the focus to all three Peace River facilities, not just Site C, and their alleged cumulative impacts. Confidential discussions with Prophet River First Nation to seek alternatives to its litigation related to Site C, filed in January 2018, remain open
Stakeholder Engagement	•	BC Hydro continues to work with the communities, regional district and stakeholder groups on the implementation of various community agreements.

3.2 Major Accomplishments, Work Completed, Key Decisions and Key Issues

3.2.1 Construction

Refer to <u>Appendix D</u> for the full construction schedule.

3.2.1.1 Main Civil Works

The scope of the main civil works contract includes the construction of the following major components:

- Diversion works, including two concrete-lined, 10.8 metre diameter tunnels.
 Tunnel No. 1 is 700 metres in length and Tunnel No. 2 is 790 metres in length;
- Diversion tunnel inlet and outlet portals, and approach channels;
- Excavation and bank stabilization;
- Relocation of surplus excavated material (including management of discharges);
- Dams and cofferdams (including a zoned earth embankment dam 1,050 metres long and 60 metres above the present riverbed, and stage 1 and 2 cofferdams);
- Roller-compacted concrete (including a buttress approximately 800 metres long made up of approximately 1.7 million cubic metres of concrete); and
- Haul roads.

Subsequent to the reporting period, a contract amendment was executed on March 6, 2020 to the main civil works contract that is retroactive to December 23, 2019 resulting in an increase in the contract value of up to \$332 million over the duration of the contract, including investments in equipment to reduce the schedule risk for dam construction and a series of performance-based at-risk incentives for the contractor with the objective of maintaining schedule for diversion and first power.

The contractual impacts will be reflected in subsequent quarters. While the amendment supports the project's ability to achieve river diversion in 2020, it also contributes to the significant cost pressures currently being managed.

Construction progress is taking place on the left bank, right bank and other areas described below. Main civil works is on track to meet river diversion in September 2020 and first power in-service milestone in December 2023.

<u>Left Bank</u>

In preparation for river diversion and construction of the earthfill dam, the significant work activities on the left bank are to stabilize the slope with a mass excavation associated with construction of the dam (complete), stabilize the diversion tunnel inlet and outlet portals (complete), excavate two diversion tunnels (complete), construct concrete diversion tunnel linings, construct inlet and outlet structures at the ends of the diversion tunnels to house the hydraulic gates, and construct the approach channels.

The activities currently underway or completed in 2019 on the left bank include:

Adit 4

Backfilling of adit 4 was completed at the end of January 2019. This is one of four tunnels and chambers located around the dam site that were excavated in the late 1970s and early 1980s during preliminary studies for the Project (a fifth adit was

excavated in 2012). Completion of backfilling of the adit removes the risk of the adit having any impact on the diversion infrastructure construction and performance.

Diversion Tunnels

Excavation of the two diversion tunnels commenced in the summer of 2018. In June 2019, the breakthrough on the upper portion (heading) of diversion Tunnel No. 1 occurred, and in early July 2019, breakthrough on the longer diversion Tunnel No. 2 occurred. The achievement of this milestone reduced the uncertainty related to the geological conditions around the tunnels.

In July 2019, access to continue excavation of the bottom portion (benching) of the tunnels was restricted due to a shotcrete delamination in Tunnel No. 1 that resulted in schedule delays in the tunnel excavation and lining. BC Hydro worked with the contractor and WorkSafeBC to resolve safety concerns and excavation recommenced in October 2019. At the end of December 2019, excavation of both tunnels was substantially complete. Roadheaders have been removed from the tunnels and minor excavation work remains.

At December 31, 2019, the gate segments and gate guides for the tunnel inlet structures were in the process of being delivered to site and the hydraulic cylinders were undergoing Factory Acceptance Testing, prior to shipping to site.

Core Trench Excavation (Left Bank)

Excavation work continued on the left bank dam core throughout 2019. Slope protection was added to the left bank excavated slopes to support continued excavation of the core trench which resulted in lower production in fall 2019. BC Hydro worked with the contractor to confirm the slope was safe and in November 2019 work recommenced in accessible areas.

The contractor has constructed additional infrastructure on site to facilitate more efficient material hauling routes. Foundation grout trials were completed, and production grouting is underway.

BC Hydro

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Diversion Tunnel Linings

Work on the tunnel lining started in April 2019 and has continued to progress through 2019. During the reporting period, progress on the concrete lining placements was temporarily halted so that the bottom excavation of the tunnels could be completed ahead of the lining work. The concrete lining was restarted in fall 2019. As of December 31, 2019, approximately 75 per cent of the concrete lining placements are complete for Tunnel No. 1 and approximately 29 per cent for Tunnel No. 2.

Diversion Tunnel Inlet and Outlet Structures

Construction of the inlet and outlet structures on both tunnels continues to progress. This work will continue through winter 2019/2020. As of December 31, 2019, the concrete works for Tunnel No.1 inlet structure is complete, and Tunnel No. 2 inlet structure is 87 per cent complete. Installation of hydraulic and mechanical systems for the inlet gates will begin in January 2020 and continue through to the spring 2020.

<u>Right Bank</u>

The right bank scope of work includes the excavation of the powerhouse, spillways and dam, and placing roller-compacted concrete for the foundations to support the powerhouse, dam and spillway structures.

The activities currently underway or completed in 2019 on the right bank include:

Right Bank Drainage Tunnel

Excavation of the right bank drainage tunnel was completed in February 2019.

Aggregate Production

Aggregate production continued through 2019 with the contractor producing the planned stockpile in advance of the 2020 construction season. Aggregate production stopped in November 2019 for winter and will recommence in spring 2020.

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Core Trench Excavation (Right Bank)

The right bank dam core trench and dam buttress excavations continued during the reporting period and were completed in November 2019. Grouting of the core trench is ongoing. Planning is currently underway on the right bank for 2020 roller-compacted concrete placements at the dam core buttress; this includes effort to optimize production and reduce downtime during the roller-compacted concrete season. Roller-compacted concrete for the dam buttress is scheduled to commence placements in spring 2020 and is expected to be complete in fall 2020.

Spillway Roller-Compacted Concrete (Upper Spillway)

The main civil works contractor completed the placements of roller-compacted concrete for the spillways in October 2019, seven months ahead of schedule. The total volume of roller-compacted concrete placed in 2019 was 585,516 cubic metres. The completion of the spillway milestone allows the generating station and spillways contractor to have access to the work area ahead of schedule and reduces the interface risk with the main civil works contractor and other contractor's now that they will be able to complete the majority of their remaining scope of work independent of the main civil works contractor's progress.

Foundation Enhancements

Geotechnical issues on work fronts other than the left bank diversion tunnels has always been a risk, and this risk has materialized on the right bank.

At the end of December 2019, investigations and analysis of geological mapping and monitoring activities during construction identified that some foundation enhancements would be required to increase the stability below the powerhouse, spillway and future dam core areas.

These investigations and analysis were reported to the Project Assurance Board in early January 2020.

BC Hydro continues to work with the independent Site C Technical Advisory Board and the Project Assurance Board to determine the appropriate enhancement measures. The estimated cost and schedule impacts will be better understood once the enhancement measures are selected in the coming months.

River Diversion

Through 2019, BC Hydro continued to progress with the preparations for diverting the Peace River in September 2020. As a part of this work, operational and construction management, dam safety, emergency management, public safety, site safety, environmental, and commissioning plans have been developed. As part of the leadup to diversion, engagement with key stakeholders and Indigenous groups has been initiated and will continue into 2020.

Debris management

The design and procurement of debris retention structures were initiated on the Peace and Moberly Rivers. Works include piles on the Moberly River and debris booms on the Moberly and Peace Rivers.

Other Areas

Conveyor Belt System

In January 2019, construction of a five-kilometre long electric conveyor belt system began, which runs from the 85th Avenue Industrial Lands to the dam site. The conveyor belt will carry glacial till, an impervious clay-like material that will form the core of the Site C dam. The till conveyor system construction was completed and commissioned in September 2019. As of December 31, 2019, till trial placements are complete and under review by BC Hydro with early positive results.

BC Hydro

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In-River Work

When the river is diverted in 2020, upstream and downstream cofferdams will be in place in the Peace River to provide safe access for the main dam construction. In 2019, the in-river work included dredging in support of the stage 1 cofferdams.

Earthfill Dam

Work on the earthfill dam commenced in October 2018 and initial material placements for the earthfill dam continued through October 2019 and will recommence in spring 2020 when temperatures are conducive to earthfill material placement. While the left bank core trench excavation is behind schedule, BC Hydro expects to meet the key earthfill dam construction milestone in July 2023 for reservoir filling.

3.2.1.2 Generating Station and Spillways

The generating station and spillways scope of work includes the construction of the following major components:

- Generating station and spillways civil works, including:
 - Powerhouse: Concrete placements, installation of structural steel, and installing hydraulic gates;
 - Inlet headworks: Concrete placements, construction of the penstocks, and installing hydraulic gates; and
 - Spillways: Concrete placements and installing hydraulic gates.
- Cranes, which includes the supply and commissioning the powerhouse cranes, tailrace gantry crane, and headworks gantry crane; and
- Hydromechanical equipment, including the supply of all gates.

Generating Station and Spillways Civil Works

The generating station and spillways civil works contract is the second largest contract awarded for the Project and includes the delivery of civil works associated with the powerhouse, intakes, penstocks and spillways for the dam. Cumulative concrete placements for all work areas are proceeding ahead of plan.

Powerhouse

Concrete placements for the powerhouse finished in 2019 slightly ahead of schedule and are about 50 per cent complete. To December 31, 2019, the contractor has placed approximately 80,000 cubic metres of concrete of a total planned 155,000 cubic metres. Unit 1 is ready for the installation of the embedded turbine parts. The steel superstructure over the main service bay was completed in 2019 and the remaining superstructure will be completed in 2020.

Intakes Headworks

In April 2019, the contractor started working on the intake headworks. As of December 31, 2019, 18,500 cubic metres of concrete has been placed of a total of 88,000 cubic metres. Work is proceeding on Units 1, 2, 3, and 6 and is approximately 20 per cent complete.

Penstocks

In April 2019, the first of the penstock segments arrived on site. Penstocks are large steel pipe segments that will bring water from the reservoir to the generating units to produce power.

Penstock fabrication and installation is approximately ten weeks behind schedule as of December 31, 2019. The contractor is developing a robust plan to increase productivity in the future to ensure that the penstock milestones will be met.

The generating station and spillways contractor has fabricated a cumulative total of 601,055 kg of steel for the penstocks. As of December 31, 2019, the penstock work is 15 per cent complete.

Spillways

The contractor commenced working on the lower spillway in October 2019 and has placed 6,300 cubic metres of concrete as of December 31, 2019. This work was not planned to commence until 2020. Work on the upper spillway will start in June 2020.

<u>Cranes</u>

The powerhouse bridge cranes shipped to site in June 2019. Design work on the intake headworks crane continues.

Powerhouse bridge cranes were installed in the main service bay in June 2019. The cranes are important components in the Site C generating station with a lifting capacity of 320 tonnes. These cranes can lift the heaviest equipment in the powerhouse, including the major components of the turbine and generator units. The cranes are scheduled to be commissioned and operational by June 2020.

Hydromechanical Equipment

In 2019, the hydromechanical supplier delivered anchors and embedded parts for the intake operating gates and maintenance gates, and for the Unit 1 draft tube maintenance gate. Anchors for the spillway operating gates and spillway stoplogs were fabricated and shipped at the end of 2019. The supplier also fabricated the first intake operating gate to 75 per cent completion by the end of 2019 with the other five intake gates currently in fabrication. The generating station and spillways contractor completed installation of first stage embedded parts for Units 1, 2, and 3 draft tube maintenance gates and started on sill beam installation for Unit 1 at the end of the year.

Engineering support to construction and vendor integration has been ongoing throughout 2019 for the hydromechanical contract and design will continue to progress in 2020.

3.2.1.3 Balance of Plant

The formal procurement process for the generating station and spillways balance of plant contract was launched in June 2018. The request for proposals for the balance of plant contract was issued in April 2019. Since that time, the proponent teams visited the site and participated in collaborative meetings to facilitate development of their competitive proposals. Proposals will be received in 2020 with a target contract award date of June 2020 and mobilization to site in September 2020.

All ten of the balance of plant equipment supply contracts were awarded in 2019. These include contracts for: generator terminal equipment; protection and control panels; AC station service; generator circuit breaker equipment supply; generator step up transformer; powerhouse cooling water and dewatering large valve; the DC station service; the high voltage equipment; the compressed air receiver; and the diesel generator supply.

3.2.1.4 Turbines and Generators

The scope of work for turbines and generators includes the complete design, supply, installation, testing and commissioning of six turbines, generators, governors and exciters. The design, procurement and manufacturing for the turbines and generators are on schedule.

The contractor continues the assembly and welding of embedded turbine components in its temporary manufacturing facility on the right bank at site. The contractor's São Paulo factory will supply most of the turbine generator components, and as of December 31, 2019, has produced all cast steel parts for the six turbines. Initial meetings for various other turbine and generator components in the São Paulo factory have been held concurrently with visits to many of the contractor's subcontractors in the São Paulo area. Based on the powerhouse construction schedule, the contractor will commence turbine installation in the powerhouse by July 2020 after mobilizing to the area in May 2020.

Pre-production stator bars for the generators were shipped in March 2019 from the contractor's São Paulo facility to BC Hydro's subsidiary, Powertech Labs, for type testing, and the test results confirmed the design will meet contractual requirements.

3.2.1.5 Transmission and Substation

The transmission sub-project will connect the Site C Project to the BC Hydro transmission system. The scope of work includes the following major components:

- Two 75-kilometre-long, 500 kV transmission lines from the Site C substation to the Peace Canyon generating station;
- Three one kilometre long, 500 kV transmission lines from the Site C Generating Station to the Site C substation;
- A new 500 kV Site C substation; and
- Expansion of the existing Peace Canyon 500 kV Gas Insulated Switchgear to incorporate the two new 500 kV transmission line terminals.

Transmission Towers and Lines

Access Roads and Clearing

Following the dismissal of the West Moberly First Nations injunction application in October 2018, the clearing and access road construction on the western half of the transmission line right of way resumed in January 2019. Starting in July 2019, construction of these access roads was significantly impacted by unseasonable wet weather until October 2019, extending the expected completion date from October 2019 to January 2020. Access to all transmission tower sites for the

transmission line construction contractor was established at the end of December 2019. BC Hydro is working with the transmission line contractor to mitigate this delay.

Vegetation clearing on the transmission line right-of-way, including trees and vegetation felling, was substantially completed in March 2019. Some hand-falling could not be completed until road access was completed in December 2019. The removal and/or disposal of waste wood and merchantable timber was also impacted by weather and limited access and is expected to be completed in January 2020. This delay did not impact the transmission line construction.

Transmission Towers and Foundations

The final transmission tower steel delivery was received in January 2019 and the final transmission line conductor delivery was received in April 2019.

The installation of transmission towers on foundations started in February 2019 and the transmission line contractor was able to install 51 towers prior the end of March 2019 when work was suspended due to warm temperatures and spring melt.

Due to poor ground conditions, significantly more piles were required for the transmission tower foundations, which extended the completion of the foundations in both the eastern and western segments of the transmission line. To mitigate any delay, the transmission line contractor continued to work on foundations and tower assembly during the summer from July to September 2019. This work was impacted by unseasonable wet conditions in the summer and delayed freeze-up in the fall/winter. Access to some of the eastern foundation sites within the wet areas of the transmission line was not possible until December of 2019, and completion of all eastern foundations is expected in February 2020.

A total of 97 out of 200 transmission towers for transmission line 5L005 were installed on foundations by the end of December 2019.

Transmission Lines

In October 2019 the transmission line contractor resumed the installation of towers on foundations and began preparation for stringing operations. The first insulator assemblies were installed in early November 2019 and the stringing of the first of nine conductor segments on the eastern segment of the transmission line started in November 2019. The transmission line contractor was able to complete three out of nine conductor segments by December 2019. Tower installation and stringing on the eastern segment of the 5L005 transmission line is expected to be complete in March 2020.

Stringing of the western segment of the 5L005 transmission line is planned to be completed in September 2020, with the line being energized in October 2020. The existing 138 kV lines on the right-of-way will then be de-energized and removed, and installation of towers and conductors will begin on the second transmission line. In total, 405 towers will support the two new 500 kV transmission lines that will connect the Site C substation to the Peace Canyon generating station, over a distance of 75 kilometers. These lines will eventually connect Site C to the rest of the BC Hydro power system.

Substation

Substation construction continued throughout 2019 with the contractor substantially completing the installation of all 500 kV electrical equipment. This included foundation installation, steel supports for buswork, assembly and installation of electrical equipment including installation of the 500 kV shunt reactor, and equipment cabling/wiring. All of the insulating crushed rock surfacing was delivered to the substation, with over 70 per cent placed in the switchyard. Installation of all protection and control equipment in the control building was completed, along with installation of the substation telecom equipment.

There are some remaining construction activities related to substation fence work, roadways within the station, 500 kV buswork and signage. All construction activity is

on track to be completed by summer 2020 with the primary focus being on the testing and commissioning work required for energization.

Together with the upgrades at nine existing BC Hydro substations and telecommunication sites located between Site C and Prince George, the telecom system connects the new Site C substation to the BC Hydro Provincial control centre, enabling remote operation of the substation.

Substation construction remains on schedule for energization in October 2020.

Peace Canyon Gas-Insulated Switchgear Expansion

As part of the transmission sub-project, two new 500 kV lines will be connected to the BC Hydro electrical system at Peace Canyon. To accommodate these new lines, the Peace Canyon switchyard and 500 kV indoor gas-insulated substation were expanded. This work commenced in June 2018 and in July 2019 the 500 kV gas-insulated switchgear at Peace Canyon was energized, becoming the first Site C asset placed into service. Termination of the new 500 kV lines between Site C and Peace Canyon will occur when the first transmission line is complete in 2020 and the second line in 2022.

3.2.1.6 Highway 29 and Hudson's Hope Shoreline Protection Berm

The creation of the Site C reservoir requires realignment of six segments of Highway 29 totalling approximately 32 kilometres. The scope of the highway realignment includes relocation of existing 25 kV distribution lines adjacent to the highway and the decommissioning of the existing highway. The Highways sub-project also includes the construction of a shoreline protection berm within the District of Hudson's Hope to protect against bank erosion due to reservoir wind waves and water table rise, and the development and operation of Portage Mountain Quarry, which will supply riprap for highway and berm construction. The permanent highway realignment is planned to be completed by spring 2023 to ensure the highway remains accessible once the reservoir is inundated and the dam is operational.

The Highways 29 sub-project is divided into the following components:

- Cache Creek highway realignment and bridge;
- Halfway River highway realignment and bridge;
- Farrell Creek highway realignment and bridge;
- Farrell Creek East highway realignment;
- Dry Creek highway realignment and bridge;
- Lynx Creek highway realignment and bridge;
- Portage Mountain Quarry development and operation; and
- Hudson's Hope shoreline protection berm.

Cache Creek

The Cache Creek highway segment has been divided into Cache Creek East (8.6 kilometers) and Cache Creek West (4.1 kilometers) to allow for the further realignment of Cache Creek East.

Cache Creek East

In 2018, BC Hydro worked with Treaty 8 First Nations and landowners on the redesign of the eastern portion of the Highway 29 realignment at Cache Creek East. BC Hydro and the Ministry of Transportation and Infrastructure explored the feasibility of three alternate route options for Cache Creek East to reduce its effects on potential Indigenous burial sites and areas of cultural importance as identified by Treaty 8 First Nations. The selected realignment option is located north of the original route and is approximately 240 metres away from a potential burial site and 370 metres from an area identified to be of cultural importance. This option is the second shortest route of the three considered, meets provincial design and safety

requirements, and includes a longer bridge at the Cache Creek crossing. The 50 per cent detailed design for the revised Cache Creek East alignment was completed in 2019 and is expected to be complete in March 2020.

An amendment to the Project's Environmental Assessment Certificate to reflect the revised realignment was received in December 2019.

A tender for the construction of the Cache Creek East embankment fill (early works) was issued by Ministry of Transportation and Infrastructure in August 2019 and closed in September 2019. The contract was awarded in October 2019. Site preparation works were completed by Ministry of Transportation and Infrastructure contractors in November 2019.

Cache Creek West

The procurement for services related to the four kilometres of the highway realignment at Cache Creek West started in summer 2018. A contract was issued for a partial scope of work in October 2018. The construction activities for this partial scope of work started in early October 2018 and most of the work was completed by December 2018 except for some drainage work which was completed in spring 2019. The invitation to quote for the remaining scope for Cache Creek West was issued in December 2018 and a contract was awarded in May 2019. Construction of the four-kilometre highway realignment commenced in June 2019 and continued through 2019. It is expected to be completed on schedule in summer 2020.

Halfway River

The Halfway River Bridge is one of the more significant components in the Highway 29 realignment and includes the realignment of 3.7 kilometres of highway and the construction of a new one-kilometre-long bridge crossing the Halfway River, approximately 500 metres north of the current structure.

The detailed design for this segment of the highway started in winter 2018 and was completed by June 2019.

The stripping and data recovery of archeological site materials was awarded to a First Nations contractor and work was completed in August 2019.

The contract for the grading, paving and bridge construction was tendered by the Ministry of Transportation and Infrastructure in July 2019 and was awarded in October 2019. Construction is expected to start in January 2020 with completion in December 2022.

Farrell Creek

The Farrell Creek segment includes the realignment of 1.9 kilometers of highway, including the construction of a new 411-meter long bridge.

The detailed design for Farrell Creek was completed to the 90 per cent level in 2019. Completion of the design is expected in early 2020.

A tender for the grading, paving and bridge construction will be initiated by the Ministry of Transportation and Infrastructure in early 2020.

Farrell Creek East

The Farrell Creek East segment includes the realignment of 8.4 kilometers of highway. Geotechnical studies in 2019 concluded that 5.7 kilometers of this segment could be removed from the scope of work and monitored following the creation of the Site C reservoir, reducing the length of Farrell Creek East realignment work to 2.7 kilometers.

The detailed design for Farrell Creek East was completed to the 90 per cent level in 2019. Completion of the design is expected in early 2020.

Procurement of the grading and paving will be initiated in 2021.

Dry Creek

The Dry Creek segment includes the realignment of 1.4 kilometers of highway, including the construction of a new 192-meter-long bridge.

The detailed design for Dry Creek was completed to the 70 per cent level in 2019. Completion of the design is expected in early 2020.

Procurement of the grading, paving and bridge construction will be initiated in early 2020.

Lynx Creek

The Lynx Creek segment includes the realignment of 9.1 kilometers of highway and the construction of a 169-meter-long bridge. The Lynx Creek segment has been split into two contract packages; Lynx Creek East and Lynx Creek.

Lynx Creek East

The design for Lynx Creek East was completed in the fall 2019.

A First Nations directed procurement was initiated for an embankment fill at Lynx Creek East, with the contract awarded in December 2019. Construction started in December 2019 and is expected to be complete in summer 2020.

Lynx Creek

The design for Lynx Creek was completed to the 50 per cent level in 2019. The design is expected to be complete in spring 2020.

A tender for the grading, paving and bridge construction is expected to be issued by the Ministry of Transportation and Infrastructure in spring 2020.

Portage Mountain Quarry and Hudson's Hope shoreline protection berm

Material from Portage Mountain will supply riprap materials for sections of Highway 29 realignment and construction of the shoreline protection berm for the District of Hudson's Hope. BC Hydro received the final report on assessments of yield production and rock quality, durability and geochemical testing indicating positive results in January 2019. Development of the quarry continued, with haul road construction completed in August 2019. The mine production permit for the Portage Mountain Quarry was received in August 2019, and production blasting occurred in August and September 2019 to begin producing riprap materials.

Design of the Hudson's Hope Berm complete in November 2019. A First Nations directed procurement was initiated in December 2019 and contract award is planned for spring 2020.

3.2.1.7 Reservoir Clearing

In 2018, work was initially delayed in portions of the reservoir due to the injunction application. Following the dismissal of the injunction application, work resumed in fall 2018.

The reservoir clearing scope of work is divided into two main regions:

- Lower reservoir, Moberly River drainage and Eastern Reservoir including Cache Creek drainage; and
- Middle reservoir, Halfway River drainage and western reservoir.

Clearing in the lower reservoir, Moberly River drainage, eastern reservoir and middle reservoir is required to support river diversion in fall 2020. All other clearing is scheduled for completion by 2023, prior to reservoir inundation.

Lower Reservoir, Moberly River Drainage and Eastern Reservoir including Cache Creek Drainage

Clearing activities including waste wood disposal occurred in the lower reservoir, Moberly River drainage, north bank of the eastern reservoir and Cache Creek area over the winter 2019. All clearing was completed in these areas except for some floodplain debris removal and some trees temporarily retained for environmental or accessibility reasons. Some of the debris and trees were subsequently removed in summer 2019. Any remaining debris that will need to be disposed of in support of diversion will be addressed by summer 2020.

In June 2019 and September 2019 contracts were awarded for the road construction and clearing of the south bank of the eastern reservoir, respectively. Road construction commenced in July 2019. Clearing activities advanced throughout the fall 2019 and are anticipated to continue through to March 2020.

Middle Reservoir, Halfway River Drainage and Western Reservoir

Surveying and inventory work in the middle and western reservoir areas including Halfway River drainage progressed through early 2019. This work was used to develop preliminary access and clearing plans for these areas used in submissions for regulatory approvals and the development of contract packages.

Three contracts for the middle reservoir were awarded in August 2019, October 2019 and January 2020.

Clearing of the reservoir is scheduled to be complete up to the Halfway River by March 2020 with work occurring in the Halfway River drainage and further westward in subsequent clearing seasons.

3.2.2 Engineering

Engineering provides technical support across the Project with substantial focus given to the maintenance and achievement of the contractor's schedule for both the main civil works contract and the generating station and spillways civil works contract.

Main Civil Works

Over the past year, design for the main civil works has continued to focus on options for advancement of the river diversion schedule which included completion of constructability refinements for the inlet and outlet portal excavations. For the spillways roller-compacted concrete, design alternates were considered, and many were implemented for schedule advancement and hand-over to the generating station and spillways contractor. Detailed geological mapping of the excavations and instrumentation monitoring continues during construction. This information is used to update the design parameters for the site geology and foundations, for the design of additional enhancements for the remaining excavations, and for future foundation enhancements for the right bank dam, core trench, powerhouse, and spillways roller-compacted concrete buttresses.

Large Cranes, Hydromechanical, Turbines and Generators

Engineering support to construction and vendor integration was ongoing throughout 2019 for the large cranes, hydromechanical equipment and turbines and generators contracts.

Generating Station and Spillways, Balance of Plant and Equipment Supply

Several batches of construction drawings for the generating station and spillways civil works contract were completed through 2019, in support of, and in accordance with the revised contractor's schedule for the release of remaining construction drawings. Following on the release of drawings for the powerhouse, significant progress was made on the issue for construction drawings for the spillways for which over 90 per cent had been released by December 2019.

The implementation design for the balance of plant and equipment supply packages for generating station and spillways has been advancing, which includes specifications and 3D modelling work. All ten equipment supply contracts were awarded in 2019 and review of design submittals for these contracts has commenced. The request for proposals for the balance of plant contract, including a first draft of the technical specifications and proposal drawings, was issued in April 2019. The final draft of the technical specifications and issued for proposal drawings was issued in December 2019.

Design continued to be advanced on the protection and control systems and is on schedule with various protection and control panels now under construction.

Transmission and Substation

Implementation design for the 500 kV lines between the Site C substation and the Site C powerhouse was completed to the 90 per cent level, including completing the design for the procurement of steel lattice transmission towers. Telecommunications design was also completed and implemented in 2019.

Highway 29

Designs for all highway segments were advanced to the detailed design level, with designs completed for Halfway River and Lynx Creek East. Designs for Dry Creek, Farrell Creek and Farrell Creek East were advanced to the 90 per cent level. Designs for Cache Creek and Lynx Creek were advanced to the 50 per cent level.

Design of the Hudson's Hope shoreline protection berm is complete.

Technical Advisory Board

The twentieth Technical Advisory Board meeting was held from May 29 to May 31, 2019 in Fort St. John and Vancouver. The Technical Advisory Board was provided with a Project update and construction site tour, while also considering technical aspects of the main civil works and the generating station and spillway contracts. Several additional conference calls, a workshop and a field visit were conducted in 2019.

Refer to <u>Appendix E</u> for the reports on Technical Advisory Board activities in 2019.

3.2.3 Quality Management

The Project has a quality management plan that outlines activities to ensure materials, equipment and the constructed works meet contract quality requirements. The plan identifies resources and procedures necessary for achieving the quality objectives, roles and responsibilities, resource planning and establishment of a quality management program.
Following BC Hydro's internal assessment of quality practices across the Project in 2018, the Project team embarked on several key activities in 2019 to support the recommendations in the internal assessment report including: 1) updating the Project Quality Plan and its supporting plans; 2) re-establishing the quality audit program for site works; 3) hiring of a deputy quality manager dedicated to the generating station and civil works; 4) provision of training to site personnel on the Project's quality management system; and 5) continuing with monthly Quality Performance Indicator assessments for the engineering, manufacturing and construction activities across each sub-project.

Implementation and monitoring of quality control and quality assurance plans are requirements for all contractors. The Project tracks and manages quality nonconformances, which is an occurrence that does not conform to the quality requirements of the contract. <u>Table 2</u> identifies quality management nonconformity instances during the reporting period.

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	Table 2	Quality Managemer January 2019 to De	nt Nonconformity F cember 2019	Report Metrics Repo	orting Peric	d I	
Contract	Reported October 1, 2019 to December 31, 2019	Closed October 1, 2019 to December 31, 2019	Reported January 1, 2019 to December 31, 2019	Closed January 1, 2019 to December 31, 2019	Reported to Date	Closed to Date	Open as of December 31, 2019
Main Civil Works	227	93	405	256	1,481	1300	181
Turbines and Generators	37	19	98	55	126	67	59
Generating Station and Spillways Civil Works	64	38	255	207	308	257	51
Large Cranes	6	6	8	8	17	17	0
Hydromechanical Equipment	6	6	8	8	œ	œ	0
Transmission	6	4	35	24	102	88	14

During 2019, the quality of the roller-compacted concrete placed by the main civil works contractor on the right bank was good. On the left bank, the contractor raised a series of nonconformity reports to address the field observations made on the diversion tunnel concrete linings during the summer and fall of 2019. BC Hydro and the contractor will be collaborating to close these nonconformity reports in 2020. BC Hydro and the contractor continue to meet weekly to discuss and resolve open nonconformity reports, and quality steering committee meetings continue to be held to discuss broader topics related to the contractor's quality performance. BC Hydro will be working with the contractor in 2020 to assess operational readiness of its on-site materials testing laboratory in advance of the commencement of materials processing for the main dam.

For the turbines and generator contract, the quality of the components manufactured to date has been good. There was a significant increase in the manufacturing activities in 2019 and this is expected to continue through 2020 and 2021. BC Hydro and the contractor continue to meet on a weekly basis to discuss and resolve quality issues, and to resolve inspector-access protocols to the main manufacturing facilities. BC Hydro continues to assess its quality assurance surveillance resources as the number of manufacturing locations in Brazil increases.

The quality of the structures built to date by the generating station and spillways civil works contractor has been good. BC Hydro observed a significant improvement in the contractor's thermal control and curing of concrete procedures throughout 2019. As penstock manufacturing and installation activities accelerated during the reporting period, BC Hydro worked closely with the contractor to ensure its dimensional control and welding procedures are being followed. BC Hydro continues to meet with the contractor on a weekly basis to discuss and resolve quality issues.

The six nonconformities reported during the last quarter of the reporting period for the transmission contract were minor in nature; corrective actions and verifications to close them out were reviewed by BC Hydro. BC Hydro continues to perform quality surveillance audits of the transmission contractors to verify that their quality management systems are being adhered to.

BC Hydro continues to have quarterly meetings with our quality assurance partners, regarding the Project's current and future resource-requirements for quality surveillance at off site manufacturing locations.

3.3 Safety and Security

With work well underway on all of the on-site and off-site sub-projects, BC Hydro and all contractors working on the Project remain committed to the safety of all workers and have their construction safety teams dedicating additional time in the field. The construction activities in 2019 continued to increase, and peaked at almost 4,900 workers working on the Project in August 2019 (representing approximately 100 contractors and sub-contractors). As a result, the Project continued to see an increased rate of both serious and non-serious safety incidents, as well as regulatory inspections and orders. The busy summer construction period eased off slightly in the winter period, although work continued on almost all work fronts through the fall and winter period. Several safety and regulatory performance metrics have trended up in 2019.

2019 Highlights

During 2019, the Project held 51 Senior Management Safety Incident Reviews where BC Hydro and Contractor Project leaders reviewed incident investigations and corrective actions for more serious (or potentially serious) safety incidents. Lessons learned are shared across Project teams.

In June 2019, work front 'Safety Walkdowns' were introduced. Safety Walkdowns are a collaborative effort between a Contractor and BC Hydro construction safety leads to identify and eliminate safety hazards.

Working around wildlife is a specific safety hazard for the Project, with an increase in bear encounters during the summer, including in the congested powerhouse work

area. Mitigations included Bear Awareness training for all workers, strong controls for bear attractants, and having wildlife conservation experts available on-site.

Muscular-skeletal incidents accounted for approximately 68 per cent of all injuries in 2019, primarily from slips and trips, lifting and pulling, overexertion, and repetitive motion. Mitigations included Move Smart training and on-site physiotherapist hours.

Technical Safety Inspection Program

Starting with a safety/technical assessment of on-site chiller plants, a formalized Technical Safety Program is now in place for the Project. The program focuses on independent technical safety specialists review of construction equipment, and high hazard systems to ensure they are installed, operated and maintained safely. BC Hydro conducted five technical safety reviews in 2019 on tower cranes, chillers, electrical cable management, lock out/tag out procedures, and the till conveyor.

Security

During 2019, Site C security has been enhanced to meet the security demands related to the increased number of workers accessing the site. This includes working with our contractors to increase their communication to the workforce on gate search protocols and site ban reviews, as well as reviewing current processes to ensure that BC Hydro's commitments to providing a safe and secure workplace for everyone on a safety sensitive project continues to respect the privacy rights of workers.

BC Hydro is committed to providing all employees with a workplace where everyone is treated with dignity and respect and free from harassment, discrimination and offensive conduct and remarks. BC Hydro's Code of Conduct includes a Respectful Workplace Policy which promotes respectful behaviours in the workplace. We actively work with our contractors to ensure their contractual requirements to have and implement a respectful workplace policy, are implemented. Contractors are also

required to comply with our Contractors Standard for Ethical Conduct which is posted on line.

All Site C workers engaged with on and off dam site workfronts on the Project site — including employees, contractors, their workforce, and consultants — are also governed by the Site C Project Absolutes, which specifically include "no bullying and no harassment" expectations. Project Absolutes state that contraventions result in immediate removal from site and, subject to appeal, may lead to revocation of site access privileges. All workers are aware of Site C's priority for an inclusive worksite as this is outlined in the New Worker Orientation which is required for all workers to access site, and posted in various locations on site.

In 2019, there was one formal respectful workplace incident at Site C involving a BC Hydro employee, which was investigated and addressed. To continue supporting an inclusive worksite, some initiatives planned for 2020 include repeating Respectful Workplace Training, introducing Bystander Training, support apprentices' and new workers' right to speak up, and offer training that provides women with skills to speak with courage and confidence. These initiatives are inclusive for BC Hydro employees, consultants, Site C contractors and the contractor workforce.

Summary of Safety and Regulatory Performance Metrics

As of the end of December 2019, all work fronts across the Project had completed more than 20 million work hours (53 months), with no fatalities and one permanent partial disabling injury in 2017. With the increase in work activity volume and safety hazards in 2019, the Project has seen a higher number of serious and non-serious safety incidents reported in 2019 compared to 2018.

In 2019 the Project reported 22 serious safety incidents consisting of eight near misses, and 14 injuries which either required medical attention or had the potential to be a serious injury. Refer to <u>Appendix B</u> for a listing of all serious safety incidents.



There were 1,021 non-serious safety incidents which includes 329 near misses and 692 minor injuries that may have required first aid and/or medical treatment.



A "near miss" is defined as an incident that could have resulted in an injury, but did not because of effective hazard barriers or the person was out of harm's way/missed. BC Hydro considers near miss reporting as indicative of a stronger and improving safety culture, and is strongly encouraging all Site C contractors and employees to report near misses.

<u>Table 3</u> below reflects safety and regulatory performance results for the Project, including all contractors. The table summarizes results in a tabular format, with incident details provided below the table.

	Met	trics			
	Reported for Quarter October 1, 2018 to December 31, 2018 ¹	Reported for Quarter October 1, 2019 to December 31, 2019 ¹	Reported for 2018 (January to December) ¹	Reported for 2019 (January to December) ¹	Reported Since Inception (July 27, 2015 to December 31, 2019) ¹
Fatality ²	0	0	0	0	0
Permanently Disabling Injury ³	0	0	0	0	1 ⁴
Serious Incidents ⁵	3	10	12	22	54
Lost Time Injuries6	2	1	11	6	25
All-Injury Incidents ⁷ (Lost Time Injuries ⁶ and Medical Attention requiring Treatment ⁸)	8	23	34	70	147
Regulatory Inspections	12	15	41	84	156
Regulatory Orders	16	26	65	125	250

Table 3Summary of Site C Safety and Regulatory
Metrics

Safety Performance Frequency Metrics

To assess safety performance over time, the Project considers key safety metrics in context of the total amount of hours worked (frequency) which corrects for the volume of work. <u>Table 4</u> below summarizes these key safety frequencies by quarter for a rolling 12-month average.

¹ Numbers are subject to change due to timing of when data is retrieved and when injury is categorized.

² Excludes any non-occupational incidents.

³ A permanently disabling injury is one in which someone suffers a probable permanent disability.

⁴ In June 2018, an injured worker received a permanent partial disability award from WorkSafeBC due to a lost time injury incident in August 2017. The worker was attempting to unload a light plant (tower) from a flatbed truck. The worker stepped on the light plant (tower) outrigger to gain enough height to reach the lifting attachment when the worker lost balance and fell approximately 7.5 feet to the ground. BC Hydro reclassified this incident as a permanent disabling injury after receiving an update on the WorkSafeBC award in June 2018. The incident is identified as a serious injury in the BC Hydro Incident Management System.

⁵ Serious incidents are any injury or near miss with a potential for a fatality or serious injury.

⁶ Lost time injuries are those where a worker (employee or contractor) misses their next shift (or any subsequent shift) due to a work-related injury / illness. If a worker only misses work on the day of the injury, it is not considered a lost time injury.

⁷ All-Injury incidents is a count of all work-related medical attention requiring treatment, lost time injuries, and fatalities.

⁸ Medical attention requiring treatment is where a medical practitioner has rendered services beyond the level defined as "diagnostic or first aid" and the worker (employee or contractor) was not absent from work after the day of the injury. Services beyond diagnostic / first aid include (but are not limited to) receiving stitches, a prescription, or any treatment plan such as physiotherapy or chiropractic.

Table 4	S F	ummary requenc	of Safet y Metrics	y Perfori S	mance			
	Apr (Rolli	Fiscal 2019 April 2018 – March 2019 (Rolling 12-Month Average)			Fiscal 2020 April 2019 – March 2020 (Rolling 12-Month Average)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Serious Incident Frequency	0.95	0.56	0.44	0.36	0.43	0.39	0.53	n/a
Lost Time Injury Frequency	0.48	0.43	0.40	0.29	0.23	0.18	0.14	n/a
All Injury Frequency	1.67	1.47	1.25	1.01	1.03	1.43	1.68	n/a

Fiscal 2020 Q4 will be updated when information is available.

The Q3 results from Fiscal 2019 to 2020 for the serious incident frequency and all-injury frequency metrics (adjusted for work hours) have increased, and lost time injury results have decreased.

The serious incident frequency for October to December 2019 quarterly reporting period is 0.53, an increase compared to 0.44 for the same period in 2018. Lost time injury frequency this quarter is 0.14, down significantly from 0.40 from the same quarter last year. This result suggests contractors have effective return-to-work and/or recover-at-work programs. Finally, all-injury frequency is at 1.68 this quarter, a 34 per cent increase compared to 1.25 for the same quarter last year.

These safety frequency results are consistent with the noted increase in work activities, workforce numbers, and unique safety hazards associated with the Project works.

Although the Project has seen some decline in safety performance measures in 2019, Project results continue to significantly outperform WorkSafeBC's safety performance comparators in the heavy construction and forestry industries.

Safety Regulatory Inspections and Orders

WorkSafeBC, under the authority of the *Worker's Compensation Act*, is the primary regulator with jurisdiction over safety for the Project. WorkSafeBC oversees all

worker safety (employee and contractor) for the Project, both on the dam site and off the dam site. The Ministry of Energy, Mines and Petroleum Resources is the regulatory authority for worker safety on any work fronts subject to the *Mines Act*, specifically West Pine Quarry, Portage Mountain Quarry, and Wuthrich Quarry.

From October to December 2019, WorkSafeBC issued 15 regulatory inspection reports and 26 regulatory orders. The Ministry of Energy, Mines and Petroleum Resources did not conduct any regulatory inspections during this period.

For 2019, the Project was issued 85 regulatory inspection reports with 125 orders, including three stop work orders and six stop equipment use orders. Of this total, WorkSafeBC issued 83 inspection reports with 122 orders, and the Ministry of Energy, Mines and Petroleum Resources issued two inspection reports with three orders. The majority of these inspection reports were issued for the main civil works and generating station and spillways sub-projects (BC Hydro and contractor).



Of the 85 regulatory inspection reports, 38 (44.7%) were a 'clean sheet' with no orders. As of December 2019, the Project's rolling 12-month 'clean sheet' result remained below WorkSafeBC benchmarks for the heavy construction and forestry industries.

To more broadly assess regulatory safety compliance, the Project monitors an additional metric – average number of orders per regulatory inspection – to help account for the higher volume of regulatory inspections expected at such a large construction project. For 2019, the average number of orders per regulatory inspection is 1.47, an improvement from 1.59 in 2018.

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Refer to <u>Appendix B</u>, for a list of safety regulatory inspections and orders received in 2019. The more significant regulatory inspections came from WorkSafeBC and were related to:

- roadheader incident in the diversion tunnel;
- tower crane incidents in the right bank cofferdam area;
- coordination of safety in multi-employer worksites;
- shotcrete falls in the left bank diversion tunnel and right bank drainage tunnel;
- grout plant incident in the right bank area;
- failed formwork in the left bank cofferdam fishway outlet structures;
- confined space violations; and

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• poor air quality resulting from burning of forest clearing debris piles.

3.4 **First Nations Consultation**

Pursuant to the Environmental Assessment Certificate and Federal Decision Statement, BC Hydro is required to consult with 13 Indigenous groups with respect to the construction stage of the Project. This consultation includes provision of information on construction activities, support for the permit review process, and review and implementation of mitigation, monitoring and management plans, and permit conditions.

Accommodation offers were originally extended to ten First Nations communities. Six agreements have been fully executed and are in various stages of implementation. In February 2019, the Province of British Columbia, BC Hydro, West Moberly First Nations and Prophet River First Nation agreed to enter into confidential discussions to seek alternatives to litigation related to the Site C Project. West Moberly First Nations withdrew from the discussions in August 2019 and filed an amended Notice of Civil Claim in September 2019. Discussions with Prophet River First Nation remain open. To date, Impact Benefits Agreements with Doig River First Nation, Halfway River First Nation, Saulteau First Nation and McLeod Lake Indian Band, and a Project Agreement with Dene Tha' First Nation have been publicly announced.

Consultation and engagement with Indigenous groups is ongoing through the Cultural and Heritage Resources Committee, Environment Forum and Permitting Forum. Engagement through these forums and directly with Indigenous groups to prepare them for river diversion and reservoir inundation is ongoing and has included numerous boat, highway and site tours.

3.5 Litigation

A number of legal challenges to the Project have been filed by First Nations and other interests. In all cases where the courts have issued rulings, the legal challenges have been dismissed.

The treaty infringement claims filed by West Moberly First Nations and Prophet River First Nation in January 2018 remain active. West Moberly First Nations had concurrently filed an injunction application in January 2018 to stop construction of the Project pending the trial of their treaty infringement claim, but the interim injunction was denied by the court.

In February 2019, the Province of British Columbia, BC Hydro, West Moberly First Nations and Prophet River First Nation agreed to enter into confidential discussions to seek alternatives to litigation related to Site C. West Moberly First Nations withdrew from the discussions in August 2019 and is continuing with its litigation. Discussions with Prophet River First Nation remain open.

On September 25, 2019, the West Moberly First Nations filed an Amended Notice of Claim, which, among other things, expands their original treaty infringement action, shifting the focus to all three Peace River facilities, not just Site C, and their alleged cumulative impacts. The West Moberly First Nations are seeking an injunction against operating the Site C Dam, an order to remove the dam, and damages, including the payment of all revenues earned on the existing Peace River dams. BC Hydro's legal counsel are currently reviewing the amended claim. The trial is expected to occur sometime in 2022.

The details of open proceedings in 2019 are summarized in <u>Table 5</u> below. Other than the treaty infringement claims, the litigation listed in <u>Table 5</u> is either inactive, meaning no steps have been taken in litigation that require a response from BC Hydro, or do not present a material financial risk to BC Hydro.

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Description Date Date					
B.C. Supreme Court: Treaty Inf	ringement Claims				
West Moberly First Nations	Civil claim filed	January 15, 2018			
	Injunction application filed	January 31, 2018			
	Injunction hearing date	July 23 to August 3, 2018 and September 4 to 7, 2018			
	Injunction denied (no appeal filed)	October 24, 2018			
	Amended civil claim filed	September 25, 2019			
Prophet River First Nation	Civil claim filed	January 15, 2018			
B.C. Supreme Court: Civil Claims					
Building Trades v. BC Hydro	Civil claim filed	March 2, 2015			
	Response to claim filed	April 10, 2015			
Aggregate Mining Process LLC and Reynolds Shipping LLC	Civil claim filed	November 16, 2018			
	Response to claim filed	December 6, 2018			
	Order granting security for BC Hydro's costs	June 17, 2019			
	Application to dismiss filed after plaintiff failed to post security as ordered (later adjourned after plaintiff belatedly posted security)	July 31, 2019			
Office of the Information and Privacy Commissioner (OIPC)					
Applicant requested review of	Request for review filed	August 17, 2017			
Freedom of Information	OIPC Order issued	December 11, 2018			
response	Application for judicial review of Order filed	January 18, 2019			
	Hearing date	September 17, 2019 and October 4, 2019			
	OIPC Order set aside	December 9, 2019			

 Table 5
 Litigation Status Summary

3.6 Permits and Government Agency Approvals

3.6.1 Background

Before the Site C Project could start construction, an extensive environmental assessment process was undertaken which resulted in the issuance of the Provincial Environmental Assessment Certificate and the Federal Decision Statement in support of the Project. In addition, the Project is required to apply for multiple provincial permits, water licences, leaves to commence construction and federal authorizations. Timing of the application for these permits and authorizations is staged and aligned with the construction schedule, availability of detailed design information, and by Project component. Permitting approaches and requirements are also determined through regular meetings with regulatory agencies and are subject to change throughout the Project. As at December 31, 2019, BC Hydro estimates that approximately 450 permits will be required throughout the life of the Project. Of these permits, 350 have been received and are actively being managed.

Multiple conditions are attached to each permit or authorization, which cover subjects such as air quality, water quality, fish and aquatics, wildlife, heritage, health and safety, construction environmental management and First Nations consultation. Each of the conditions must be implemented, audited and tracked to prove compliance or identify issues for follow-up with corrective actions. Table 6 provides an overview of Provincial Environmental Assessment Certificate and Federal Decision Statement Conditions. BC Hydro has developed a comprehensive Construction Environmental Management Plan which outlines how we will comply with the Project Environmental Assessment Certificate, Federal Decision Statement, and provincial and federal permits and authorizations. As of December 31, 2019, all required conditions and submissions have been met in accordance with the schedule and requirements of the conditions.

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Table 6Overview of Provincial EnvironmentalAssessment Certificate and FederalDecision Statement Conditions				
Туре	Number of Environmental Assessment Certificate Conditions	Number of Federal Decision Statement Conditions	Notes	
AQUATIC ENVIRONMENT				
Hydrology, Water Quality	3	12	Monitoring and management of hydrology, fluvial geomorphology and sediment transport, and water quality.	
Downstream Monitoring		5	Analysis of model predictions using existing data (Peace Athabasca Delta).	
Fish and Fish Habitat	4	10	Protecting riparian zones, including fish passage in design, and managing total dissolved gas.	
Vegetation and Ecological Communities	7	9	Updating mapping, conducting pre-construction surveys, analyzing wetland function and replacing lost wetlands, protecting rare plants.	
Species at Risk		6	Ensuring that potential effects are addressed and monitored.	
Wildlife Resources	10	17	Providing bird windows and identifying mitigation measures for migratory and non-migratory birds, bats, snakes, and fishers.	
Current Use	4	4	Mitigating Indigenous plant use and ground truthing measures to inform additional measures.	
LAND AND RESOURCE USE				
Harvest of Fish and Wildlife	1		Compensating guide outfitters and trap line holders.	
Agriculture	2		Establishing a \$20 million fund and monitoring.	
Other Resource Industries	3		Addressing surplus aggregate, and interface with oil and gas producers.	
Transportation	5		Controlling access, providing carpool plans, monitoring traffic and delivering appropriate signage.	



Туре	Number of Environmental Assessment Certificate Conditions	Number of Federal Decision Statement Conditions	Notes
Outdoor Recreation and Tourism	3		Building boat launches and recreation fund, compensating camp ground owners, and informing downstream Alberta fishers.
COMMUNITY			
Community Infrastructure	6		Mitigating effects on waste management, sewage and water systems.
Housing	2		Building 50 rental units in Fort St. John and providing camp accommodation for workers.
Regional Economic Development	6		Providing funds for Hudson's Hope, non-profits, labour/training plans, and community recreation.
HUMAN HEALTH			
Air Quality/Noise	4	7	Monitoring of ambient air quality, noise and vibration.
Water Quality	1		Monitoring of potable and recreational water quality.
Methylmercury	1	7	Monitoring of accumulation in fish, including collection, timing and reporting requirements.
HERITAGE RESOURCES			
Visual Resources	1		Managing landscape views through design of facilities exteriors and landscaping.
Heritage	3	6	Developing a Heritage Management Plan and providing funding for storage.
ENVIRONMENTAL PROTEC	TION and MANAG	EMENT	
Greenhouse Gas Monitoring	1		Monitoring greenhouse gas emissions.
Environmental Management Plans	4		Providing required plans and establishing requirement for an Independent Environmental Monitor.



Туре	Number of Environmental Assessment Certificate Conditions	Number of Federal Decision Statement Conditions	Notes
Safety Management Plans	2		Developing and implementing Worker and Public Safety, Traffic Management, and Fire Protection Plans.
Dam Safety	2		Undertaking a dam breach assessment and supporting emergency management in Alberta.
Mitigation, Monitoring and Development Plans	4		Providing required mitigation Plans, Quarry Development, Communications and Business Participation Plans.
Accidents and Malfunctions		6	Providing required plan and consultation with Environment Canada on effects of potential accidents and malfunctions on the environment.
ADMINISTRATIVE			
General Conditions		4	Using science to inform plans and carry on consultation as appropriate.
Implementation Schedule		3	Providing an implementation schedule for conditions 90 days in advance of activity.
Record Keeping		2	Retaining records in a manner that facilitates compliance review.
TOTAL	79	98	

3.6.2 Federal Authorizations

Federal authorizations are required under the *Fisheries Act* (Fisheries and Oceans Canada) and the *Navigation Protection Act* (Transport Canada). All major federal authorizations for construction and operation of the Site C dam and reservoir were received in July 2016. At this time, no further *Fisheries Act* authorizations are anticipated. Additional *Navigation Protection Act* approvals for discrete works in the reservoir (e.g., shoreline works, debris booms and Highway 29 bridges) are anticipated to be issued at the regional level. As of December 31, 2019, a total of

53 federal approvals have been received and are actively being managed. Six approvals were pending, and 15 future approvals planned.

3.6.3 Provincial Permits

Site C requires provincial permits primarily under the *Land Act, Water Sustainability Act, Forest Act, Wildlife Act, Heritage Conservation Act,* and *Mines Act.* These permits include investigative permits, licences to occupy land, water licence approvals, leaves to commence construction and leaves to construct, and licences to cut vegetation, among others. Permit applications are sequenced with the overall schedule of the Project to ensure the most current and factual information is included in the submissions.

Approximately 381 provincial permits and approvals will be required throughout the life of the Project. As of December 31, 2019, 297 permits have been obtained and are actively being managed. These have included permits for the dam site area (site preparation and clearing, as well as works for the main civil works and generating station and spillways, such as construction of cofferdams, excavation and construction of roller-compacted concrete buttress), worker accommodation (land tenure and water withdrawal), Highway 29 geotechnical investigations and construction, transmission line clearing and construction of access roads, and lower/eastern reservoir and Moberly River clearing. Future provincial permits are planned for the construction of the Highway 29 realignment, Hudson's Hope Berm, and middle and western reservoir clearing and filling. All future permits are anticipated to be issued in accordance with the Project construction schedule.

The majority of the provincial permits are administered by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development and the Ministry of Energy, Mines and Petroleum Resources. In addition, BC Hydro has developed a coordinated First Nations consultation process with the Ministry of Forest, Lands, Natural Resource Operations and Rural Development to assist with the government permit workload. This coordinated consultation process was implemented in January 2018.

3.6.4 Environmental Assessment Certificate

Compliance with the Project conditions in the Environmental Assessment Certificate is regularly monitored, and evidence is collected by various federal and provincial regulatory agencies, the Independent Environmental Monitor, BC Hydro and contractors.

In 2019, the Environmental Assessment Office issued the following three amendments to the Project's Environmental Assessment Certificate.

- On February 12, 2019, the Environmental Assessment Certificate was amended to allow for selective use of machinery to clear in riparian zones during reservoir clearing when it is unsafe to undertake manual clearing;
- On February 12, 2019, the Environmental Assessment Certificate was amended to allow for the expansion of the worker accommodation to a peak capacity of 2,200 persons; and
- On December 13, 2019, the Environmental Assessment Certificate was amended to reflect design changes to the realignment of Highway 29 at Cache Creek. The revised realignment reduces impacts to cultural sites of importance to Indigenous groups.

All amendments and amendment requests are posted on the Environmental Assessment Office website at

https://projects.eao.gov.bc.ca/p/site-c-clean-energy/docs:

As with any large construction project, refinements to the design are expected. There are no material impacts to the cost of the Project as a result of the proposed amendment requests.

3.6.5 Permitting Improvement

In order to efficiently and effectively manage the large volume of permits required for the Project, BC Hydro continues to engage with regulators, First Nations communities and contractors to share information, seek feedback, and identify process improvements. Process improvements implemented include the following:

- BC Hydro continues to facilitate meetings with the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, the Comptroller of Water Rights, the Department of Fisheries and Oceans and contractors to ensure permit applications are coordinated, timely and sufficient;
- Regular permitting forums are being held with Indigenous groups to share information on upcoming permit applications and to seek feedback before applications are submitted to regulators;
- BC Hydro has implemented a coordinated Indigenous groups consultation process with the Ministry of Forest, Lands, Natural Resource Operations and Rural Development to assist with the government permit workload; and
- Permitting Forum No. 13 was held on July 17, 2019, covering eight permit applications for works related to Highway 29 realignment at Lynx Creek East, middle reservoir clearing, Portage Mountain Quarry, and transmission line stringing. Permitting Forum No. 14 was held on September 11, 2019, covering six permit applications for debris boom facilities on the Moberly and Peace Rivers, groundwater use for Highway 29 construction, and construction of the realignment of Highway 29 at Cache Creek. Permitting Forum No. 15 was held on November 14, 2019, covering five permit applications for Highway 29 realignment for Farrell Creek, Farrell Creek East, in-river material sources for Highway 29 realignment, and the Peace River boat portage program.



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3.7 Environment

3.7.1 Mitigation, Monitoring and Management Plans

The Environmental Assessment Certificate and Federal Decision Statement conditions require the development of draft and final environmental management, mitigation and monitoring plans, as well as the submission of annual reports on some of these plans.

Focus remains on minimizing sediment and erosion across the dam site, care of water, hydrocarbon management and invasive weed control. Given the size of the Project and the length of construction, wildlife is becoming less wary of the site. As such wildlife attractant management is becoming more of a focus.

On the left bank, construction of the sediment control features located at L3 (a gulley on the left bank which contains a stream that flows for a portion of the year) is substantially complete and the control features effectively conveyed water during the spring rain events. Care of water systems are substantially complete within the till conveyor area and include directional ditching, sediment control devices and ponds.

On the right bank management of water that has contacted naturally occurring acidic rock has been substantially implemented. Works are substantially complete for the right bank downstream side channel fish enhancement project. This Project has created shallow, still backwaters that provide valuable habitat for fish within the Peace River.

Wildlife mitigation programs are progressing with further installations of summer bat boxes, fisher maternity boxes, eagle nest platforms and snake dens necessary in advance of reservoir clearing. Wildlife sweeps of the area for any potential project interactions continue regularly and appropriate mitigation or avoidance practices established; such as snake fencing and warning signs, no work zones, and limiting hours or days of work.

Wildlife and fisheries studies and monitoring continue to collect baseline usage data for comparison post dam construction.

Air quality, water, noise and light monitoring continue at various locations throughout the Project with only localized or sporadic elevated readings noted and appropriate mitigation taken.

As of December 31, 2019, all required submissions have been made in accordance with the schedule and requirements of the conditions, including all environmental protection plans required for the generating station and spillways contractor.

Also in 2019, there were 13 annual reports submitted in accordance with the conditions.

3.7.2 Environmental Compliance Inspections and Enforcement

Throughout 2019, the Project was inspected by provincial and federal regulators from the Water Comptrollers' Office, the B.C. Environmental Assessment Office, the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, the Ministry of Energy, Mines and Petroleum Resources and the Canadian Environmental Assessment Agency.

Throughout the course of the on-site inspections, environmental compliance was focused on the following areas:

- Completing the channelization works at the areas of the dam site referred to as L3 and Garbage Creek. The stilling basin in the upper portion of L3 was damaged due to high flows during the 2018 freshet. This stilling basin was decommissioned, and the area cleared of debris. Repairs to the L3 upper stilling basin and channel were underway through the fall and winter of 2018 and were substantially completed in March 2019.
- Improving the care of water systems on the right bank. BC Hydro increased the holding capacity and effectiveness of these care of water systems by removing much of the weathered acidic rock, completing clean water bypass ditches,

increasing treatment pond holding capacity and increasing the overall water holding capacity.

- Selected over-greasing of equipment at the dam site area. BC Hydro is requiring any noncompliant contractors to immediately address the non-compliances and implement an action plan that requires equipment to be maintained going forward to prevent a re-accumulation of grease.
- Enhancing erosion and sediment control measures along the 85th Avenue conveyor corridor. BC Hydro is addressing these concerns through the installation of erosion and sediment control structures on the site. Hydroseeding of both contact and non-contact slopes took place within the deep cut portions of the corridor. In addition, the catchment located at the base of the L3 ravine is handling sediment releases and reducing turbidity in downstream reaches.
- Spill prevention and response plans. BC Hydro is addressing this concern by continuing to utilize spill pads and drip trays and monitoring of equipment with appropriate storage and disposal. This also includes replenishing/refreshing spill kits and continued spill kit inspections.
- Waste management plans with regards to bear proofing. BC Hydro is addressing this concern by actioning items to get bins repaired or replaced and ensuring best secure waste management practices are implemented.
- Enhancing erosion and sediment control measures along the dam site area and Portage Mountain Quarry. BC Hydro is addressing this with ongoing maintenance and installation of erosion and sediment control devices including specific maintenance at Portage Mountain Quarry and rock installation within the dam site area. Additionally, BC Hydro is working to improve contractors' road and ditch maintenance practices.

Inspectors from the B.C. Environmental Assessment Office, Department of Fisheries and Oceans Canada, Impact Assessment Agency of Canada, the Independent Environmental Monitor, the Water Comptroller, Ministry of Energy and Mines, and Transport Canada performed over 1,800 hours of inspections between January 1 and December 31, 2019. The results of these inspections are listed below in <u>Table 7</u>.

BC Hydro completed almost 45,000 environmental compliance inspections in 2019, with a compliant or partial compliant result of 98 per cent across all contractors and works areas.

Agency	Number of Warning Letters	Number of Orders
Water Comptroller's Office	0	1
Environmental Assessment Office	0	0
Ministry of Forests, Lands, Natural Resource Operations and Rural Development	0	0
Ministry of Energy, Mines and Petroleum Resources	0	0
Canadian Environmental Assessment Agency	0	0

 Table 7
 Warning Letters and Orders

Site C Project staff met bi-weekly with provincial regulators to ensure ongoing focus and attention to the areas of most importance and concern for the regulators, and to proactively address any environmental or regulatory issues that may arise.

Issues continue to be observed for excessive greasing of equipment and hydrocarbon spills. BC Hydro is working with its on-site contractors to raise the awareness of both care of water and spill/leak prevention requirements.

Additionally, the Project has engaged both an Independent Environmental Monitor and an Independent Engineer that report directly to provincial regulators. The Independent Environmental Monitor provided weekly reports that have also demonstrated substantial compliance across the Project while continuing to identify areas of focus for sediment and erosion control, water management and spill



prevention. The Independent Engineer worked directly with site staff to proactively identify design issues that may impact the environment and develop mitigation plans to avoid or minimize impacts.

3.7.3 Heritage

In accordance with Environmental Assessment Certificate and Federal Decision Statement conditions, the Site C Heritage Resources Management Plan addresses the measures that will be used to mitigate the adverse effects of the Project on heritage resources.

The 2019 heritage field program is focused on field work that will meet regulatory requirements for pre-construction archaeological impact assessments, and systematic data recovery at selected archaeological sites. The field season was initiated in May 2019 and ended in December 2019.

Heritage works includes approximately 80 archaeologists and Indigenous community representatives and the submittal of 22 archaeological interim reports, one archaeological annual permit report, and one archaeological final permit report to the BC Archaeology Branch and Indigenous communities in accordance with *Heritage Conservation Act* permit terms and conditions.

Additionally, three archaeological interim reports and two archaeological annual reports for work conducted in 2019 are pending submission to the BC Archaeology Branch and Indigenous groups. One palaeontological report will be submitted to the B.C. Archaeology Branch and the B.C. Heritage Branch.

Heritage reviews of contract documents, contractor environmental plans and construction readiness plans, as well as field inspections, were performed to ensure compliance. Additionally, five heritage chance finds were reported in this period. A total of four new *Heritage Conservation Act* permits, and two *Heritage Conservation Act* permit amendments were received in support of the 2019 Heritage Program.

One *Heritage Conservation Act* permit closed on December 31, 2019 once the terms and conditions of this permit were met.

3.7.4 Agricultural Mitigation and Compensation Plan Framework

As part of the Site C Agricultural Mitigation and Compensation Plan, BC Hydro has established a \$20 million BC Hydro Peace Agricultural Compensation Fund to support agricultural production and related economic activity in the Peace Region. The fund is governed by a regional decision-making board made up of representatives from five regional agricultural organizations, the Peace River Regional District, three agricultural producer members-at-large and one Peace River Valley agricultural producer. Northern Development Initiative Trust was selected as the fund administrator and is managing the investment of the funds. The first grant intake of \$250,000 was held in fall 2019 and seven Peace Region agricultural projects received a total of \$209,086 in funding. A second grant intake of \$250,000 is currently open.

3.8 Labour, Employment and Training Initiatives and Building Capacity Initiatives

3.8.1 Labour

To date, unions that have participated in the construction of Site C are listed in <u>Table 8</u> below.

Table 8 Participating Unions				
Union				
Construction Maintenance and Allied Workers (CMAW)				
Christian Labour Association of Canada (CLAC), local 68				
Canada West Construction Union (CWU)				
Construction and Specialized workers Union (CSWU), local 1611				
International Union of Operating Engineers (IUOE), local 115				
Ironworkers, local 97				
International Brotherhood of Electrical Workers (IBEW)				
MoveUP, local 378				

Union
Pile Drivers 2402
The Boilermakers, lodge 359
The United Association of Journeymen & Apprentices of the Plumbing & Pipefitting Industry of the U.S. & Canada, local 170
Teamsters, local 213

In addition, ten unions affiliated with the BC Building Trades will be working on the installation of the turbines and generators.

The generating station and spillways contractor has signed a labour agreement for the generating station and spillways civil works with the IUOE Local 115, the CSWU Local 1611 and CMAW.

Further, the substation contractor has negotiated labour agreements with the IBEW for the electrical work on the Site C substation, and their civil subcontractor has been certified to the CMAW. The transmission contractor is performing transmission line work on the Project and is signatory to a labour agreement with the IBEW. The Teamsters have collective agreements with other contractors on the Project.

The labour approach for the Site C balance of plant contract will be for the contractor to retain the Construction Labour Relations Association to enter into an agreement, through negotiations, with the Bargaining Council of BC Building Trades Unions or another consortium of Building Trades Unions that covers an agreed set of labour requirements.

3.8.2 Employment

Contractors submit monthly workforce data electronically to BC Hydro. <u>Table 9</u> presents the monthly number of construction contractors, non-construction contractors, engineers, and Project team workers for this period. As with any construction project, the number of workers — and the proportion from any particular location — will vary month-to-month and also reflects the seasonal nature of construction work.

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Table 9	Site C Jobs Snapshot Reporting Period –
	January 2019 to December 2019

Month	Number of B.C. primary residents ⁹	Number of total workers ¹⁰
January 2019	2,479	3,186
February 2019	2,760	3,494
March 2019	2,894	3,674
April 2019	2,950	3,775
May 2019	3,395	4,385
June 2019	3,521	4,634
July 2019	3,596	4,797
August 2019	3,701	4,870
September 2019	3,634	4,790
October 2019	3,637	4,823
November 2019	3,445	4,650
December 2019	3,197	4,330

In December 2019, 74 per cent (3,197 workers) of the workforce was made up of residents of British Columbia, while 19 per cent (689 workers) of the workforce lived in the Peace River Regional District. The on-site contractor workforce number also includes 12 per cent women (433 workers) and 162 workers who are working for various contractors as apprentice carpenters, welders, electricians, millwrights, ironworkers, mechanics, boilermakers and heavy equipment operators.

In August 2019, the total workforce peaked at 4,870, the highest number to date since the start of construction. In 2019, the Project reached record highs in the numbers for women and Indigenous workers on site, and contractors also reported the highest use of apprentices to date.

⁹ Employment numbers provided by Site C contractors and consultants are subject to revision. Data not received by the Project deadline may not be included in the above numbers. Employment numbers are direct only and do not capture indirect or induced employment.

¹⁰ Total workers include:

[•] Construction and non-construction contractors performing work on Site C dam site, transmission corridor, reservoir clearing area, public roadwork, worker accommodation and services.

[•] Engineers and Project team that is comprised of both on-site and off-site workers.

[•] The Project team, which includes, BC Hydro construction management and other offsite Site C Project staff. An estimate is provided where possible if primary residence is not given.

3.8.3 Training and Capacity Building Initiatives

In September 2017, the Contractors Labour Committee agreed to establish an Indigenous labour subcommittee. The purpose of the subcommittee is to support Indigenous training, labour and employment on Site C through communication, consultation, coordination and cooperation among contractors on the Project.

The committee meets quarterly, or on an as-needed basis. All major Site C construction contractors currently attend this meeting.

The committee has developed a number of initiatives, such as:

- Established a protocol for distribution of Indigenous candidate resumes;
- Developed and implemented the Indigenous Employment and Information Day;
- Participated in the development of the BC Hydro and Northern Lights College pre-carpentry skills pilot program on the Site C Project;
- Reviewed and assisted contractors in contract reporting requirements;
- Discussed communication of site-wide policies;
- Shared regional cultural events with Project contractors;
- Shared BC Hydro's Indigenous Employment and Business Development employment and training initiatives;
- Reviewed contractors' best practices;
- Shared success stories to assist in generating opportunities; and
- Reviewed Project status and upcoming labour requirements for contractors and how to meet labour demands.

BC Hydro has included apprentice targets in the generating station and spillways civil works contract, the transmission lines and the substation contracts, and the Highway 29 work to be procured by BC Hydro.

The generating station and spillways contractor has also committed to providing opportunities for apprentices. An apprentice target will also be included in the balance of plant contract.

In August 2013, Northern Lights College Foundation started distributing the BC Hydro Trades and Skilled Training Bursary Awards. As of December 2019, a total of 263 students had received bursaries, including 114 Indigenous students who have benefitted from the bursary in programs such as electrical, welding, millwright, cooking, social work, and many others. The bursary ended in October 2018, with remaining amounts still available. BC Hydro has worked with the Northern Lights College Foundation to extend the bursary and reserve the remaining bursary amounts for trades programs directly needed for Project work. Part of this agreement was to set aside funds for the BC Hydro and Northern Lights College pre-carpentry skills pilot program for Site C. This will be reviewed in October 2020.

BC Hydro continues to work with local employment agencies to ensure that as job opportunities become available, they are posted on the WorkBC website as well as on the Fort St. John Employment Connections website. With the announcement of the Louisiana Pacific Peace Valley Oriented Strand Board mill permanent curtailment, BC Hydro is working with Ministry of Forests, Lands, Natural Resource Operations and Rural Development and their worker transition initiative to assist the local community in responding to this closure. On July 30, 2019, WorkBC hosted a job fair at the Peace Valley Oriented Strand Board (OSB) mill to support the impacted workers. There were approximately 110 employees who attended the job fair. BC Hydro and six Site C contractors attended the job fair. The main civil works contractor hired approximately 30 people at the job fair. The generating station and spillways contractor hired approximately six employees, including three Indigenous workers. BC Hydro has also hired one employee from the mill since the announcement of the curtailment. BC Hydro's contractors continue to work with the local community to access available skilled and gualified workers impacted by the downturn in the forestry sector, including participating in local job fairs.

In October 2019, BC Hydro hosted a Site C Employment and Training Information session for local employment agencies and training organizations at Site. This session was an opportunity for local employment and training organizations to connect with Site C Contractors on their current and future employment and training needs. Contractors presented on their current and future employment needs, the scope of their work on the Project, the types of workers typically employed and their hiring requirements. The goal of this event was to assist in facilitating training as well as facilitating local employment on the Project. The BC Construction Association STEP program, WorkBC Chetwynd, WorkBC Fort St. John (Employment Connections), WorkBC Mackenzie, the Industry Training Authority, and Northern Lights College were all in attendance.

In December 2019, Site C contractors reported 689 workers on site from the Peace River Regional District. This is a total of 19 per cent of the construction and non-construction contractors' workforce.

Contractor Indigenous Employment and Training information session

In January and July 2019, BC Hydro hosted a Contractor Indigenous Employment and Training information sessions in Fort St. John. The purpose of these meetings were to assist in building relationships between employment and training professionals from the Indigenous communities and key Site C contractors.

Site C contractors have noted that certain trades will be in high demand over the next two to three years during peak project construction periods. As such, major on-site contractors are exploring opportunities for apprentice and other training to take place on-site. BC Hydro worked with Northern Lights College and Site C contractors to develop the BC Hydro and Northern Lights College on-site pre-carpentry skills pilot program. This program was successfully delivered in April 2019 and BC Hydro and Northern Lights College are currently planning on delivering the program again in spring 2020. The intent of this program is to provide an overview of the skills required for the carpentry trade (essential skills training),



general employment knowledge (employment readiness), overview of job requirements for carpenters, knowledge of B.C.'s apprenticeship system, and Site C Project-specific knowledge.

This is a 14-day program designed for local new workers or workers new to the trade with preference given to local Indigenous candidates. The course was partly run at the worker accommodation camp and the 14 days were intended to reflect a typical Site C schedule. Seven Indigenous students from this program were hired for Project work by contractors on the Project, with one student entering an apprentice program to become journey-person carpenter. Funding for this program was also provided through the North East Native Advancing Society and donations from the Construction Maintenance and Allied Workers.

The main civil works contractor has reported apprentices in the heavy equipment operator and labourer trades through a new training program in partnership with Christian Labour Association of Canada (CLAC) and the Industry Training Authority.

3.9 Community Engagement and Communication

3.9.1 Local Government Liaison

There are a number of Environmental Assessment Certificate conditions that are relevant to local communities in the vicinity of the Project. BC Hydro is implementing some of these conditions through community agreements offered to five local governments. Through these discussions BC Hydro has, in some instances, agreed to additional measures to address concerns about local community impacts from construction and operation of the Project.

BC Hydro has concluded four community agreements with respect to the Project: the District of Taylor (2013), the District of Chetwynd (2013), the City of Fort St. John (2016) and the District of Hudson's Hope (2017). BC Hydro and the City of Fort St. John established a Community Agreement Monitoring Committee to jointly oversee implementation of the community agreement. BC Hydro continues to work

cooperatively with the City of Fort St. John, District of Hudson's Hope, District of Taylor and the District of Chetwynd to ensure implementation of their respective agreements.

In 2019, the Regional Community Liaison Committee, which is comprised of local elected officials and local First Nations communities, met three times (March 13, June 19 and September 18). In addition, a site tour was conducted with the Regional Community Liaison Committee on September 19, 2019. Eight local governments and four local First Nations communities (McLeod Lake Indian Band, Doig River First Nations, Saulteau First Nations and Blueberry River First Nations) as well as the two MLAs for Peace River North and Peace River South, are invited to participate as committee members. Representatives from the Project's major contractors may also attend the meetings as invited guests.

3.9.2 Business Liaison and Outreach

BC Hydro continued to implement its business construction liaison and outreach by attending local chamber of commerce meetings in Fort St. John and Chetwynd. The Project team sent out 14 notifications in 2019, which includes five notifications in the final quarter of the year to the Site C business directory.

3.9.2.1 Community Relations and Construction Communications

BC Hydro continued to implement its construction communications program throughout 2019. The program includes updating and maintaining the Project website (<u>www.sitecproject.com</u>) with current information, and photos and videos of construction activities, and providing information to local and regional stakeholders as required.

In 2019, the Site C community relations team hosted 50 external site tours, which includes eight in the final quarter of the year, showing key stakeholders, local government officials and Indigenous groups how the Project is progressing.

Construction Bulletins

Bi-weekly construction bulletins continued to be issued throughout 2019. These bulletins are posted on the Project website and sent by email to the web-subscriber list. There were 26 construction bulletins and four quarterly construction notification letters issued in 2019, with seven and one, respectively, distributed in the final quarter of the year.

Public Enquiries

In total, BC Hydro received 2,056 public enquiries between January 1 and December 31, 2019, with 417 received in the last quarter of the year. The majority of these enquiries continued to be about business and job opportunities, with limited construction impact concerns from local residents. <u>Table 10</u> shows the breakdown of some of the most common enquiry types.

Enquiry Type ¹¹	October 1, 2019 to December 31, 2019	2019
Job Opportunities	249	1,429
Business Opportunities	65	346
General Information	37	143
Construction Impacts ¹²	23	72
Other ¹³	43	66
Total	417	2,056

In total, BC Hydro has received more than 11,000 enquiries since August 2015.

 Table 10
 Public Enquiries Breakdown

3.9.2.2 Communications Activities

Based on a search using the media database Infomart, there were 575 stories referencing the Site C Project in B.C. news media between January 1 and

¹¹ This table is a sample of enquiry types and does not include all enquiry types received.

¹² The nature of the construction impact inquiries is primarily air quality, noise and traffic conditions.

¹³ "Other" accounts for enquiries related to a variety of other topics, such recreation access near construction sites, property owner correspondence, or requests for site tours.

December 31, 2019. In the final quarter of the year, there were 135 media stories referencing the Project.

3.9.3 Housing Plan and Housing Monitoring and Follow-Up Program

BC Hydro and BC Housing Management Commission (BC Housing) signed a contribution agreement on July 19, 2016 related to the development, construction and operation of a building in Fort St. John comprised of 50 residential rental units. The agreement structured the financial contribution from BC Hydro to enable viable financial operation of the affordable housing units by BC Housing in the near-term and viable financial operation of all 50 units of affordable housing in the longer term.

BC Hydro completed a head lease with BC Housing in May 2019 for 20 units in the building. Any suites not utilized by BC Hydro are available to BC Housing to offer for public rental. The grand opening of the building was held jointly by BC Housing, BC Hydro and the City of Fort St. John in November 2019. BC Hydro currently rents 25 units in the building. The remaining units are used by BC Housing for affordable housing or rented to the public.

3.9.4 Labour and Training Plan

In accordance with an Environmental Assessment Certificate condition, a Labour and Training Plan was developed and submitted to the Environmental Assessment Office on June 5, 2015. This plan, as well as Environmental Assessment Certificate Condition 45, includes reporting requirements to support educational institutions in planning their training programs to support potential workers in obtaining Project jobs in the future. This report was issued to the appropriate training institutions in the northeast region of B.C. in July 2016, July 2017, July 2018 and July 2019. The next report will be issued in summer/fall 2020.
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3.9.5 Human Health

3.9.5.1 Health Care Services Plan and Emergency Service Plan

The Project health clinic is contracted by BC Hydro with Halfway River International SOS Medical Ltd., a partnership between Halfway River First Nation and International SOS. The clinic continues to operate in its permanent location within the Two Rivers Lodge and based on camp occupancy was staffed 24/7 during this period with a nurse practitioner and advanced care paramedics. BC Hydro and the clinic operator continue to liaise with the local health care community.

The clinic provides workers with access to primary and preventative health care and work-related injury evaluation and treatment services and is currently open seven days a week, 24 hours a day. Since opening the health clinic, there have been a total of 13,223 patient interactions. During the last quarter of 2019, there were 1,370 patient interactions, of which 251 were occupational and 1,119 non-occupational. Several preventive health themes were promoted to workers including: influenza awareness and resiliency, mental health awareness and impact from fly-in/fly-out work schedules and HIV/AIDS awareness.

3.9.6 Property Acquisitions

In spring 2019, BC Hydro accessed private properties to inform design and mitigation options for the various components of the Site C Project. Throughout 2019, BC Hydro continued the property acquisition process for the re-alignment of three highway projects (Cache Creek East, Lynx Creek and Farrell Creek) and the Hudson's Hope shoreline protection berm project. BC Hydro also successfully negotiated several land acquisitions for other Project components to enable reservoir clearing and inundation.

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3.10 Key Procurement and Contract Developments

3.10.1 Key Procurement

The procurement approach was approved by the board of directors in June 2012 for the construction of the Project. The procurement approach defined the scope of the major contracts and their delivery models, as summarized in <u>Table 11</u> below.

Component	Contract	Procurement Model	Anticipated Timing
Worker Accommodation	Worker accommodation and site services contract	Design-Build-Finance-Op erate-Maintain	Completed
Earthworks	Site preparation contracts	Predominantly Design-Bid-Build	Completed
	Main Civil Works contract	Design-Bid-Build	Completed
Reservoir/ Transmission Clearing	Multiple reservoir clearing contracts to be awarded over seven to eight years	Design-Bid-Build	Eleven contracts completed (two transmission line, nine reservoir) Five contract packages remain to be procured; final number will depend on the scope of each package.
Generating Station and Spillways	Turbines and Generators contract	Design-Build	Completed
	Generating Station and Spillways Civil Works contract	Design-Bid-Build	Completed
	Hydromechanical Equipment contract	Supply Contract	Completed
	Balance of Plant Equipment Supply	Supply Contracts	All 10 major equipment supply contracts completed.

Table 11Major Project Contracts and Delivery
Models

PUBLIC Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18) – January 2019 to December 2019

Component	Contract	Procurement Model	Anticipated Timing		
	Balance of Plant Contract	Design-Build/ Design-Bid-Build	Collaborative meetings with the proponents were held in November 2019. The final draft contract was sent to the proponents in December 2019. Technical proposals are due in February 2020 and financial proposals are due in March 2020.		
Electrical and Transmission Infrastructure	Transmission Lines Construction contract	Design-Bid-Build	Completed		
	Site C substation contract	Design-Bid-Build	Completed		
	Peace Canyon Substation upgrade contract	Design-Build	Completed		
Highway 29 Realignment	Cache Creek West 2018 and 2020 scope of work	Design-bid-Build	Completed		
	Halfway River Bridge, Grade and Paving	Design-Bid-Build	Completed		
	Cache Creek East Embankment	Design-Bid-Build	Completed		
	Cache Creek East Grading, Paving and Bridge	Design-Bid-Build	June 2020		
	Dry Creek Grading, Paving and Bridge	Design-Bid-Build	June 2020		
	Farrell Creek Grading, Paving and Bridge	Design-Bid-Build	July 2020		
	Lynx Creek West Grading, Paving and Bridge	Design-Bid-Build	August 2020		
	Design Bid Build in coordination with B.C. Ministry of Transportation and Infrastructure with anticipated contracts being awarded from 2019 to 2022				

3.10.2 Major Construction Contracts Exceeding \$50 Million

Since inception of the Project, nine major construction contracts have been awarded that exceed \$50 million in value, as shown in <u>Table 12</u>.

All of the construction contracts have been procured and awarded as per the BC Hydro procurement policies.

Work Package	Contract Value at December 31, 2019 ¹⁴ (\$ million)	Contract Execution Date
Site Preparation: North Bank	60	July 2015
Worker Accommodation	524	September 2015
Main Civil Works	2,163	December 2015
Turbines and Generators	464	March 2016
Transmission and Clearing	73	October 2016
Generating Station and Spillways Civil Works	1,644	March 2018
Hydromechanical Equipment	69	April 2018
Transmission Line Construction	114	May 2018
Highway 29	160	October 2019

 Table 12
 Major Project Contracts Awarded

3.10.3 Contracts Exceeding \$10 Million

For open contracts procured and awarded in excess of \$10 million, refer to Appendix H.

3.10.4 Contract Management

3.10.4.1 Material Changes to the Major Contracts

The main civil works contract is a unit price contract and as such variations in quantities and design are expected over the term of the contract. Since contract award in December 2015, the main civil works contract value has increased by \$415 million to reflect approved changes to December 31, 2019.

¹⁴ Contract value reflects the current value including executed change orders to the end of the reporting period.

Subsequent to the reporting period, a contract amendment was executed on March 6, 2020 to the main civil works contract that is retroactive to December 23, 2019 resulting in an increase to the contract value of up to \$332 million over the duration of the contract, including investments in equipment to reduce the schedule risk for dam construction and a series of performance-based at-risk incentives for the contractor with the objective of maintaining schedule for diversion and first power.

The contractual impacts will be reflected in reporting in subsequent quarters.

3.10.4.2 Contingency and Project Reserve Draws

As a result of the change in timing for river diversion and other factors including an increase in direct and indirect costs, BC Hydro revised the Project budget to \$10.7 billion, which was approved by the provincial Treasury Board in January 2018 and the BC Hydro board of directors in February 2018. This revised budget includes an \$858.1 million contingency allowance and a \$708 million reserve that is subject to Treasury Board's discretion.

The Project has a risk management plan that establishes the risk management framework for the Project and describes specific processes, procedures, organization, tools and systems that guide and support effective risk management. Utilizing this plan, risks are identified, assessed and managed on a continuous basis. The output of the risk management process is documented in the risk register. The risk register is utilized as an input into Project forecasts and cost risk analysis is conducted periodically to inform contingency requirements. In 2019, cost risk analyses were completed and based on these analyses, subject to the approval of the Treasury Board, BC Hydro expects to request a draw on the Project reserve in fall 2020, as needed.

Refer to <u>Appendix J</u> for more detailed information regarding contingency and Project reserve draws.



3.11 Impacts on Other BC Hydro Operations

In the last quarter of 2019, operational planning considerations were initiated with GM Shrum and Peace Canyon Generating Stations and Williston Reservoir in order meet the target flow releases for Site C river diversion.

3.12 Site Photographs

Refer to <u>Appendix A</u> for Site Construction photographs.

4 **Project Schedule**

4.1 **Project In-Service Dates**

As filed with the British Columbia Utilities Commission Inquiry with respect to Site C on October 4, 2017, BC Hydro identified that the river diversion milestone will move from 2019 to 2020. This did not impact the overall in-service dates, as shown in Table 13 below.

Description	Final Investment Decision In-Service	Status
5L5 500 kV Transmission Line	October 2020	On track
Site C substation	November 2020	On track
5L6 500 kV transmission line	July 2023	On track
Unit 1 (first power)	December 2023	On track
Unit 2	February 2024	On track
Unit 3	May 2024	On track
Unit 4	July 2024	On track
Unit 5	September 2024	On track
Unit 6	November 2024	On track

Table 13In-Service Dates

4.2 Project Governance, Costs and Financing, and Risk

4.2.1 Project Governance

In December 2017, the provincial government announced their approval to continue with construction of the Site C Project. The approval to proceed included increased

external and internal oversight of Project performance. Refer to <u>Figure 5</u> for the current organization structure. Measures to improve Project governance in 2019 include:

- EY Canada continued to provide independent oversight for the Project including budget oversight, schedule evaluation and risk assessment analysis. BC Hydro and EY Canada are working collaboratively on enhancements to risk analysis and reporting;
- BC Hydro completed cost and schedule risk analyses in 2019. During these analyses BC Hydro worked collaboratively with EY Canada and implemented identified enhancements. Please refer to <u>Table 22</u> for more information;
- An Independent Construction Advisor was retained in summer 2019 to provide advice and opinions on construction planning by major contractors at the Dam Site;
- The Technical Advisory Board met numerous times through 2019. These
 meetings consisted of conference calls, workshops, tours and in person
 meetings. In February 2019, EY Canada attended a site visit with a member of
 the Project Advisory Board and a member of the Technical Advisory Board;
- Continued to increase the number of BC Hydro on-site representatives to effectively manage the construction contracts; and
- Changes were made to the Project Assurance Board membership as a result of resignations and appointments in BC Hydro Board and Project Assurance Board memberships.





4.2.2 Project Budget Summary

As a result of the change in timing for river diversion and other factors including an increase in direct and indirect costs, BC Hydro presented a revised cost estimate of \$10.7 billion which was approved by the board of directors in February 2018.

<u>Table 14</u> below presents the overall Project budget, based on the Project budget approved in February 2018, represented in nominal dollars.

Description	(Nominal \$ million)
Dam, Power Facilities, and Associated Structures	4,548
Offsite Works, Management and Services	1,845
Total Direct Construction Cost	6,393
Indirect Costs	1,456
Total Construction and Development Cost	7,849
Contingency	858
Interest During Construction	1,285
Project Budget, before Treasury Board Reserve	9,992
Treasury Board Reserve	708
Total Project Budget	10,700

Table 14Overall Project Budget

4.3 Project Expenditure Summary

<u>Table 15</u> provides a summary of the updated budget and the actual costs for the calendar year 2019 and the variance between the two.

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Table 15Project Expenditure Summary
(\$ million Nominal) Compared to Budget

Description	Budget for Calendar 2019	Actuals for Calendar 2019	Variance
Project	1,280	1,485	(205)
Treasury Board Reserve	0	0	0
Total	1,280	1,485	(205)

Table 16 provides a summary of the 2019/21 Service Plan and the actual costs for

the calendar year 2019 and the variance between the two.

Table 16

Table 17

Service Plan				
Description	2019/21 Service Plan Calendar 2019	Actuals for Calendar 2019	Variance	
Project	1,466	1,485	(19)	
Treasury Board Reserve	-	-	-	
Total	1,466	1,485	(19)	

Project Expenditure Summary

Details of the variances between actual and plan are in Appendix J.

4.4 Comparison of Cost Plan by Quarter to Actual Expenditures (F2019 Q4 to F2020 Q3)

January 2019 to December 2019 (\$ million Nominal) Compared to Budget					
Description	F2019 Q4	F2020 Q1	F2020 Q2	F2020 Q3	Total for Reporting Period
Planned Expenditures	266	267	442	306	1,281
Actual Expenditures	285	303	466	431	1,485
Variance	(19)	(36)	(24)	(125)	(204)

Cost Plan for the Reporting Period:

<u>Table 17</u> above presents a comparison of the planned total expenditures by quarter with the actual expenditures. Over the entire reporting period, actual expenditures were \$204 million more than plan, primarily due to spillway buttress construction activities ahead of plan and claims for main civil works; more powerhouse construction work being completed than planned, an earlier start on penstock work, as well as change orders and claims for the generating station and spillways; higher than planned worker accommodation; and earlier than planned transmission expenditures. These are partially offset by timing differences for turbines and generators and property acquisitions.

Table 18 Cost Janua (\$ mil 2019/		an for the F 2019 to D n Nominal Service PI	Reporting Per ecember 2019) Compared to an	iod:) D	
Description	F2019 Q4	F2020 Q1	F2020 Q2	F2020 Q3	Total for Reporting Period
Planned Expenditures	288	315	496	367	1,466
Actual Expenditures	285	303	466	431	1,485
Variance	3	12	30	(64)	(19)

<u>Table 18</u> above presents a comparison of the planned total expenditures by quarter with the actual expenditures. Over the entire reporting period, actual expenditures were \$19 million more than plan, primarily due to spillway buttress construction activities ahead of plan and claims for main civil works; work planned in prior years being completed in the current fiscal year and additional change orders and claims for generating station and spillways. There were also schedule advancement of highway early works and higher than planned worker accommodation expenditures. These are partially offset by timing differences for turbines and generators, property acquisitions and reservoir clearing expenditures.

4.5 Internal Project Financing versus External Borrowings to Date

To date, all Project funding has been from internal borrowings and there has been no Site C Project specific debt issued. As part of BC Hydro's debt management strategy, BC Hydro's exposure to variable debt is managed within a board-approved range of 5 per cent to 25 per cent and a target of 15 per cent. In addition, since fiscal 2017, BC Hydro has hedged \$10.0 billion of its future forecast long-term debt issuances through the use of derivative contracts to lock in interest rates. As at December 31, 2019, \$5.0 billion of hedges remained outstanding to hedge future



debt issuances, hedging approximately 75 per cent of BC Hydro's forecast total borrowing requirements out to and including fiscal 2025.

4.6 Material Project Risks

Material Project risks are identified and reviewed on an ongoing basis. As the Project progresses through implementation phase, the material Project risks will evolve to reflect the current risks facing the Project. The following list of material Project risks does not include risks that are subject to confidentiality obligations or solicitor client privilege, or that disclose commercially sensitive information relating to matters that are currently outstanding, including procurements and negotiations that are in progress at the time of this report, the disclosure of which would be harmful to BC Hydro's commercial interests.

Refer to <u>Table 19</u> below for a list of the material Project risks.

Risk Description	Impact and Response Plan Summary
Risk of river diversion system delay if contractor productivity does not meet plan and/or differing geotechnical conditions	 Impact: Diversion delay could cause the schedule to slip by a year and increase costs. Response: BC Hydro closely monitors the development of design and construction plans, and labour and equipment productivity for critical construction activities (tunnel excavation/linings, inlet/outlet portals, and gates and cofferdam); provision of performance incentives for achievement of milestone dates.
Risk of geotechnical issues on work fronts other than left bank diversion tunnel	Impact: Potential schedule delay and increased cost. Response : Completed detailed geotechnical investigations prior to construction; close monitoring and quick intervention to manage construction risk if geotechnical issues arise.
Risk of Highway 29 costs exceeding the approved budget	Impact: Cost increases due to progression of detailed design, geotechnical conditions and direct award cost pressure. Response : Conduct value engineering and constructability reviews to optimize designs, use competitive tendering on Halfway River, Cache Creek, Farrell Creek and Lynx Creek West.

Table 19Material Project Risks

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Annual Progress Report No. 4
(Combined with Quarterly Progress Report No. 18) - January
2019 to December 2019

Risk Description	Impact and Response Plan Summary
Risk of additional work to meet approach channel, powerhouse, and spillway roller-compacted concrete buttress requirements	Impact: Increased costs for investigation and design changes. Response : Finalize engineering investigations and analysis; complete right bank foundation enhancements design evaluation.
Risk that dam or approach channel is not completed on time for reservoir inundation	Impact: Minor delay (days/weeks) to inundation milestones but able to inundate; major schedule delay/impact missing inundation seasonal window inundating following year. Response : Closely monitor/expedite contractors work and progress; include schedule lag time for minor delays; manage work interfaces between contractors.
Risk of contractor labour rate increases in excess of budgeted amount	Impact: BC Hydro has included provisions in major contracts that allow for labour escalation to a prescribed amount, as well as a cost/savings sharing formula based on general industry rates above or below the prescribed amount. Increased pressure on the labour market would likely drive labour wage rates higher, potentially resulting in general industry increases beyond the prescribed amounts. Response: BC Hydro has defined contract labour escalation formulas in all major contracts.
Risk of a safety incident resulting in fatality or disabling injury	Impact: Serious worker injury or fatality; Project delays and associated costs. Response: Continue with BC Hydro and contractor safety steering committee to address shared safety issues and opportunities; BC Hydro and contractors have implemented safety cultural leadership training; increase BC Hydro executive involvement and engagement with site safety leadership; regular on site safety conferences; contractor to bring in senior safety manager to prepare safety improvement plan for BC Hydro review; continue to include safety in BC Hydro and contractor on-boarding orientations; and continue to promote a strong safety culture.
Risk of additional expenditures required for engineering support for the Project	Impact: Exceed budget due to work required for as found site conditions, complete designs, and support schedule and construction activities; insufficient resources to complete, manage and/or oversee engineering work. Response: Optimize BC Hydro resources; optimize work front team structure and minimize duplication of activities. Work with contractors to increase their quality control staffing.

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Annual Progress Report No. 4
(Combined with Quarterly Progress Report No. 18) - January
2019 to December 2019

Risk Description	Impact and Response Plan Summary
Risk that Indigenous groups do not support the Project	 Impact: Indigenous groups file legal challenges (e.g. injunction applications) or engage in protest actions that could delay or stop the Project work and/or increase costs. Response: Project team to continue to engage and consult with First Nations and ensure commitments to First Nations are met or exceeded; fully support the development of legal response documents; follow court order requirements, if applicable; continue to negotiate Impact Benefit Agreements.
Risk that reservoir clearing costs are higher than budget	Impact: Increased cost. Response : Review scope, modify approach, negotiate pricing, provide sufficient time to negotiate, work with Indigenous Relations on procurement of clearing services; develop alternative procurement options if planned procurements are not feasible.
Risk that the Project cannot attract and retain sufficient skilled workers	Impact: Contractors may not be able to adequately source, supply, attract, and retain sufficient Project labour due to workforce demographics, increased competition for labour from other major projects, and the requirement for specialized workers. This may result in potential impacts to schedule, safety, productivity and cost. Response : Contractors provide labour sourcing and supply plans, provide advance notice of foreign workers, and participate in local job fairs. BC Hydro encourages and facilitates capacity building initiatives and monitors employee turnover rates and labour conditions on other projects.
Risk that Hydro's borrowing costs for the Project are higher than budgeted	 Impact: Rising interest rates increase the Project's interest costs above the amount budgeted. Response: BC Hydro has hedged interest rates on approximately 75 per cent of future debt placements through Fiscal 2025 to reduce the potential impact of rising interest rates.
Risk of the stage 2 cofferdam overtopping or erosion	Impact: Damage to upstream and downstream cofferdams; uncontrolled river flow; flooding and damage to dam and powerhouse while under construction. Response : Clear reservoir area before river diversion and install debris structures; utilize Williston reservoir to provide water storage; complete river flow forecasting and manage water.
Risk of insufficient aggregate supply to meet demand on dam site.	 Impact: Decreased productivity, schedule delays and increased cost that could impact multiple contracts. Aggregate supply required for concrete production (roller-compacted concrete, cast-in-place concrete/conventional vibrated concrete and shotcrete) and dam (general fill, filter materials, drain material, and riprap). Response: Increase aggregate stockpiles; work with contractors to minimize waste and maximize aggregate production; release BC Hydro on-site contingency aggregate excavation sites and seek out additional aggregate on-site sources; procure off-site and haul in additional aggregate.

Risk Description	Impact and Response Plan Summary
Risk that the river has been diverted but the stage 2 cofferdam is not completed on time.	Impact: Unable to release restrictions upstream; overtopping of the cofferdam; construction delays; BC Hydro system (GM Shrum generation, etc.) impacts. Response: Contractor performance incentives in place to meet milestone dates; contractor increases work force; BC Hydro and contractor evaluate schedule and optimize activities.

5 Look ahead – January 2020 to December 2020

5.1 Construction

The following is a look ahead of activities planned to take place in 2020:

5.1.1 Key Milestones

The Project is on track to achieve the Project completion date of November 2024.

The key milestones for 2020 are listed in Table 20.

Milestone	Performance Measurement Baseline	Plan Date (Control Date ¹⁵)	Forecast ¹⁶	Status (Measured by Month)
Generating Station and Spillways	I		L	
Powerhouse bridge cranes commissioned and ready for travel load tests	December 2019	March 2020	March 2020	On track
Work Area W4 access to generating station and spillways	June 2020	June 2020	June 2020	On track
Unit 1 - Unit bay superstructure complete and powerhouse bridge crane ready	June 2020	June 2020	June 2020	On track
Intake operating gates and intake maintenance gates supplied	August 2020	August 2020	August 2020	On track
Unit 2 - Unit bay superstructure complete and powerhouse bridge crane ready	September 2020	September 2020	September 2020	On track
U3 - Unit bay superstructure complete and powerhouse bridge crane ready	November 2020	November 2020	November 2020	On track
Highways				
Contract Awarded - Grading, paving, & bridge Lynx Creek West	May 2019	July 2020	August 2020	At risk

Table 20Key Milestones

¹⁵ Control date reflects plan, adjusted for approved changes to milestone dates.

¹⁶ As at December 31, 2019.

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Contract Awarded – Hudson's Hope berm	January 2021	April 2020	May 2020	At risk	
Main Civil Works					
Diversion Tunnel No. 1 & No. 2 Construction Complete	November 2019	November 2019	May 2020 ¹⁷	At risk	
Diversion tunnel inlet structure complete	January 2020	January 2020	February 202017	At risk	
Diversion tunnel outlet structure complete	February 2020	February 2020	February 202017	On track	
(M3.1) Diversion works stage 2 works complete, excluding portions to be completed in M3.2	March 2020	March 2020	March 202017	On track	
Diversion inlet portal & channel complete	March 2020	March 2020	May 202017	At risk	
Diversion outlet portal & channel complete	April 2020	April 2020	June 202017	At risk	
All diversion stage 2 works complete	June 2020	June 2020	July 202017	At risk	
Stage 2 upstream cofferdam abutments placement to elevation 433.9 metres complete	August 2020	August 2020	August 2020	On track	
Diversion started	September 2020	September 2020	September 2020	On track	
(M4.2) Upstream cofferdam to elevation 422 metres complete	October 2020	October 2020	October 2020	On track	
Turbines and Generators					
Voith 1st component installed (draft tube liner)	July 2020	July 2020	July 2020	On track	
Transmission					
Substation in-service date	October 2020	October 2020	October 2020	On track	
5L5 in-service date	October 2020	October 2020	October 2020	On track	
Balance of Plant					
Contract Award – Balance of plant	June 2020	June 2020	June 2020	On track	
Reservoir Clearing					
Contract Awarded – Halfway River Drainage	September 2020	September 2020	September 2020	On track	
Reservoir Prepared for Diversion	March 2020	March 2020	March 2020	On track	

5.1.2 Main Civil Works

The next year will see significant activity on the main civil works work front as preparation and execution of river diversion and work on the right bank roller-compacted concrete dam buttress.

¹⁷ In response to some delays with the excavation of the diversion tunnels, the construction activities required to complete the diversion tunnels have been re sequenced, by advancing some activities and delaying others, to optimize the schedule. This optimized schedule still achieves the key schedule milestones associated with river diversion in fall 2020.

On the left bank, the completion of the diversion works including; concrete tunnel lining, intake and outlet towers and installation and commissioning of the gates, construction of the approach channels for the inlet and outlet portals, and the completion and commissioning of the temporary upstream fishway. Installation of hydraulic and mechanical systems for the inlet gates will begin in January 2020 and continue through to the spring 2020.

As a key component of diversion of the Peace River, the upstream and downstream cofferdams will be constructed in the fall of 2020. These structures allow for dry access to the central portion of the river for preparation of the dam foundation and construction of the earthfill dam.

On the right bank, final excavation of the roller-compacted concrete dam buttress foundation, and placement of approximately 490,000 cubic metres of roller- compacted concrete for the dam buttress. The commencement of the approach channel excavation is also scheduled for the fall of 2020.

At the end of December 2019, a project risk materialized on the right bank when investigations and analysis of geological mapping and monitoring activities during construction identified that some foundation enhancements would be required to increase the stability below the powerhouse, spillway and future dam core areas. These investigations and analysis were reported to the Project Assurance Board in early January 2020. BC Hydro continues to work with the independent Site C Technical Advisory Board and the Project Assurance Board to determine the appropriate enhancement measures.

Other works that are to be completed in the upcoming year include; installation of the debris management structures (pile structures and booms) prior to diverting the Peace River, and transportation of material from the 85th Avenue Industrial Lands to site via the conveyor system.

5.1.3 **River Diversion**

In the coming year, preparation for diversion will include, finalizing of the diversion commissioning and operation plans by March 2020. The debris management structures will be constructed in early 2020, with the Moberly pile structure beginning in January 2020, and the Moberly River and Peace River booms beginning construction in March 2020, with a forecast construction completion and commissioning by the end of June 2020. At the start of diversion, the Peace River will be closed to boat traffic at Site C, and the BC Hydro Portage Program will be operational. The temporary upstream fishway will be completed and commissioned in the summer of 2020 in advance of construction of the stage 2 cofferdams. The diversion tunnel liners and structures are forecast to be completed in early 2020, with the gates and electrical and mechanical components being completed by the summer of 2020. Once the gates and systems have been completed and commissioned, the inlet and outlet stage 1 cofferdams will be removed, and the Peace River will be able to flow through the tunnels, allowing for the stage 2 cofferdams to be constructed for full diversion of the Peace River. Construction of the upstream and downstream cofferdams are forecast to begin in the summer of 2020. There is a possibility of early placement of material into the river dependent on water storage levels in the upstream reservoirs and forecast unregulated inflows from the local basin.

5.1.4 Generating Station and Spillways

Over the next year, there are many key activities planned for the generating station and spillways. These activities include: placement of a cumulative total of over 300,000 cubic metres of concrete for the generating station and spillways: completing the first stage of powerhouse concrete; completing the steel super structure for the powerhouse; starting the construction of the spillway headwork; and commissioning the powerhouse bridge cranes.

Deliveries and installations will ramp up in 2020 beginning with deliveries of intake operating gate guides, gates and hydraulic systems, as well as the spillway gates and stoplog primary anchors, and draft tube maintenance gates.

5.1.5 Balance of Plant

Over the next year the balance of plant contract is expected to be awarded and the contractor will mobilize to site in the fall. After mobilization, the contractor will start the installation work for the cable trays and piping in the lower areas of the powerhouse unit one bay. With all equipment supply contracts completed and awarded in 2019, equipment deliveries to the Peace River region will commence in 2020, starting with the compressed air receivers. Factory integration testing of the protection and control panels will commence in the summer of 2020.

5.1.6 Turbines and Generators

Over the next year, design, procurement and manufacturing will continue for the turbines and generators contract. The turbines and generators contractor will continue to fabricate the large turbine-embedded parts at a temporary manufacturing facility on-site, including the draft tube cone and elbow, and the spiral case. The contractors' factory in São Paulo will continue production of the turbine runners, headcovers, stayrings and wicket gates, and will continue with fabrication of the generator components including stator, rotor, windings, and stator laminations.

Based on the powerhouse construction schedule, the contractor will commence installation of turbine components in the powerhouse by July 2020 after mobilizing to the area in May 2020.

5.1.7 Transmission and Substation

All clearing and access road construction on the transmission line will be completed in early 2020 and contracts closed out.

In 2020 the Site C substation will be substantially completed, testing and commissioning will be completed, and the substation will be energized and connected to the BC Hydro integrated system via Peace Canyon Generating Station.

In early 2020, the eastern segment of transmission line 5L005 will be completed, with the western segment completed in the fall of 2020. The line will be energized in the fall of 2020; connecting the Site C substation to the BC Hydro integrated system at Peace Canyon generating station.

5.1.8 Highways and Hudson's Hope Shoreline Protection Berm

Design of all highway segments will be completed by the middle of 2020. Procurement of construction contracts for Cache Creek East, Dry Creek, Farrell Creek and Lynx Creek will be completed and contracts awarded by the fall of 2020.

Construction will be completed at Cache Creek West, Cache Creek East embankment and Lynx Creek East embankment.

Construction contractors will mobilize, and construction will begin by the fall of 2020 for the Cache Creek East grading, paving and bridge; Dry Creek grading, paving and bridge; Farrell Creek grading, paving and bridge; and Lynx Creek grading, paving and bridge.

Procurement will be completed in the spring of 2020 and a contract awarded for the Hudson's Hope shoreline protection berm, and construction will start in the summer of 2020.

Production of riprap and berm fill material will continue at Portage Mountain in May 2020 and will continue until September 2020.

5.1.9 Reservoir Clearing

Clearing design work will continue in 2020 for the western reservoir. Access and clearing will continue in the middle reservoir and start in the western reservoir in

winter 2020/2021. Initiating the clearing of the Halfway River drainage is a priority in 2020.

5.1.10 Worker Accommodation

The Site C worker accommodation camp was originally designed to house 1,600 workers with services and utilities to accommodate a total capacity of 2,200, should the need arise over the duration of the Project. In 2018, various scenarios were modelled to forecast required bed nights, and these indicated peaks in camp capacity greater than 1,600 beds occurring in 2020, 2021 and 2022 based on forecasted work volumes. As a result, in 2019 the first phase of a two-phase expansion was completed which added 150 beds. Phase 2, which will add a further 450 beds, is planned for construction in 2020.

5.2 Engineering

The engineering team will continue to provide technical and construction support to the Project through 2020, with focus given to the achievement of the contractor's schedule for both the main civil works contract, and the generating station and spillways civil works contract. Further, the engineering design team will continue to advance the implementation design for the generating station and spillways civil works contract including the ongoing issue of construction drawings in accordance to the current Project requirements, and the balance of plant work package with issuance of the first set of issued for construction drawings in the summer of 2020. Also, integration and review of the large cranes, hydromechanical, and turbine and generators will be ongoing throughout 2020.

Key areas on the main civil works contract will be supported including the ongoing construction of the Peace River diversion inlet structures and tunnels, the placement of roller-compacted concrete foundation for the dam buttress, and additional support on an as and when required basis for all other aspects required to achieve the works.

With respect to the Highway 29 re-alignment, activities will include the advancement and substantial completion of the implementation design and ongoing technical support for the construction activities.

The engineering team will continue to provide the Technical Advisory Board with Project and construction updates through 2020, while also considering technical aspects of the main civil works and the generating station and spillways contracts. The Technical Advisory Board will undertake two formal meetings in January and June 2020 which will be held in Fort St. John and Vancouver.

5.3 Quality Management

In 2020, the Quality team will continue to work with suppliers and contractors to ensure they are satisfying their obligations with regards to quality control of their work. Training will be provided to Project team members to enhance the quality auditing program at the site. Additional important areas of focus include collating quality documentation for completed work(s) to facilitate handover of work areas and the transition between construction and commissioning.

5.4 Safety and Security

Top priorities for BC Hydro in 2020 are public safety and security planning for diversion of the Peace River in September 2020 and working with the prime contractors on their worker safety plans for diversion and the start of construction of the earthfill dam. BC Hydro will continue to focus on all aspects of our Contractor Safety Program working with contractors to ensure they are fulfilling their safety responsibilities, including our completion of independent field safety verifications, prime contractor audits, and incident investigations. The Technical Safety Inspection program will prioritize fire prevention and response, traffic management, welding, heavy trucks and equipment, and hazardous materials for 2020.

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5.5 **First Nations Consultation**

Efforts will continue in the next year to conclude Impact Benefit Agreements with the remaining First Nations communities who do not yet have agreements. In addition, BC Hydro will continue to consult with respect to the construction stage of the Project, and to work with Indigenous groups to prepare communities for river diversion.

5.6 Permits and Government Agency Approvals

Permits and licences are required for construction activity to be undertaken in 2020. Approximately 40 permit applications are anticipated to be submitted for approval in this time frame as well as two Environmental Assessment Certificate amendment requests related to the realignment of Highway 29 segments at Cache Creek, Dry Creek, and Farrell Creek; the location of material sources for construction and reservoir clearing; groundwater monitoring; the expansion of the worker camp; and hauling of material from 85th Avenue Industrial Lands.

Delays to these permits, licences or amendments may result in delays to the associated construction work. However, BC Hydro continues to consult with federal and provincial authorities, local government and First Nations communities to mitigate this risk and does not anticipate delays that will impact construction schedules. Specific actions to mitigate risk to permits and licences include:

- Early identification and submission of permit and licence applications through consultation with contractors (e.g., weekly meetings with main civil works contractor on permits/permitting plan);
- Weekly meetings with Ministry of Forests, Lands, Natural Resource Operations • and Rural Development on permitting process, technical details and consultation status;
- Bi-weekly meetings with the Environmental Assessment Office;

- Leave to Commence Construction scoping meetings with the Comptroller of Water Rights, Independent Engineer, and Independent Environmental Monitor (and contractor, as appropriate);
- Weekly meetings and monthly on-site visits (and more, as required) with BC Hydro, Peace River Hydro Partners, Independent Engineer and Independent Environmental Monitor regarding Leave to Construct approvals;
- Joint development of permitting dashboards between the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Comptroller of Water Rights and BC Hydro to track permit risks and develop mitigation measures; and
- Proactive key stakeholder and First Nations community consultation on Environmental Assessment Certificate condition amendment requests.

5.7 Environment

Site environmental monitoring and survey work will continue through 2020. The Project team will continue to collaborate with Indigenous groups, stakeholders and regulators to ensure BC Hydro is adhering to the environmental conditions of both the Environmental Assessment Certificate and Federal Decision Statement and any other permits or authorizations.

On-site compliance resources continue to perform daily inspections and to work with the on-site contractors to ensure environmental compliance. Inspectors will continue to focus on the areas of sediment and erosion control, water management, hydrocarbon spill prevention and will increase focus on wildlife attractant management. Additionally, as new contractors mobilize to site, the site staff are working closely to ensure an immediate focus on environmental compliance.

Additionally, experts in wildlife mitigation and fish and aquatic mitigation will continue to collect field data and install wildlife mitigation features, such as bat and fisher houses, snake dens, course woody debris piles, and other habitat features as the work progresses and undertake enhanced wildlife identification in the future headpond area.

5.8 Community Engagement and Communications

Increased focus on community engagement will occur through the Regional Community Liaison Committee, one on one community meetings, presentations and issue-specific technical meetings.

Site C public affairs will continue to promote local and B.C. business participation on the Project by encouraging businesses to sign up to the Site C Business Directory to receive information about the Project and notifications about procurements; posting procurement information on the Project website; and providing a copy of the Site C Business Directory to proponents during the competitive selection process to encourage partnering with local businesses.

The Site C public affairs team will attend business and chamber of commerce meetings in Fort St. John, Dawson Creek, Chetwynd and Prince George. In addition, Project update presentations will be provided to varying organizations as opportunities arise. Discussions will continue with the Peace River Regional District to reach a community measures agreement.

The Regional Community Liaison Committee will continue to meet at least three times to discuss Project progress and areas of community interest. In addition, a site tour will be conducted for the Regional Community Liaison Committee to view construction-related activities.

5.9 Property Acquisitions

Over the next year, BC Hydro will continue the property acquisition efforts for the remaining highway re-alignment projects and portions of middle and western reservoir clearing projects. BC Hydro will also continue negotiations with private property owners in relation to permissions for the further field investigations to inform design and mitigation options for the various Site C sub-projects.

5.10 Cost Plan by Quarter F2020 and F2021

Table 21Annual Cost Plan (\$ million Nominal)
Reporting Period: January 2020 to
December 2020

Description	Final Investment Decision	F2020 Q4	F2021 Q1	F2021 Q2	F2021 Q3	Summary of Quarters
Total Project Costs (\$)	9,992	371	393	416	TBD ¹⁸	TBD
Treasury Board Reserve	708	0	0	0	TBD	TBD
Authorized Project Cost (\$)	10,700	371	393	416	416	1,596

5.11 Material Project Risks

Risk management is an ongoing, iterative process. As documented in the Site C Risk Management Plan, the ongoing risk management activities include risk identification, risk analysis and evaluation, risk response planning, and risk monitoring and control. Over the next year, the Project's risk registers will be regularly updated to identify new risks, refine risk evaluations and treatment plans, and monitor mitigation activities.

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¹⁸ While a draw on the Treasury Board Reserve is anticipated in Q3 F2021, the amount of the draw cannot be estimated at this time.



6

Risk and Cost Management Assessment Summary and Independent Oversight

Area	EY Findings	Recommendation	BC Hydro Action Plan
Cost Risk Analysis (CRA)	EY and BC Hydro have now agreed on cost risk measurement and analysis practices that support active and effective risk management and verification by Project oversight and	Involving EY throughout the planning, development and review of the cost risk analysis to allow for a shared understanding and identification of any gaps between the risk register and the cost risk analysis. To facilitate, EY and BC Hydro will develop a work plan including key touch points based on estimating, stakeholder input, periodic cost risk analysis progress updates and the review of cost risk analysis reports	Complete. Cost risk analysis process was documented and agreed to with EY prior to the commencement of the cost risk analysis.
	technical advisors. This will be achieved by BC Hydro through these	Continuing to improve traceability through enhancement of the documentation of risks (from the risk register) used as inputs to the cost risk analysis.	Complete. Reconciliation between risk register and cost risk analysis.
	recommendations.	Freezing risk data as of the data date by continuing the practice of capturing copies of the risk register at the end of each month and storing them on SharePoint	Complete. Each month a snapshot of the risk register is captured and saved on SharePoint.
		Tracking risk treatment plans and action items at the program level (rather than just within the risk register) for Project Assurance Board level risks (10.5 and higher risk level) and evaluating, at a future date, extending the approach to the remaining risks	Complete. Track and evaluate all Project Assurance Board level risks. Risk treatment plans are updated periodically.
		Continuing to prepare a monthly high-level Monte Carlo Analysis of the risks in the Risk Register and present it to EY and the Risk Management Committee	Complete. Done on a monthly basis and presented to EY and the Risk Management committee monthly.
		Continuing to provide Project Assurance Board members periodic access to Risk Register information (including presentations on risks, including commercial risks)	Complete. Provided in September 2019 and will provide again in spring 2020 (twice per year).
		Providing the Technical Advisory Board members with the opportunity to review the Project's technical risks on a regular basis (twice yearly)	Complete. Provided to the Technical Advisory Board in May 2019 and January 2020.

Table 22EY Findings, Recommendations and
BC Hydro Action Plan from June 2019

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(Combined with Quarterly Progress Report No. 18) - January
2019 to December 2019

Area	EY Findings	Recommendation	BC Hydro Action Plan
Earned Value	EY and BC Hydro have agreed on Earned Value reporting relative to baselines that reflect material approved plan changes to schedule and cost.	EY and BC Hydro will jointly select a date and capture a secondary performance measurement baseline (i.e. from a Prior Month Forecast Baseline) to calculate alternate earned value information to be used to compare to performance measurement baseline -based results. EY and BC Hydro will assess the results of this alternative earned value analysis and determine if the benefits from this type of earned value are justified based on the effort required to prepare it BC Hydro will take a new performance measurement baseline for any major Project	Complete. April 2019 secondary performance measurement baseline captured and used for earned value reporting and analysis. Results reviewed at Project monthly Accountability meetings.
		changes (in accordance with BC Hydro's Project & Portfolio Management project change control sub-practice) BC Hydro will provide the basis of the Integrated Master Schedule (Primavera P6) input data that drives the overall Project earned value and review how this earned value is calculated with EY BC Hydro will give EX direct access to the	measurement baseline was required for 2019. Complete. BC Hydro met with EY and reviewed the basis for the earned value calculations.
		BC Hydro will give EY direct access to the scheduling software and reporting systems.	Complete.
Critical Path Analysis	EY and BC Hydro have agreed on the importance of access to critical path	Show month to month changes of float for near critical path milestones, by using historical data reports to identify changes over time	Complete. Reporting developed and reviewed monthly at Project Accountability meetings.
	schedule snapshots that clearly illustrate any cause and effect relationships, the development of trend reporting, and tracked mitigation plans that are relevant to specific areas of focus in the progress update has been achieved.	When key activities are delayed, identify for EY what other activities that may be impacted using the detailed (Level 1) schedule to highlight key dependencies and/or interfaces	Complete. Provided EY with a copy of the Level 1 schedule.

7 Project Objective

The strategy being employed on the Site C Project related to balancing the Project objectives of scope, quality, schedule, and cost is shown in <u>Figure 6</u>, and is as follows:

- First, implement the Project scope, consistent with the quality specifications; in other words, do not compromise on scope or quality. BC Hydro is building Site C for the long-term, and it does not make sense to undermine the quality of the asset;
- Second, mitigate schedule risk and build schedule float. The rationale for this is due to the very significant impacts associated with missing the river diversion schedule milestone. There is a relatively narrow window to complete river diversion in fall 2020, and if that window is missed, the Project is delayed by a full year. As a result, the Project team has completed a number of activities to increase schedule float to further reduce the risk of missing river diversion when unplanned events occur that delay the schedule; and
- Third, complete the Project within the approved budget at the lowest reasonable cost.

BC Hydro's goal is to achieve all of these objectives. However, as unplanned events occur, they put pressure on meeting all of the Project objectives, and the Project team has utilized the above strategy to balance how best to meet these objectives.



8 Technical Advisory Board

The Technical Advisory Board is a global panel of engineering and construction experts appointed by the board of directors. Its mandate includes:

- Advising the Executive Vice President, the President, Chief Executive Officer and the Site C Project Assurance Board regarding the engineering and technical decisions related to Project design consistent with best practices and current international guidelines;
- Provide technical review of key design milestones and ongoing external advice to supplement existing engineering and design and procurement expertise;
- Report out to the Project Assurance Board and management following each meeting and provide a report of key findings and recommendations; and
- Prepare and submit technical reports as required to management and the board of directors.

The twentieth Technical Advisory Board meeting was held in June 2019 with site visits and meetings in Fort St. John and Vancouver. Presentations and discussions were held on a range of topics, including schedule risks and planning for river diversion; remaining excavations for the final stages of roller-compacted concrete placements; for the earthfill dam; quality management; debris management; dam foundation grouting; and long-term dam safety management. The Technical Advisory Board also met via conference call in January and March 2019. A multiday field workshop was also carried out in September 2019 with a focus on the results and analysis of mapping and instrumentation monitoring of the foundation of the roller-compacted concrete buttress and related design reviews. Discussions and inspections also involved the remaining excavations, underground works, foundation grouting, concrete structures and the diversion works.



The twenty-first Technical Advisory Board meeting occurred in early January 2020 with a focus on diversion planning, final design for the dam and core roller-compacted concrete buttress, foundation grouting, earthfill dam trial placement and the ongoing assessment of the foundation performance of the roller-compacted concrete buttress and related design review.

Refer to <u>Appendix E</u> for reports on Technical Advisory Board activities in 2019.

9 Annual Compliance Report

As per the Environmental Assessment Certificate, the Project is required to submit an annual compliance report describing the status of compliance with the conditions of the certificate. To date, the Project has met all required conditions and submitted its third annual compliance report on time on March 29, 2019, which can be found in <u>Appendix G</u>.

Site C Clean Energy Project

Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18)

Appendix A

Site Photographs



Figure A-1 Overhead Cranes in the Workshop in Fort St. John where the Penstock Parts are Assembled. Penstocks are Ten-Metre-Wide Pipes that Move Water from the Reservoir Intakes to the Turbines (January 2019)



Figure A-2 A Welder Works on Part of the Spiral Case in the On-site Turbines and Generators Manufacturing Facility (January 2019)





B Hoarding and Heating Protects Concrete from the Cold as it is Placed at the Generating Station's Double Chamber Walls (January 2019)



Figure A-4 Inspector Reviewing and Certifying that Scaffolding is Safe and Complies with Regulations. All parts of the Project are Regularly Monitored by Environmental and Safety Inspectors (January 2019)



Site C Clean Energy Project



On-site Concrete Batch Plant is used to Mix Concrete for the Generating Station and Spillways (February 2019)





Figure A-6 A View of the Unit #3 Draft Tube Formwork (February 2019)



A-7 As of March 31, 2019, 51 Towers had been Raised along the 75-Kilometre-Long Transmission Line Corridor. In Total, 405 Towers will Hold Up Two New 500 kV Transmission Lines, which will Connect Site C Power to the Rest of BC Hydro's Grid (February 2019)



Figure A-8

This Photograph shows Work Underway on the Five-Kilometre-long Electric Conveyor System that will Move Excavated till Material from the 85th Avenue Industrial Lands to the Dam Site for Construction of the Site C dam. Piles have Concrete Caps with Bolt Settings onto which the Conveyor Structure is Bolted (March 2019)





Twenty-two New Protection and Control Panels at Peace Canyon have been Added and/or Upgraded in Preparation to Receive the Transmission from Site C (April 2019).



Figure A-10 Two New 500 kV Gantries (5L5, 5L6) have been Installed at the Peace Canyon Substation to Receive the 500 kV Lines from Site C. A Gantry is where the Transmission Lines Tie onto and Anchor at the Substation (April 2019).




Figure A-11 Environmental Scientists Release Weevils to Control Dalmatian Toadflax, an Invasive and Noxious Weed near the Dam Site. This Release is an Extension of the Province's Biocontrol Program for Toadflax, which has been in Place since 1991 (April 2019)



Figure A-12 We will be Building and Assembling 84 of these Penstock Sections over the Next few Years, to Create the Six Penstock Pipes for Site C's Generating Station (May 2019)





Figure A-13 Grading and Levelling Occurring on the New Alignment of Highway 29 at Cache Creek West (June 2019)



Figure A-14 Newly Built Side Channels on the Peace River which Provide Fish Habitat (June 2019)





Figure A-15 Crews Inspect the Opening that Connects both Ends of the Diversion Tunnel Excavations Shortly after Breakthrough in Tunnel No. 1 (June 2019)



Figure A-16 Diversion Tunnel No. 2 Breakthrough (July 2019)





Figure A-17 View of Inside the Unit 1 Draft Tube in the Powerhouse. Once Site C is Operational, Water will Enter the Penstocks, Move through the Turbines and then be Released into the Draft Tubes prior to Exiting through the Tail Race (July 2019)



Figure A-18 Assembly of a Multi-plate Culvert that will Provide Drainage under a Realigned Segment of Highway 29 in the Cache Creek Area. A variety of Culverts are Being Installed as Part of the Highway 29 Realignment (July 2019)





Figure A-19 A Worker Conducts Archaeological Excavations Near Farrell Creek, in Support of the Highway 29 Realignment Work (July 2019)



Figure A-20 To Compensate for the Loss of Wetland Habitat Resulting from the Project, we are Working with Ducks Unlimited to Construct and Restore over 500 Hectares of Wetlands. The First of these is at a 50-Acre Wetland Project at Golata Creek, a Complex System of 15 Ponds Retained with a Dam and Berms. (September 2019)





Figure A-21 The Five-km Conveyor System, which Runs from the 85th Avenue Industrial Lands to the Dam Site (September 2019)



Figure A-22 Construction Starting on a Temporary Bridge to an Island in the Peace River Near Halfway River, as Part of Clearing Activities for the Project. (September 2019)





Figure A-23 Levelling of Sheet Piles for the Water Control Structure in the Main Basin of the Golata Creek Wetland (October 2019)



Figure A-24 Looking South at the Spillways Buttress (Left) and the Construction of the Site C Powerhouse (Right) (October 2019)









Figure A-26 The Halfway River Segment of the Highway 29 Road Alignment is Four-km Long, Including a One-km-Long Bridge. Preparation Work Began in 2019 and Completion is Scheduled for 2022 (October 2019)





Figure A-27 Back Channel Enhancement Project Created Approximately Two Hectares of Permanent New Wetted Fish Habitat. Areas with Water Fluctuations are Filled in to Prevent Fish Stranding. Engineered Logjams Provide Rearing Habitat for Juvenile Fish (October 2019)



Figure A-28 A Worker Insulates the Steps and Slope of the Powerhouse Buttress. As it Gets Colder Outside it is Necessary to Reduce the Temperature Difference Between the Core and the Surface of the Concrete to Prevent Cracking (October 2019)





Figure A-29 Rebar is being Delivered at the Intake Area where it will be Used to Reinforce the Concrete Intake Structures. More than 5,000 tons of Rebar will be Installed in the



Figure A-30 Penstock Units 1, 2 and 3 in Varying Stages of Construction (October 2019)





Figure A-31 Workers Walk through a Segment of One of the Diversion Tunnels, Recently Lined with Concrete (November 2019)



Figure A-32 Excavation of the Lower Half of a Diversion Tunnel (November 2019)





Figure A-33 Inside One of Two Diversion Tunnels where a Slip form Places Concrete (November 2019)



Figure A-34 View of the Tunnel Inlet Portal with the Inlet Bypass Road and Diversion Structures under Construction (November 2019)





Figure A-35 Construction of the Powerhouse Continues with Installation of Penstock Units (Top Right) at the Top of the Structure (November 2019)



Figure A-36 Scaffolding is Installed Inside a Penstock to Allow Access Around the Circumference of the Init to Weld Sections together (November 2019)





Figure A-37 Preparing Rebar Dowels for Grouting in the Spillway Stilling Basin, which will Anchor the Slabs to the Roller-compacted Concrete. About 8,000 Dowels will be Installed at Depths between Four to 13 metres in the Concrete below (November 2019)



Figure A-38 Construction of the intake gate of penstock Unit 3 (November 2019)





Figure A-39 In Late December 2019, we Substantially Completed Excavations in the Two Peace River Diversion Tunnels. The Tunnels are Temporarily Coated with Shotcrete until the Permanent Concrete Liner is Installed (December 2019)



Figure A-40 As Part of our Reservoir Clearing Program, Spruce and Pine Logs are Stacked for Shipment to Lumber Mills (December 2019)





Figure A-41 Towers with Stringing Complete, as Part of the New 75 km Transmission Line (December 2019)



Figure A-42 Power Line Technicians Clip Conductors into the New Transmission Line Insulator Assembly (December 2019)





Figure A-43 The Portion of Highway 29 at Cache Creek West is Four-kilometers Long and will be Paved by July 2020. Combined, the Cache Creek Highway Segments Total 8.6 kilometers (December 2019)



Figure A-44 The Eastern end of the Cache Creek Segment of Highway 29 will be Replaced with a New Two-lane, 4.6 km Highway, Including a 600-metre-long Bridge (December 2019)



Site C Clean Energy Project

Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18)

Appendix B

Safety and Security



In 2019, the Project reported: 22 serious safety incidents consisting of eight near misses, and 14 injuries which either required medical attention or had the potential to be a serious injury; and 70 all-injury incidents consisting if six lost time injuries and 64 medical attention injuries.

Following is a listing of serious safety incidents and all-injury incidents reported in 2019.

Serious Safety Incidents

The 22 serious incidents include:

- 1. A worker did not isolate the energy to the 600v cable prior to start of work;
- 2. A worker received a high voltage electric shock involving a roadheader in the diversion tunnel;
- 3. A worker was removing a tarp in the ice with a jackhammer when it contacted a buried 600v electrical cable;
- 4. A worker was struck by a log during cable yarding;
- 5. A worker's fall arrest lanyard was attached to a formwork that shifted. The worker immediately unhooked their lanyard and climbed off the formwork;
- 6. A worker was travelling down a steep path in rugged terrain when they lost their footing, fell, and sustained a fracture;
- A worker was affected by a sudden pressure release when the side wall of a loaders rear tire failed;
- 8. Sloughing of material from the spillway buttress excavation slope struck a worker and carried the worker down the slope for approximately 2.5 metres;
- 9. While inspecting cables on a tower crane, a worker was struck by a pin assembly that fell from approximately 51 metres above;

- 10. A rock truck operator started the vehicle while the fuel and lube attendant was still positioned under the truck. This was a near miss as there were no injuries.
- 11. A worker was struck by a metal hook weighing between 15 and 20 pounds when the hook disengaged from one of the steel sets and fell approximately five to six feet above striking the worker's head and shoulder. The worker was assessed by a medical professional and returned to work with no injuries.
- 12. A worker tripped over a wooden plank while walking backwards and sustained fractures to major bones.
- 13. A worker was using their fall arrest incorrectly while working at height.
- 14. Workers were not wearing respiratory protection or water suppression when they were observed using a gas-powered concrete cut-off saw to cut a portion of a concrete lock block.
- 15. A worker's hand contacted a damaged section of cable resulting in the worker receiving an electrical shock.
- 16. A worker received a minor injury when a formwork failed during a concrete pour causing a release of approximately 80 cubic metres of concrete onto the ground.
- 17. While a contractor vehicle was waiting to merge on to road, a truck in motion from the adjacent side of the contractor vehicle sped through the yellow traffic light and collided with another SUV that was about to cross the road, then crashed into the contractor vehicle.
- 18. A worker was cleaning a grout plant when they sustained an injury to their thumb.
- A worker was using a 3-foot piece of coil rod as a roller handle when they lost their grip causing the rod and roller to fall approximately 88 feet to the zero deck.

- 20. A worker injured their leg when they slipped on icy ground conditions and sustained a fracture.
- 21. A worker was hit on the side of their face by a shotcrete hose and shotcrete when the hose they were using became blocked and then cleared itself.
- 22. A worker was stripping a panel from a bulkhead when the bar they were using slipped out of the workers hand, falling approximately 15 feet. The bar grazed the hard hat of another worker assisting in the task.

All Injury Incidents

The 70 injury incidents that occurred in 2019 include six lost time injury and 64 medical attention injuries:

Lost Time injury

- 1. A section of a conveyor dropped on a worker's foot and the worker suffered a fractured foot.
- 2. A worker was hosing off a concrete mix truck, when they tripped on a curb behind them and fell backwards, landing their right shoulder.
- 3. A worker was travelling down on a steep path in rugged terrain when they turned to speak to another worker, lost their footing, fell, and sustained a fracture
- A worker was working on a concrete pour when concrete backed up on the telebelt above and fell 15 feet onto the worker's back, dropping them to one knee.
- 5. A worker tripped over a wooden plank while walking backwards and sustained fractures to major bones.
- 6. A worker was connecting a heater sock to a heater unit, slipped on icy ground conditions, and injured their leg.



Medical Attention requiring Treatment

- 1. A worker bumped their forearm against a stay-form resulting in a 4"x 1" laceration.
- 2. A worker was struck by woody debris in the eye from their chainsaw while cutting.
- 3. A pry bar slipped and contacted the side of the workers head, just below the workers hard hat. The worker sustained a small laceration.
- 4. Workers were offloading a pressure washer when the pressure washer slipped, pinching and lacerating a finger of one of the workers.
- 5. A worker was wearing gloves using a box cutter to cut tape and received a laceration that required stitches.
- A worker was affected by a sudden pressure release when the side wall of a loaders rear tire failed.
- 7. A worker was widening a hole in a girder when a drill bit caught; the worker sustained a fracture.
- 8. A worker using a palm drill sustained a puncture that required staples.
- A worker was cutting a piece of rope. The knife blade went through the rope and cut through the worker's leather glove. The worker sustained a laceration that required stitches.
- 10. A worker was cutting steel with an oxyacetylene torch when a piece of metal fell off the table, struck the worker, and the worker sustained a fracture.
- 11. A worker was stepping over a small pile of rebar, lost their footing and received a laceration that required stitches.
- 12. A worker was pre-loading core tubing into a drill rod, when the tip of their thumb became pinched between the core tubing and drill rod. The worker required stitches.

- 13. A worker was cleaning construction debris out of water that had been used for green-cutting concrete. Their hand showed signs of peeling from concrete irritation.
- 14. A worker was drilling anchors for coil rod in-beds. The worker filled a hole with epoxy, started to hammer a piece of coil rod into the hole, and hit an air pocket causing the epoxy to splatter up under their safety glasses and contacted their eye.
- 15. A worker slipped at the end of plywood access path then tried to catch themselves and received a laceration on their arm on a horizontal rebar.
- 16. A worker inhaled fire retardant fumes in an enclosed space while extinguishing a fire in the manifold of the rock truck.
- 17. A worker pinched their finger and sustained a laceration, while adjusting scaffolding.
- 18. A worker slipped on some loose gravel and fell forward hitting their left shoulder against a steel beam.
- 19. A worker lost their footing, slipped, and strained their back while unloading the vacuum hoses from the back of a light duty vehicle.
- 20. A worker stepped into fresh concrete during a mud slab pour, causing it to overflow into the workers boots. The worker sustained concrete burns to both legs.
- 21. A worker felt discomfort in both eyes after welding work.
- 22. A worker was adjusting a hydraulic jack when a space plate dislodged and the worker received a laceration to their upper lip.
- 23. A worker lost their footing, fell forward and received a laceration on their hand.
- 24. A worker stepped onto an unmarked pin flag and strained their hip and lower back.



- 25. A worker slipped on uneven ground and strained their lower back.
- 26. A worker stepped on a power cable and strained their knee.
- 27. A worker stepped on a rock and rolled their ankle.
- 28. A worker felt discomfort in both eyes after grinding work.
- 29. A worker stepped into a hole and rolled their ankle.
- 30. A worker strained their shoulder while lifting a cutlery holder.
- 31. A worker received concrete burns while raking concrete.
- 32. A worker pinched their finger and received a laceration, while working on formwork.
- 33. A worker stepped backwards on a rebar mat and their foot went through the mat; worker fell onto the vertical form savers causing a laceration on their back.
- 34. A worker sustained a laceration to their lip and earlobe while installing stay-form.
- 35. A worker installing bracing disturbed some metal debris and experienced discomfort in their eye.
- 36. A worker drilled through formwork and punctured another worker's hand.
- 37. A worker cut their hand on the inner perimeter flange of an electrical panel.
- 38. A worker caught their finger between the ball and hitch of their equipment, and received a laceration.
- 39. A worker pinched their thumb between two plates and received a laceration.
- 40. A worker stumbled on the steps of a crew bus and their arm got stuck between the handrail and bulkhead and received a shoulder injury.
- 41. A worker injured their knee while using a pry bar.
- 42. A worker climbing through rebar had a tie wire poke the worker.

- 43. A worker was laying decking when they grabbed a used piece of plywood with an un-removed nail, which contacted their chin, and received a laceration.
- 44. A worker was falling a 24 cm spruce when a dead limb about 14 cm broke off from the tree and struck the worker on their shoulder.
- 45. A worker was cutting a zip tie with a utility knife when the knife slipped and cut through their glove. The worker received a laceration on their finger.
- 46. A worker bent over to move a 4" x 6" piece of lumber when they lost their footing. The worker slipped and twisted their knee at the same time.
- 47. A worker was placing a box on a lower shelf, they suddenly felt a squeezing pain in their leg as they squatted down.
- 48. A worker was climbing a scaffold ladder when they struck their head on a concrete header that was not visible due to it being covers by tarps.
- 49. A worker was shoveling tracks on heavy equipment when their hand contacted a plant thorn and they received a small puncture.
- 50. A worker was working on a haul truck replacing a hydraulic cylinder bushing and pin. The cylinder slipped off the jack and pinched the worker's finger between jack and the cylinder.
- 51. A worker was cleaning the grout plant after a concrete pour, when they placed their hand inside the pump box while power was engaged, causing an injury to their thumb.
- 52. A worker was attempting to remove a form from a wall. While prying a panel towards themselves with the pry bar, the bar slipped and contacted the lip and the worker received a laceration.
- 53. A worker was removing a coil rod in the process of pre-stripping forms. Worker had a pipe wrench on the coil rod and the wrench slipped and contacted the lip and the worker received a laceration.

- 54. A worker was carrying a sheet of plywood causing a splinter to enter the wrist.
- 55. A worker pinched their finger between two slicklines and the worker received a laceration.
- 56. A worker slipped while holding a scaffold tube and strained their shoulder.
- 57. A worker pulled hard on a loose bolt with a torque wrench which contacted the lip and the worker received a laceration.
- 58. A coil rod contacted a worker's earlobe while the coil rod was being pushed up from the bottom of a pre-built form.
- 59. A worker suffered from back pain after performing bolt torque checks.
- 60. A worker fractured their finger when the bush hammer accidently engaged and contacted their hand.
- 61. A worker stepped and fell 4-5 feet from single section of the scaffold deck onto the stairs below the scaffold.
- 62. A worker pinched their finger between a bracket and hook.
- 63. A worked rolled their ankle while a worker was retrieving a clamp.
- 64. A worker suffered from eye irritation after their work shift in diversion outlet structure area.

<u>Figure B-1</u> below provides information on Employee and Contractor Serious Incidents/Near Miss Frequency, Lost Time Injury Frequency and All Injury Frequency as at December 31, 2019.



Figure B-1 **Employee and Contractor Serious** Incidents/Near Miss Frequency, Lost Time **Injury Frequency and All Injury Frequency**











Table B-1 lists the Regulatory Inspections and Orders received from January 2019 through December 2019.

BC Hydro Power smart

	Table B-1	Regulatory Inspections and Orders	
Risk Level	Theme	Inspection reports and orders received	Date of Inspection
Inspection	#1: WorkSafeBC co	nducted an inspection in the contractor's mainte	enance shop.
Low Risk	Safety Documentation	Order #1: Brake cleaner is used in the maintenance shop and being applied using a spray bottle. The contractor failed to ensure that the container has a workplace label applied to it.	
Low Risk	Safety Documentation	Order #2: The contractor acquired brake cleaner for use, handling or storage at a workplace and provided the inspector a safety data sheet for brake cleaner. The contractor failed to ensure that all the safety data sheets are available for acquired products used in the workplace.	
Low Risk	Safety Documentation	Order #3: The contractor failed to ensure that a hazardous product is not used, stored or handled in a workplace unless all the applicable workplace hazardous materials information system requirements concerning labels, product identifiers, safety data sheets and worker education and training are complied with.	January 4, 2019
Low Risk	Safety Documentation	Order #4: The contractor failed to ensure effective local exhaust ventilation is used at any fixed work station to minimize worker exposure to harmful air contaminants produced by welding, burning or soldering.	
Low Risk	Safety Documentation	Order #5: The contractor failed to ensure the inspection and maintenance of the weld fume extraction system (smoke eater) is being carried out in accordance with the manufacturer's instructions and standards. The contractor was conducting pre-use checks but could not provide any information or proof that other regular maintenance had been conducted.	
Low Risk	Safety Documentation	Order #6: The contractor failed to ensure the health and safety of all workers present at the workplace.	



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Risk LevelInspection reports and orders receivedDate of inspectionInspection #2: WorkSafeBC conducted an inspection on the underground workings and set up times to inspect the right bank drainage tunnel, the inlet diversion tunnels 1 and 2 and the outlet diversion tunnel portal area.Inspection: The contractor reported in the meeting that they are performing quality and assurance inspections to ensure the health and safety of all workers.Respirators: As dust levels vary due to the activity being conducted in the tunnel, different levels of respiratory protection are used. The occupational hygienist provided a list of activities and the level of respirator protection required.				
		No Orders	January 16, 2019	
Inspection	#3: WorkSafeBC co	nducted a site inspection in the inlet portals of t	he diversion tunnels.	
Low Risk	Safety Documentation	Order #1: The contractor failed to ensure that an effective tag-in method of accounting for all workers entering and leaving the underground working is established and maintained.	January 17, 2019	
 Inspection #4: WorkSafeBC inspection was conducted on the outlet diversion tunnel portal area. There are several workers working on the slope above the portal and other workers installing the infrastructure on the surface that is required to support the underground. Above portal entrance: At the time of the inspection there were rock climbers working on the slopes above the portal area installing mats. As part of the safe work process, a control zone was set up below the area to prevent workers from entering into the hazard area. Acceptance: The inspection was also conducted to gather information for the prevention practices and quality group of WorkSafeBC that are working on AR201800122 (the acceptance for the heating equipment and ventilation for the diversion tunnel (outlet portal). 				
		No Orders	January 17, 2019	
 Inspection #5: WorkSafeBC conducted an inspection on the right bank drainage tunnel. At the time of the inspection the underground crew were installing rock bolts. Topics of discussion with the contractor included but were not limited to the following: Dust collection – the contractor must ensure that the mechanical ventilation system is operated in accordance with good engineering practice, maintained in good working order as per the manufacturer and capable of supplying sufficient fresh air to the underground working. Ground failure – On December 10, 2018 an electrician noticed that a portion of the east wall, in the gallery to the cofferdam had failed. The electrician notified supervision immediately. The accumulation of water behind the shotcrete may have been one of the contributing factors into the failure of the wall. When the engineer of record and the contractor create safe work procedures and ground support details they must ensure that suitable systems are installed to remove the water to prevent an incident like this from happening again. All remedial engineering documentation and a safe work procedure must be submitted to WorkSafeBC engineering for review, prior to re-entering the drainage gallery and initiating remedial work. 				



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
		No Orders	January 18, 2019	
Inspection the new war	#6: WorkSafeBC control workSafeBC control that the set of the se	nducted an inspection on aerial work platform. is under construction.	The inspection area is at	
Low Risk	Safety Documentation	Order #1: The contractor failed to ensure suitable ladders, work platforms or scaffolding were provided for roofing activities requiring position at elevations above a grade. In addition, the contractor to provide supporting documentation from the manufacturer for the utilization of the aerial work platform equipment for access on location.	January 21, 2019	
Inspection #7: WorkSafeBC conducted an inspection on aerial work platforms. The inspection area is at the new warehouse building that is under construction. The sub-contractor is to provide the exterior wall and roof panel installation services at the warehouse project. At the time of the inspection the contractor was installing three-part sheet metal clad and insulating roof material on the northern roof elevation above the main entrance of the warehouse.				
Low Risk	Safety Documentation	Order #1: The contractor failed to ensure each elevating work platform (aerial work platform) in use at a workplace, the equipment manufacturer's operation manual, including specific instructions for enter and exit at elevations, to be available at the workplace.		
Low Risk	Safety Documentation	Order #2: The contractor failed to ensure each elevating work platform in use at a workplace, the equipment manufacturer's operation manual, including specific instructions for enter and exit at elevations, to be available at the workplace.	January 21, 2019	
Low Risk	Safety Documentation	Order #3: The contractor failed to ensure the s-fork hoisting hook attachments installed on the forks of the all-terrain fork lift to be installed on the equipment as specified by the equipment manufacturer or certified by a professional engineer for use on the equipment.		
Inspection #8: WorkSafeBC conducted site inspection as a result of an incident that involved a high risk of serious injury to a worker on the roadheader equipment #084 in the left bank diversion tunnel #2 – inlet. This inspection report contains a stop use order.				



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Risk Level	Theme	Inspection reports and orders received	Date of Inspection
High Risk	General Conditions	Order #1 OSH 2.12: Cable ties were installed on the electrical cabinet door safety interlock switches, rendering them ineffective on the roadheader equipment #084. The contractor must not intentionally remove, impair, or render ineffective any safeguard provided for the protection of workers, except as permitted by the Occupational Health and Safety Regulation.	
High Risk	Stop Use Order	Order #2 WCA 190 (1): WorkSafeBC has reasonable grounds to believe that a thing that is being used or that may be used by a worker in this workplace is either not in safe operating conditions or does not comply with this part or the regulations. Pursuant to Section 190(1) of the Workers Compensation Act, the main civil works contractor is ordered to immediately stop use of the roadheader equipment #084.	February 17, 2019
Low Risk	Rights and Responsibilities	Order #3 OSH 3.7 The employer is directed to perform a special inspection of the roadheader equipment #084 involved in the electrical incident on February 17, 2019. A malfunction occurred when a worker was in the process of resetting the equipment's main circuit breaker and a 1000-volt electrical discharge occurred, the employer is directed to conduct an inspection prior to use.	
Inspection #9: WorkSafeBC conducted site inspection as a result of an incident that involved a high risk of serious injury to a worker on the roadheader equipment #025 in the left bank diversion tunnel #1 – inlet. This inspection report contains a stop use order.			
High Risk	General Conditions	Order #1 OHS 4.12: The roadheader equipment #025 equipment's electrical cabinet door safety interlock switches had been rendered ineffective by use of electrical tape. The contractor must not intentionally remove, impair, or render ineffective any safeguard provided for the protection of workers, except as permitted by the Occupational Health and Safety Regulation.	February 17, 2019



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Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
High Risk	Stop Use Order	Order #2 WCA 190 (1): WorkSafeBC has reasonable grounds to believe that a thing that is being used or that may be used by a worker in this workplace is either not in safe operating condition, or does not comply with this part of the regulations. Pursuant to Section 190(1) of the Workers Compensation Act, the main civil works contractor is ordered to immediately stop use of the roadheader equipment #025.		
Low Risk	General Conditions	Order #3 OHS 4.11(a): Prior to the operation of the roadheader equipment #025, the contractor is responsible to ensure the safeguards are in place and functioning.		
Inspection #10: WorkSafeBC conducted site inspection as a result of an incident that involved a high risk of serious injury to a worker on the roadheader equipment #026 in the left bank diversion tunnel #2 – outlet. This inspection report contains a stop use order.				
High Risk	General Conditions	Order #1 OHS 4.12: Cable ties were used on the electrical cabinet door safety interlock switches, rendering them ineffective on the roadheader equipment #026. The contractor must not intentionally remove, impair, or render ineffective any safeguard provided for the protection of workers, except as permitted by the Occupational Health and Safety Regulation.		
High Risk	Stop Use Order	Order #2 WCA 190(1): WorkSafeBC has reasonable grounds to believe that a thing that is being used or that may be used by a worker in this workplace is either not in safe operating condition, or does not comply with this Part of the regulations. Pursuant to Section 190(1) of the Workers Compensation Act, the main civil works contractor is ordered to immediately stop use of the roadheader equipment #026.	February 17, 2019	
Low Risk	General Conditions	Order #3 OHS 4.11(a): Prior to the operation of the roadheader equipment #026, the contractor is responsible to ensure the safeguards are in place and functioning.		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection
Inspection risk of seriou – outlet. This	#11: WorkSafeBC c us injury to a worker s inspection report c	onducted site inspection as a result of an incide on the roadheader equipment #023 in the left b ontains a stop use order.	ent that involved a high bank diversion tunnel #1
High Risk	General Conditions	Order #1 OHS 4,12: Cable ties were used on the electrical cabinet door safety interlock switches, rendering them ineffective on the roadheader equipment #023. The contractor must not intentionally remove, impair, or render ineffective any safeguard provided for the protection of workers, except as permitted by the Occupational Health and Safety Regulation.	
High Risk	Stop Use Order	Order #2 WCA 190 (1): WorkSafeBC has reasonable grounds to believe that a thing that is being used or that may be used by a worker in this workplace is either not in safe operating condition, or does not comply with this part of the regulations. Pursuant to Section 190(1) of the Workers Compensation Act, the main civil works contractor is ordered to immediately stop use of the roadheader equipment #023.	February 17, 2019
Low Risk	General Conditions	Order #3 OHS 4.11(a): Prior to the operation of the roadheader equipment #023, the contractor is responsible to ensure the safeguards are in place and functioning.	
Inspection a risk of seriou – inlet. The i The main cin order to perf electrical sh	#12: WorkSafeBC causinjury to a worker incident occurred durcuit breaker had beeform a complete reserved form a complete reserved form this 1000-v	onducted site inspection as a result of an incide on the roadheader equipment #084 in the left b ring the start-up phase for the underground roa en accessed through the equipment's high volta et of the equipment and computer system. A wo olt energy release.	ent that involved a high bank diversion tunnel #2 odheader equipment. age electrical cabinet, in brker received an
An observat door handle electrical ca ineffective b revealed two contact to th	ion of the roadheade s were not functionir binet door via felt ma binet door safety inte y way of cable ties. I o missing isolation co le energized parts.	er equipment on location revealed that main ele ng as per the manufacturer; this had been clear arker. Upon further inspection of the equipment erlock switches to de-energize the cabinet had Further observation and review of the main circ overs that were not installed to protect the work	ectrical cabinet exterior ly labeled on the , it was noted that been rendered uit breaker switch box er from inadvertent
High Risk	Rights and Responsibilities	Order #1 – OHS 3.9 The contractor failed to ensure the missing breaker extension in the roadheader electrical cabinet must be	February 17, 2019

remedied without delay.



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Risk Level	Theme	Inspection reports and orders received	Date of Inspection
Low Risk	Rights and Responsibilities	Order #2 – OHS 3.10: The contractor must investigate after receiving the report of unsafe condition and ensure that any necessary corrective action is taken without delay.	
Low Risk	General Conditions	Order #3 – OHS 4.3(1)(b)(i): The contractor failed to ensure that each tool, machine and piece of equipment in the workplace is capable of safely performing the functions for which it is used and is selected, used and operated in accordance with the manufacturer's instructions, if available.	
Low Risk	Mobile Equipment	Order #4 - OHS 4 16.4(1)(a): The manufacturer developed a contractor specific training program for the use of the roadheader equipment on location, but the contractor failed to ensure the injured worker took part in this instructional training.	
High Risk	De-Energization and Lockout	Order #5 – OHS 10.2: The contractor failed to ensure the energy is isolated and effectively controlled the unexpected release of electrical energy that could cause an injury.	
Low Risk	General Duties of Employers	Order #6 – WCA 115(2)(e): The contractor failed to provide adequate information, instruction, training and supervision at the workplace to ensure the workers can work without undue risk.	
Inspection #13: WorkSafeBC conducted a site inspection on the tower crane erection and use in L2 powerhouse area.			
Low Risk	Safety Documentation	Order #1 OHS 15.59 : The contractor failed to have a nameplate or other permanent marking for the hook lifting devices that displays the manufacturer's name and address, serial number, weight of the device, if more than 45kg and working load limit.	February 20, 2019



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Inspection #14: WorkSafeBC conducted the site inspection on the concrete pump and concrete placing boom. The contractor has three concrete pumps trucks and four concrete placing booms that either have been or will be erected / operating on the Site C Clean Energy Project.				
The contract concrete on	tor is the subcontrac the generation static	tor of the generating station and spillways prime on, powerhouse and spillway projects.	e contractor to place	
 WorkSafeBC reviewed and discussed the content of a Concrete Pump Inspection Checklist that included the following: Qualification of the supervisor Qualification of the operator Evaluation of the set-up location Periodic (annual) inspection requirements as per CSA Z151-09 Frequent (monthly) inspection requirements as per CSA Z151-09 Daily pre-use inspection by the operator documented Short rigging outriggers as per the manufacturer's instruction Outrigger cribbing under all float pads as per the manufacturer's instruction Guarding installed at the hopper supply elbow Controls and emergency stops functioning correctly 				
		No orders	February 21, 2019	
 Inspection #15: WorkSafeBC conducted an inspection on the procedures for checking well-being of a worker which includes following: 1. Working alone policy 2. Time intervals / emergency rescue 3. Recording results 				
		No orders	March 11, 2019	
Inspection #16: WorkSafeBC attended an information session at the contractor's site. The discussions included Canadian Standards Association standards, various engineering aspects, definitions and regulatory requirements for the proposed tunnel lining formwork to be operated and set for concrete placement within the diversion tunnels.				
		No orders	March 13, 2019	
Inspection #17: WorkSafeBC conducted an inspection to provide clarifications to questions with the rigging, lifting devices, chain spreaders and plate clamps.				
		No orders	March 18, 2019	
Inspection #18: WorkSafeBC conducted an inspection at 240 Road till conveyor road crossing site.				
Low Risk	Traffic Control	Order #1 OHS 18.2 : The contractor failed to ensure that effective traffic control is provided and used whenever traffic could be hazardous to a worker.	March 25, 2019	



Risk I aval	Thomo	Inspection reports and orders received	Date of Inspection	
Risk LevelThemeInspection reports and orders receivedDate of InspectionInspection #19: WorkSafeBC conducted a general inspection and focused on the lockout and safety program at the Peace Canyon Generation Station. At the time of the inspection, the Peace Canyon Generation Station was undergoing an upgrade to support Site C Dam. The current project entails the erection of two new 500 kV lines supplying power to the Site C Dam. The 500 kV lines will be terminated into gas insulated switch gear. Gas insulated switch gear uses sulfur hexafluoride to insulate the switch, replacing the need for oil filled circuit breakers.				
		No Orders	April 4, 2019	
 Inspection #20: The Inspector of Mines examined the Mines Rescue Equipment at the West Pine Quarry. It was noted that while Mine Rescue equipment is in place, it is deficient in some areas. Examples of this are the unknown age of the ropes and the amount of ropes. Additionally, there is only one harness available for the whole team. This is not sufficient. As per 3.7.5 of the Health, Safety and Reclamation Code of BC: The manager of an open pit mine employing more than 25 persons per shift shall ensure that: (1) one fully trained and equipped mine rescue team, and (2) on every shift where more than 10 persons are working, there are four persons trained in mine rescue procedures. 				
High Risk	Open Pit	Order 1# MA 3.7.5: The contractor failed to ensure the adequate equipping of the Mine Rescue Cache to have an equipped mine rescue team. This should be in conjunction with the Mine Rescue Trainer.	May 6, 2019	
Inspection #21: WorkSafeBC conducted an inspection on physical or mental impairment and impairment by alcohol, drug or other substance.				
The following excerpt has been provided for clarification purposes:				
Note: In the application of sections 4.19 and 4.20, workers and employers need to consider the effects of prescription and non-prescription drugs, and fatigue, as potential sources of impairment. There is a need for disclosure of potential impairment from any source, and for adequate supervision of work to ensure reported or observed impairment is effectively managed.				
		No Orders	May 9, 2019	
Inspection #22: WorkSafeBC attended the workplace as a result of an incident that involved an injury of a worker in the left bank diversion tunnel 1 outlet.				
		No Orders	May 9, 2019	
Inspection #23: During a regular inspection the WorkSafeBC Officer discussed the effects of prescription and non-prescription drugs, and fatigue, as potential sources of impairment.				
		No Orders	May 9, 2019	


Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Inspection #24: WorkSafeBC conducted an inspection on the electrical distribution; qualified personnel and high voltage limits of approach were discussed but not limited to.				
		No Orders	May 14, 2019	
Inspection and material.	Inspection #25: WorkSafeBC conducted an inspection on the Spillway where there was a slide of material.			
Topics of dis following.	scussion with the sub	o-contractor and the prime contractor included,	but not limited to, the	
Slide of Mat At 4:00 a.m. block 8. The by 0.4 metre undetermine	erial: on Wednesday, Ma size of the slide was to 0.5 metres deep ed injuries.	y 29, 2019, there was a slide of material in an a s reported to be 5 metres horizontal length by 2 p. There was a worker that was struck by the sl	area referred to as 2 metres vertical length ide and has	
Low Risk	Special Inspections	Order #1 OHS 3.7: A special inspection must be made when required by malfunction or accident.	May 29, 2019	
Inspection #26 : WorkSafeBC conducted an inspection as a result of a slide of material that occurred at the roller-compacted concrete spillway buttress excavation that was approximately 5 metres horizontal by 2 metres vertical and 0.5 metres in depth and involved an injury to a worker.				
That inciden additional to enforcemen reports that	t is currently under in any orders that are t action arising out o relate to the incident	nvestigation by WorkSafeBC and may result in included in this inspection report. This may also f the orders cited in this inspection report, or in a referred to in this inspection report.	order being issued, in be subject to further subsequent inspection	
The orders of section to el to conductin excavation a	cited in this report are evations 383.0 to 39 g all work within the and correspond to wi	e to address roller compacted concrete spillway 6.0 material slide, observed at the workplace, t hazardous area of the roller compacted concre ritten instructions on site.	 excavation block 8 hat need attention prior te block 8 slope 	
Work Stoppage	Orders to stop work	Order #1 WCA 191(1): Based upon the violation cited in this inspection report, WorkSafeBC has reasonable grounds to believe there is a high risk of serious injury, serious illness or death to a worker at this workplace.	May 29, 2019	
High Risk	Work standards	Order #2 OHS 20.78(1)(a): Excavation work was not done in accordance with the written instructions of a qualified registered professional if the excavation is more than 6 metres (20 ft.) deep.		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection
Inspection #27: WorkSafeBC conducted an inspection on the spillway where there was a slide of material. On May 29, 2019, there was a slide of material in an area referred to as block 8. The size of the slide was reported to be 5 metres horizontal by length by 2 metres vertical length by 0.4 metres to 0.5 metres deep. There was a worker employed by the contractor was struck by the slide and has undetermined injuries.			
At the time of professional	of the inspection the as the means of pro	contractor was using written instructions by a q otection of the worker while working on the slop	ualified registered e of the excavation.
High Risk	Sloping shoring requirements	Order #1 - OHS20.81(1): The contractor failed to ensure that the sides of the excavation were sloped as specified in writing by a qualified registered professional and sloped at angles, dependent on soil conditions, which will ensure stable faces.	May 29, 2019
Inspection exposure.	#28: WorkSafeBC co	onducted an inspection on the Safety Data She	ets (SDS) chemical
		No Orders	May 30, 2019
Inspection shop.	#29: WorkSafeBC co	onducted an inspection of the contractor's right	bank maintenance
		No Orders	May 30, 2019
Inspection #30: WorkSafeBC conducted an inspection in Area 33 - generating stations and spillways. discussions held with the contractor for submitting Employer Incident Investigations Reports occurred on June 6, 2019.			
An inspection of the provided documentation has revealed that the contractor has had approximately 100 incidents between February 24, 2019 to May 18, 2019, verification of the Claims Management Solution system of submitted claims by this officer indicates approximately 70 to 80 incidents in 2019, required submission to the WorkSafeBC board within 30 days.			
An updated (June 20, 2019) search of the WorkSafeBC Employer Incident Investigations Reports submission portal for contractor has shown two investigations being uploaded to date.			
The requirement to submit investigations to the WorkSafeBC Board within 30 days has not been followed by the contractor.			
Low Risk	Safety Documentation	Order #1 WCA176(2)(b): The contractor failed to submit all the remaining outstanding incidents to the WorkSafeBC Employer Incident Investigations Reports portal, and advise this officer when they uploaded to the system.	June 6, 2019



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Inspection #31: This incident (IMS# 186015) resulted from the attempted towing of a disabled 14M grader by means of the all terrain forklift and tractor trailer, a failure to negotiate a 90-degree corner and slight decline grade on left bank haul road L5 intersection. The all terrain forklift inadvertently flopped over on its right-hand side onto the gravel road surface, which subsequently caused injury to a worker. The orders cited in this report are to address items, noted at the workplace, that need attention prior to conducting more work with respect to responsibilities, transportation, inspection, and work practices noted on location. Refer to orders 1, 2, 3, 4, 5, 6 & 7				
Low Risk	Rights and Responsibilities	Order #1 - OSH3.7: A special inspection must be made when required by malfunction or accident.		
High Risk	Safe Machinery and Equipment	Order #2 - OHS4.3(1)(b)(i): The contractor failed to ensure that the tow/winch line in the workplace is used in accordance with the manufacturer's instructions.		
High Risk	Rigging Slings	Order #3 - OHS15.39: The contractor failed to ensure the edge or the sling must be protected to prevent damage to the sling when a sling is applied to a sharp edge of a load.		
High Risk	Operator's Responsibilities	Order #4 - OHS16.5: The operator of the mobile equipment failed to ensure to operate the equipment safely, maintain full control of the equipment, and comply with the laws governing the operation of the equipment.		
High Risk	Supervisor's Responsibilities	Order #5 - OHS16.6: A supervisor has knowingly permitted the workers to conduct a towing practice of the disabled 14M grader that created undue hazard to the health or safety of the workers.	June 6, 2019	
Low Risk	Standards	Order #6 - OHS16.7(e): The contractor failed to ensure the design, fabrication, use, inspection and maintenance of mobile equipment must meet the requirements of the following applicable standard: (e) Rough Terrain Forklifts: ANSI/ITSDF B56.6 2001, Safety Standard for Rough Terrain Forklift Trucks.		
Low Risk	Standards	Order #7 - OHS16.7(j): The contractor failed to ensure the design, fabrication, use, inspection and maintenance of mobile equipment must meet the requirements of the standard: Lift Truck Operator training: Canadian Standards Association Standard		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection
		B335-94, Industrial Lift Truck Operator Training.	
Inspection Road crossi	#32: WorkSafeBC cong.	onducted an inspection at the till conveyor exca	vation for the Old Fort
A worker an sheet pile th	d foreman could not at cut through the O	provide the written instructions for the excavati ld Fort Road. Therefore, a stop work order was	on, a power pole and issued.
Low Risk	Excavation – Work Standards	Order #1 - OHS20.78(1)(b): Excavation work was not done in accordance with the written instructions of a qualified registered professional where the excavation was adjacent to a road, sheet pile and power pole.	
Work Stoppage	Orders to stop work	Order #2 - WCA191(1)(a): WorkSafeBC has reasonable grounds to believe there is a high risk of serious injury, serious illness or death to a worker at this workplace. Therefore, WorkSafeBC orders that work inside the excavation stop at this workplace is immediately stopped.	June 26, 2019
Inspection the horizonta	#33: WorkSafeBC co al life lines were insp	onducted an inspection at SS2 Site 24 Compar- pected and certified by a professional engineer.	tment 1B to verify that
The contract program and	tor verified that the h d that the preventive	orizontal life lines are managed within a prever maintenance for the life lines is current.	tive maintenance
		No Orders	June 26, 2019
Inspection #34: WorkSafeBC conducted an inspection at the generating station & spillways powerhouse construction worksite due to a crane misadventure while the contractor was in the process of erecting the tower crane. Items discussed and areas of inspections included, but were not limited to the following: crane misadventure, manufacturer's erection instructions, and incident investigation. Crane misadventure - "misadventure" means a contact with a high voltage electrical source, a shock load, a loss of a load, a brake failure, a collision or upset, or any other circumstance that may impair the safe operation of the crane or hoist.			



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
High Risk	Certification following misadventure	 Order #1 – OHS14.16.1(2): The tower crane was subject to a misadventure and due to the impact between the jib end, hoist cable and the jib boom, there may have been unknown damage to the tower crane. The contractor failed to remove the tower crane from service until a professional engineer has: a) supervised an inspection of, and supervised any necessary repairs to, the equipment; and certified the equipment as safe for use at the manufacturer's rated capacity for the equipment or as provided by section 14.16 if the manufacturer's rated capacity is not available. 	July 2, 2019	
Low Risk	Tower crane erection	Order #2 – OHS 14.73(2): The tower crane erection was not done in accordance with the instructions of the crane manufacturer or professional engineer		
Inspection #35: WorkSafeBC conducted an inspection at the generating station and spillways powerhouse construction worksite due to a crane misadventure while the contractor was in the process of erecting the tower crane. Items discussed and areas of inspections included, but were not limited to the following: system to ensure compliance				
Low Risk	Tower crane erection	Order #1 – WCA118 (2)(b): The prime contractor of a multiple-employer workplace must do everything that is reasonably practicable to establish and maintain a system or process that will ensure compliance with the <i>Workers</i> <i>Compensation Act</i> Part 3 and the regulations in respect of the workplace.	July 2, 2019	
Low Risk	Safety documentation	Order #2 – OSH20.3(4)(c): BC Hydro failed to have a set of construction procedures designed to protect the health and safety of workers at the workplace.		
Inspection #36: WorkSafeBC conducted an inspection at the generating station and spillways powerhouse construction worksite due to a crane misadventure while the contractor was in the process of erecting the tower crane 3.				
Crane misadventure - "misadventure" means a contact with a high voltage electrical source, a shock load, a loss of a load, a brake failure, a collision or upset, or any other circumstance that may impair the safe operation of the crane or hoist.				



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
High Risk	Certification following misadventure	 Order #1 – OHS14.16.1(2): The tower crane was subject to a misadventure and due to the impact between the jib end, hoist cable and the jib boom, there may have been unknown damage to the tower crane. The contractor failed to remove the tower crane from service until a professional engineer has a) supervised an inspection of, and supervised any necessary repairs to, the equipment; and b) certified the equipment as safe for use at the manufacturer's rated capacity for the equipment or as provided by section 14.16 if the manufacturer's rated capacity is not available. 	July 2, 2019	
Inspection #37: WorkSafeBC conducted an inspection at the generating station and spillways powerhouse construction worksite due to a crane misadventure while the contractor was in the process of erecting the tower crane 3. Items discussed and areas of inspections included, but were not limited to the following: system to ensure compliance				
		No Orders	July 2, 2019	
Inspection #38: WorkSafeBC conducted an inspection at the generating station and spillways powerhouse construction worksite due to a crane misadventure while the contractor was in the process of erecting the tower crane 3. Crane misadventure - "misadventure" means a contact with a high voltage electrical source, a shock load, a loss of a load, a brake failure, a collision or upset, or any other circumstance that may impair the safe operation of the crane or hoist				
		No Orders	July 2, 2019	
Inspection goal of the i	#39: WorkSafeBC c nspection was to ver	onducted a general inspection at the quality cor ify crystalline silica management as part of the	ntrol lab at the Project. A high-risk strategy.	
Low Risk	Safety Administration	Order #1 – WCA 138(B): The contractor failed to post or kept the posted report of the three most recent joint committee meetings. A worker produced a set of minutes from January and the committee meets bi-weekly.	July 4, 2019	
Low Risk	Safety Administration	Order #2 – WCA 138(a): The contractor failed to post and keep posted the names and work locations of the joint committee members.		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection
Rescinded	Safety Documentation	Order #3 – OHS 5.14(2): When a supplier safety data sheet obtained under subsection (1) for a hazardous product that is three years old, the contractor failed to obtain from the supplier an up-to-date supplier safety data sheet in respect of any of the hazardous project in the workplace at that time.	
Rescinded	Exposure Control Plan	Order #4 – OHS 5.57(2): The contractor failed to implement an exposure control plan for 600 sulfur cement to maintain worker exposures to designated substances as low as reasonably achievable below the exposure limit established under section 5.48.	
High Risk	Occupational First Aid	Order #5 – OHS 5.85: The contractor failed to ensure that appropriate emergency washing facilities are provided within a work area where a worker's eyes or skin may be exposed to harmful or corrosive materials or other materials which may burn or irritate.	
Low Risk	Occupational First Aid	Order #6 - OHS5.88: The contractor failed to ensure that the selection of emergency washing facilities is based upon an assessment of the risks present in the workplace.	
High Risk	Workplace label for decanted products	Order #7 – OHS 5.10(1): The contractor had various products in containers other than the supplier container and the contractor failed to ensure that the container has a workplace label applied to it.	
Low Risk	Occupational First Aid	Order #8 – OHS 5.93(2): The contractor failed to ensure that a plumbed emergency eyewash or shower facility is full flow tested at least once per month, for a sufficient length of time to completely flush the branch of the water line supplying the eyewash.	

Risk Level	Theme	Inspection reports and orders received	Date of Inspection
Low Risk	Ventilation	Order #9 – OHS 5.67(2): The exhaust ventilation system used to control air contaminants at the 600 sulfur cement pots and the sieve testing machines has not been regularly inspected or monitored to ensure that it remains effective.	
Low Risk	Ventilation	Order #10 – OHS 5.61: The ventilation system for controlling airborne contaminants from the molten 600 sulfur cement in the workplace has not been designed and/or installed using established engineering principles as there one round collection point that does not cover the area of both pots.	
High Risk	Exposure Control Plan	Order #11 – OHS 5.54(2)(e): The contractor failed to ensure the exposure control plan incorporates hygiene facilities and decontamination procedures, when required.	
High Risk	Noise Exposure	Order #12 – OHS 7.7(1)(b): If it is not practicable to reduce noise levels to or below noise exposure limits, the contractor failed to post warning signs in the noise hazard areas.	
High Risk	Noise Exposure	Order #13 – OHS 7.3(1): The contractor failed to measure the noise exposure for the use of the diamond coring tool where a worker is, or may be, exposed to potentially harmful levels of noise, or if information indicates that a worker may be exposed to a level exceeding 82dBA Lex.	
High Risk	General Duties	Order #14 – WCA 115(1)(a)(i): The contractor failed to ensure the health and safety of all workers working for the contractor.	
Inspection section faile	#40: A near miss inc d within a newly con	ident resulted from two 50mm shotcrete suppo structed left bank diversion Tunnel No. 1 outlet	rt layers at heading area.
Low Risk	Reporting and Investigation	Order #1 – WCA 172(1)(b): The contractor failed to immediately notify WorkSafeBC of the occurrence of a shotcrete failure incident that involved a major structural failure or collapse of a building, bridge, tower, crane, hoist, temporary construction support system or excavation.	July 8, 2019



Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
Low Risk	Reporting and Investigation	Order #2 – WCA 172(2): The contractor disturbed the scene of an incident that is reportable.			
High Risk	Special Inspection	Order #3 – OHS 3.7: The contractor failed to conduct a special inspection when required by malfunction or accident.			
Inspection section faile	#41: A near miss inc d within a newly con	ident resulted from two 50mm shotcrete suppo structed left bank diversion Tunnel No. 1 outlet	rt layers at heading area.		
Low Risk	Reporting and Investigation	Order #1 – WCA 172(1)(b): The contractor failed to immediately notify WorkSafeBC of the occurrence of a shotcrete failure incident that involved a major structural failure or collapse of a building, bridge, tower crane, hoist, temporary construction support system or excavation.	July 9, 2019		
Low Risk	Reporting and Investigation	Order #2 – WCA 172(2): The contractor disturbed the scene of an incident that is reportable.	July 9, 2019		
High Risk	Special Inspection	Order #3 – OHS 3.7: The contractor failed to conduct a special inspection when required by malfunction or accident.			
Inspection onto the tow failure allow sheave area	Inspection #42: WorkSafeBC was on site during the installation of a new, 34 mm x 600-meter load line onto the tower crane, the wire mesh grip device used to attach the lead-line to the load line failed. The failure allowed the new load line to be dropped uncontrolled approximately 90 metres from the jib trolley sheave area to the ground.				
		No Orders	July 16, 2019		
Inspection destined for narrowed du	Inspection #43: The Portage Mountain Quarry is being developed by the contractor with the material destined for BC Hydro's Site C Project. The mine is located on a hillside, and the working face has been narrowed due to wildlife issues. This has resulted in a steep switchback ramp going up the face.				
Low Risk	Fire Fighting Equipment	Order #1 <i>Mines Act</i> Section 3.9.1 : The contractor failed to ensure the fire extinguishers on the contract drills parked in the laydown area have an up-to-date inspection records.			
High Risk	Haulage Road Width	Order #2 <i>Mines Act</i> Section 6.9.1 : The contractor failed to ensure that the haul roads for single lane traffic must be twice the width of the largest haul truck running on that road and berms must be 3/4 height of the largest tire running the road.	July 25, 2019		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
Inspection #44 : The contractor requested a pre-construction meeting to comply with the requirements of section 22.5 for the left bank drainage adit. The contractor stated that it planned to commence construction on September 17, 2019.					
The left bank drainage adit will be constructed using a drill and blast method of excavation. Due to the two left bank diversion tunnels being directly below, the contract must meet the requirements of OSH section 22.68					
The contract the left bank	tor that is constructir diversion tunnels, is	ng the entrance to the left bank drainage adit ac s being asked to provide a traffic review to Worl	ljacent to the outlet of ⟨SafeBC.		
The contract • Engine and the • An eva upset c tunnel of Prior to the c	tor is requested to pr ering documents that e required measures luation of the potenti onditions) at the left putlets and any mea	rovide the following to WorkSafeBC: at outline the evaluation of blasting above the le to meet section 22.68; and al impacts from traffic and ventilation equipmer bank drainage adit on ventilation equipment at sures, if any to address impacts. sures (if any are required) being in place, no wo	ft bank diversion tunnel at operation (normal and the left bank diversion ork may commence for		
the left bank	drainage adit.		,		
		No Orders	July 26, 2019		
Inspection was request	#45: WorkSafeBC co ed due to an employ	onducted an inspection at Gate B on the Site C /ee refusing unsafe work.	Project. The inspection		
Low Risk	Safe Buildings and Structures	Order #1 – OHS4.2: The contractor failed to ensure that each building and temporary or permanent structure in a workplace is capable of withstanding any stresses likely to be imposed on it.			
Low Risk	Working Alone	Order #2 – OSH 4.20.2(1): Before a worker is assigned to work alone or in isolation, the contractor failed to identify any hazards to that worker.	huly 20, 2010		
Low Risk	Safety Equipment	Order #3 – OHS 4.3(1)(b)(i): The contractor failed to ensure that each tool, machine and piece of equipment in the workplace is capable of safely performing the functions for which it is used and selected, used and operated, in accordance with the manufacturer's instructions. The extension cords at Gate B are being used to supply power where hardwired connections should be used.	July 23, 2013		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Inspection #46: WorkSafeBC conducted a site inspection in the right bank drainage tunnel. The excavation of the tunnel has been completed and the contractor is working on finishing the floor area as per design. At the time of the inspection the air operated chipping hammer did not have a restraint on the air line.				
Low Risk	Restraining device	Order #1 - OHS12.15(a): The air operated chipping hammer did not have a restraint between the tool and the airline. The contractor failed to have an effective means of restraint on a connection of a hose or a pipe if inadvertent disconnection could be dangerous to a worker.	July 31, 2019	
Inspection # 47: WorkSafeBC conducted an inspection in the left bank diversion tunnels. Topics of discussion with the contractor included but were not limited to the following: - Ventilation - Diversion Tunnel 2 Outlet: Lightning, tunnel inspections, shotcrete machine - Diversion Tunnel 1 & Inlet: Liner, concrete for liner, elevated work platform				
		No Orders	July 31, 2019	
Inspection date for sub main civil wo	#48: The purpose of mitting their final investors area.	this inspection is to document the contractor's estigation report for an incident that occurred or	request to extend the n July 8, 2019 in the	
		No Orders	August 8, 2019	
Inspection #49: WorkSafeBC conducted an inspection to verify concerns expressed in a discriminatory action complaint.				
A worker expressed concerns about the operation of rock trucks at the Site C Dam Project. Specifically, the excavation of the core trench on the right bank. The worker had concerns about the height of the berm/curb where trucks could dive over an edge. The worker expressed concerns about communication amongst drivers and other equipment operators, the worker had concerns about orientation and training and the lack of wheel chock use.				
The worker expressed these concerns to the general foreman and later a member of the health and safety team. The same evening that the concerns were expressed, the worker was told their employment was being terminated.				
It was confirmed from discussions with the contractor that the worker's concerns were not fully investigated, and it was observed at the time of inspection they had not been remedied without undue delay.				



Risk Level	Theme	Inspection reports and orders received	Date of Inspection
Low Risk	Reporting unsafe conditions	Order #1 - OHS3.10: Whenever a person observes what appears to be an unsafe or harmful condition or act, the person must report it as soon as possible to a supervisor or to the contractor, and the person receiving the report must investigate the reported unsafe condition or act and must ensure that any necessary corrective action is taken without delay.	August 9, 2019
High Risk	General Conditions	Order #2 - OHS4.63: The contractor failed to install a curb, where practicable, whenever there is a danger of a vehicle or other equipment running off the edge of an elevated area.	
High Risk	General Conditions	Order #3 - OHS4.3(1)(b)(i): The contractor failed to ensure that each tool, machine and piece of equipment in the workplace is capable of safely performing the functions for which it is used and is selected, used and operated in accordance with the manufacturer's instruction, if available.	
Low Risk	Safety Documentation	Order #4 - OHS3.25: The contractor failed to keep records of all training proved under sections 3.23 and 3.24 as the contractor does not have written records of the on-the-job-training (e.g., ride along/competency verification)	
High Risk	General duties of employers	Order #5 - WCA115(2)(e): The contractor failed to provide the workers the information, instruction, training and supervision necessary to ensure the health and safety of those workers in carrying out their work and to ensure the health and safety of other workers at the workplace.	
High Risk	General duties of employers	Order #6 - WCA115(1)(a): The contractor failed to ensure the health and safety of all workers working for that contractor and any other workers present at a workplace where the contract is being carried out.	

Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
Inspection involved the shotcrete at were preser	Inspection #50: WorkSafeBC attended the workplace as a result of a shotcrete failure incident that involved the potential for serious injury to workers. The contractor noted a failure of fibre reinforced shotcrete at station 0+672 to 9+690. Work was stopped, and WorkSafeBC was notified. No workers were present at the time of failure.				
Work Stoppage	Orders to stop work	Order #1 - WCA191(1): Pursuant to section 191(1) of the Workers Compensation Act, the Board orders that all work in the right bank drainage tunnel is immediately stopped, and that the workplace or any part of the workplace be cleared of persons and isolated by barricades, fencing or any other means suitable to prevent access to the area until the danger is removed.	August 14, 2019		
Low Risk	Special inspection	Order #2 - OHS3.7: A special inspection must be made of the right bank drainage tunnel due to a failure of the shotcrete between stations 0+670 and 0+690.			
Inspection #51: This inspection report contains an order for BC Hydro to complete a special inspection of the right bank drainage tunnel following a shotcrete collapse. BC Hydro is pursuing completion of this activity. This had been immediately reported to WorkSafeBC by the responsible prime contractor (not BC Hydro). BC Hydro's involvement is related to engineering and design.					
Low Risk	Special inspections	Order #1 - OHS3.7: A special inspection must be made when required by malfunction or accident.	August 14, 2019		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection			
Inspection #52: Due to some questions being posed by BC Hydro, the following comments are from WorkSafeBC.						
The remediation procedures accepted for the left bank diversion tunnel outlet #1 may need to be revisited for the following reasons:						
 The cha 	 The outlet portal has been excavated, leaving a 20 to 30-foot drop to ground level that has changed the access; 					
• The	rock/tunnel condition	ns may have changed since the original inciden	t; and			
 Due and 	e to the above two ite ensure all of part 22	ms procedures may need to be adjusted to refle and other parts of the regulation are being follo	ect the current situation wed.			
After the verif see the follow	fication and potential ving steps:	re-submission of the remediation plan, WorkSa	afeBC would expect to			
Ren	nediation;					
 Ass 	urance in writing that	the tunnel is now safe;				
• App outl qua	ly the updated inspe et #2. After work is fι lified professional; ar	ction/verification process as occurred in left bar Illy completed an updated package signing off t id	ık diversion tunnel he changes by a			
 In le com app 	eft bank diversion tun pleted in left bank di ly the updated inspe	nel outlet #1 apply potential changes that align version tunnel outlet #2. Same sign off as the li ction/verification process and resulting work.	with CO275 as ne above. Across site			
		No Orders	August 23, 2019			
Inspection WorkSafeB0	#53 : Due to some q C.	uestions being posed by BC Hydro, the followin	g comments are from			
The remedia revisited for	ation procedures acc the following reason	epted for the left bank diversion tunnel outlet #1 s:	I may need to be			
• The cha	outlet portal has been nged the access;	en excavated, leaving a 20 to 30-foot drop to gr	ound level that has			
• The	rock/tunnel condition	ns may have changed since the original inciden	t; and			
 Due and 	to the above two ite ensure all of part 22	ms procedures may need to be adjusted to refle and other parts of the regulation are being follo	ect the current situation wed.			
After the verif	fication and potential ving steps:	re-submission of the remediation plan, WorkSa	afeBC would expect to			
• Ren	Remediation:					
 Ass 	 Assurance in writing that the tunnel is now safe: 					
• App outl qua	 Apply the updated inspection/verification process as occurred in left bank diversion tunnel outlet #2. After work is fully completed an updated package signing off the changes by a qualified professional; and 					
 In le com app 	eft bank diversion tun pleted in left bank di ly the updated inspe	nel outlet #1 apply potential changes that align version tunnel outlet #2. Same sign off as the li ction/verification process and resulting work.	with CO275 as ne above. Across site			
		No Orders	August 23, 2019			



Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
Inspection compliance hazard area revealed tha discovered f area (670 m This indicate work.	Inspection #54: The contractor has provided inspection results as part of the incident immediate compliance inspection report on August 14, 2019. This inspection report revealed that there are known hazard areas in the right bank drainage tunnel. Through meetings and conversation, it has been revealed that the contractor intends to proceed to the failure area unless significant hazards are discovered following their entry procedures. The contractor report risk ranked known hazards and an area (670 m to 690 m) highlighted in orange failed while working on area further into the tunnel system. This indicates that the contractor has previously been traveling past known hazard areas to conduct work.				
Low Risk	Emergency Requirements	Order #1 OHS22.53(1): Only workers trained for emergencies may enter or remain in any underground working dangerous to life or health by virtue of other hazardous conditions, and no other work may be performed until the hazardous condition has been eliminated or controlled.	August 27, 2019		
Inspection	#55: WorkSafeBC c	onducted an inspection on the sub-contractor's	river boat vessel.		
Low Risk	Vessel design	Order #1 - OHS17.10(1)(h): The contractor failed to equip the vessel with the appropriate first aid equipment, under Occupational Health and Safety Regulation section 3.16 or 3.2, and with appropriate fire extinguishers in good working order.			
Low Risk	Seating design	Order #2 - OHS17.2(a): The contractor failed to equip the vessel with seats that are safely located and securely attached to the vehicle, with a width of at least 41cm (16 in) for each passenger and an upholstered seat and seat back which provide normal and comfortable seating for passengers.	August 28, 2019		
Low Risk	Maintenance and inspection	Order #3 - OHS17.24(1): The contractor failed to ensure the vessel is inspected before initial use that is fit for safe operation, and after that at intervals that will prevent the development of unsafe conditions.			
Inspection #56: The purpose of this inspection report is to document the contractor request to extend the date for submitting their final investigation report for an incident that occurred on July 8, 2019.					
This incident resulted from two 50mm shotcrete support layers at heading section failed within a newly constructed left bank diversion Tunnel No. 1 outlet area.					
<u> </u>		No Orders	August 29, 2019		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Inspection #57: WorkSafeBC contacted the contractor via telephone as a result of a reported incident that presented a risk of injury to a worker. The incident (IMS# 188779) occurred on August 31, 2019 in the diversion inlet tunnel #2. It was stated that concrete was being displaced from a small infill section (200mm x 400mm) of the stopend formwork onto the floor of the tunnel. It is estimated that between 3-5 cubic metres of concrete were displaced. The pump operating pressure was reduced to allow crews to safely make the necessary repairs and resume normal pumping operations. No workers were in the immediate area and no injuries were reported.				
		No Orders	August 31, 2019	
Inspection Risk Strateg	#58: WorkSafeBC co y.	onducted an inspection as part of the 2019 Wor	kSafeBC Forestry High	
The contract relating to or	tor is in a multiple en ccupational health ar	nployer workplace which have the responsibility nd safety.	/ to coordinate activities	
Low Risk	Coordination at multiple-employer workplaces	Order #1 - WCA 118(2)(b): The prime contractor of a multiple-employer workplace failed to do everything that is reasonable practicable to establish and maintain a system or failed to ensure compliance with the <i>Workers Compensation Act</i> Part 3 and the regulations in respect of the workplace.	September 5, 2019	
Inspection High Risk St	#59: WorkSafeBC co trategy.	onducted an inspection as part of the 2018-202	0 WorkSafeBC Forestry	
The contract job-site (Bloo river from th	tor has been contrac ck OLTC7) has beer e Site C main boat la	ted to conduct hand falling, bucking, and slash n established as boat access only and is located aunch.	ing operations. The d approximately 7 km up	
 Due to the isolated location and high risk of work activities, the following was discussed: Emergency Response Plan; Falling cuts and maintaining control of the tree being felled; Avoiding unnecessary brushing of standing trees and timber; and Falling plan and active falling area. 				
Low Risk	Access to work areas	Order #1 - OHS4.32: The contractor failed to ensure a safe way of entering and leaving each place where work is performed and a worker must not use another way, if the other way is hazardous.	September 5, 2019	
Inspection #60: WorkSafeBC conducted an inspection in the left bank diversion tunnels as a result of an incident that resulted in an injury to a worker. The orders cited in this report are to address items that need attention prior to conducting more work within the left bank diversion tunnels and work procedures noted on site. The ventilation hanger bracket weld failed causing it to fall to the work platform located below.				



Risk Level	Theme	Inspection reports and orders received	Date of Inspection			
Low Risk	Special Inspection	Order #1 - OHS3.7: A special inspection must be made when required by malfunction or accident.	September 8, 2019			
Inspection included cor 90 metres fr tower crane	Inspection #61: This inspection report is related to a July 16, 2019 tower crane misadventure that included contractor worker dropping, uncontrolled a new, 34 mm X 600-meter load line approximately 90 metres from tower crane 3 jib to the ground during installation. This was the final assembly of the tower crane before placing it into service at this workplace.					
Low Risk	Modifications	Order #1 OHS14.15(1): Each crane or hoist must be erected, dismantled, operated, adjusted, inspected and maintained as specified by the manufacturer's manual unless otherwise approved by the original equipment manufacturer or a professional engineer.				
High Risk	Tower Crane Erection	 Order #2 OHS14.73.2: The erection, climbing and dismantling of a tower crane must be done by qualified persons and in accordance with the instructions of: (a) the crane manufacturer; or (b) a professional engineer; if the installation varies from the crane manufacturer's instructions. 	September 9, 2019			
Inspection BC Hydro. T not a regula provide cert	Inspection #62: This inspection report is the result of discussions between WorkSafeBC and BC Hydro. The Inspection report contains one order to BC Hydro. The order is a Directive Order and is not a regulatory non-compliance order. The order directs BC Hydro, as owner of the Site C Project, to provide certain technical information to the prime contractor on the Project.					
Low Risk	General duties of owner	Order #1 WCA119(b): Every owner of a workplace must give the prime contractor at the workplace the information known to the owner that is necessary to identify and eliminate or control hazards to the health or safety of persons at the workplace. The Prime contractor responsible for tunneling work does not have the information they require to make decisions.	September 10, 2019			
Inspection #63: WorkSafeBC contacted the contractor via telephone as a result of a reported incident that presented a risk of injury to a worker. This incident resulted in the inadvertent contact between the tower crane 3 ladder access and a water tote stationed on the ground. A spotter was deployed to ensure no obstructions that could cause contact with the tower crane 3 while moving along the rails. No injuries were reported. (IMS# 189224)						
		No Orders	September 17, 2019			



		r	1	
Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Inspection #64: WorkSafeBC conducted an inspection in the new rebar laydown area within the left bank cofferdam area above the tunnel outlet portal as part of the 2019 Construction High Risk Strategy. WorkSafeBC discussed with the contractor's health and safety responsibilities with regards to preventing falls from heights.				
High Risk	Specifications for guards and guardrails	Order #1 – OHS 4.58(2): The contractor failed to install complaint guardrails to ensure the workers are protected from the fall hazard.	September 18, 2019	
Inspection Construction	#65: WorkSafeBC co High Risk Strategy	onducted an inspection as part of the WorkSafe Initiative.	BC's 2018-2020	
The goal of and fatalities proper selec	this initiative is to pressing iden by addressing iden tion of tools, equipm	event unsafe acts or conditions that cause work tified shortcomings in planning and supervision nent, or processes.	place serious injuries and by ensuring a	
At the time of bank diversi	of the inspection, sca on tunnels for the pu	affolding and formwork was being erected and n irpose of constructing various inlet and outlet st	naintained at the left ructures.	
Low Risk	Scaffold stability	Order #1 - OHS 13.17(2): The contractor failed to ensure the base of the scaffold at the base of the Fishway entrance pool formwork have sills resting on a solid surface and are sufficient to support the weight of the scaffold.		
Low Risk	Manufactured components	Order #2 - OHS 13.15(a): The contractor failed to ensure the major components of scaffolds are used in accordance with the technical data provided by the manufacturer, or in writing by a professional engineer, that shows the rated load, erection procedures and compliance with an applicable standard under section 13.2.	September 18, 2019	
Low Risk	Inspections	Order #3 - OHS 13.3: The contractor failed to ensure the stair tower at the left bank diversion Tunnel No. 2 inlet is inspected before use on each shift, after any modification, and any condition that might endanger workers that must be remedied before the equipment is used.		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
Inspection #66: WorkSafeBC conducted a follow-up meeting with the contractor. The purpose of the conversation was in part to review the progress towards submission of the final investigation report for the 50 mm shotcrete support layers at the heading section failed within a newly constructed left bank diversion Tunnel No. 1 outlet area.					
Following a request an e	meeting on Septemb xtension until Nover	per 20, 2019, the contractor sent an email to We mber 4, 2019.	orkSafeBC to formally		
The original inspection re	due date for the con port issued by the C	tractor 30 day 'full investigation' report was Au Occupational Safety Officer.	gust 8, 2019 as per		
An extensior the due date	n had been previous	ly granted which was documented within an ins	pection report to extend		
A further ext	ension had been gra	anted by the Occupational Safety Officer.			
After conside further verifie and submit t	ering the most recen ed by BC Hydro, and he incident investiga	at explanation and progress report provided by t other extension has been granted until Novemb ation report.	he contractor and er 4, 2019 to complete		
		No Orders	September 20, 2019		
Inspection a responsibiliti	#67: WorkSafeBC has and compliance i	as learned that a misunderstanding has occurre requirements.	ed in regards to roles,		
BC Hydro, th record for th contractor ha main civil wo complete to	ne owner of the Site e design on the main as entered into a cor orks, the contract pro the final design as p	C Project has conducted the engineering and is n civil works contracts for the Site C Clean Ener ntract from the owner that identifies them as the ovides for the construction activities to execute the per the engineer of record.	s the official engineer of rgy Project. The prime contractor for the work process to		
During previous inspection activities, the contractor has been requested, advised or directed, through inspectional text or orders, to provide assurances relating to some of the construction activities. In order to clarify those expectations, the following parameters are being provided to identify who is expected to provide the assurances.					
Where the requested/directed assurance is related to: safe workplace, safe for entry, (etc.), the assurance must be provided by the engineer of record. Where the requested/directed assurance is related to confirming work practices or standards, conformity to design or field instruction, the assurance is to be provided by the contractor or the engineer of record.					
BC Hydro was previously directed to provide information to the prime contractor information in their possession, as per the requirements of WCA 119, to date this has been substantially complied. The opportunity has been provided to the contractor to review the design criteria and modelling. The contractor's responsibility for the design is limited to the implementation of the design or any field instructions which have been prepared in accordance with good engineering principles.					
		No Orders	September 26, 2019		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
Inspection #68: The inspection report cancels and replaces inspection report that was issued on August 23, 2019 to the contractor and suggested specific revisions to safe work procedures for the remediation of a shotcrete failure in diversion tunnel one at Site C. This updated inspection report specifies that written safety assurances are expected to come from the engineer of record.					
		No Orders	September 26, 2019		
Inspection a August 23, 2 remediation specifies tha	#69: The inspection 2019 to BC Hydro an of a shotcrete failure It written safety assu	report cancels and replaces inspection report th Id suggested specific revisions to safe work pro e in diversion Tunnel No. 1 at Site C. This upda Irrances are expected to come from the enginee	nat was issued on cedures for the ted inspection report r of record.		
		No Orders	September 26, 2019		
Inspection injury of a w maneuver a their footing	Inspection #70: WorkSafeBC conducted an inspection as a result of an incident that involved a serious injury of a worker. The incident occurred during the worker accessing the frosty flat deck trailer to maneuver a load to be picked up by the all-terrain forklift, when exiting the trailer deck the worker lost their footing and fell to grade approximately 4 to 5 feet. (IMS #189547)				
		No Orders	September 30, 2019		
Inspection #71 : WorkSafeBC contracted the contractor via telephone as a result of a reported incident that presented a risk of injury to a worker. The incident occurred on October 5, 2019 (IMS#189740) and resulted from the re-fueling of a contractor vehicle on location. It was stated that a worker pulled into the fuel bay at the left bank office complex and proceeded to fuel the contractor pickup truck, after the re-fueling process the worker started the engine. A popping noise was heard and flames were observed coming from under the vehicle's hood. Note: The Fort St. John Fire Investigator has been requested to engage in an inspection of the vehicle in attempt to determine cause(s) for the fire. No injuries were reported and no orders issued.					
		No Orders	October 6, 2019		
Inspection #72: WorkSafeBC attended the site as a result of an incident (IMS#189981) that presented a high risk of serious injury to a worker. The orders cited are to address berm/curb placement, noted at the right bank haul road that need attention prior to continuation with the hauling activities at the present location. The incident resulted when a haul truck contacted the soft shoulder of the right bank haul road that have been created by the grading activity proceeding ahead of the haul truck, this caused the haul truck					
to roll over on to its side adjacent to the road way.					
Low Risk	Special Inspection	Order #1 - OHS3.7: A special inspection of the haul truck must be made.			
High Risk	Vehicle travel areas	Order #2 - OHS4.63: The contractor failed to install curb, whenever there is a danger of a vehicle or other equipment running off the edge of an elevated area.	October 18, 2019		

Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
Inspection presented a damaged se for a de-wat attention pri- correspondi	Inspection #73: WorkSafeBC attended the site as a result of a reported incident (IMS#190183) that presented a high risk of serious injury to a worker. The incident resulted in the inadvertent contact to a damaged section of the 600V 3-phase underground trailing cable utilized to power a control switch box for a de-watering pump in the underground location. The order cited are to address items that need attention prior to moving the electrical trailing cables within the left bank diversion tunnels and corresponding safe work procedures noted on site.				
Low Risk	General Requirement	Order# 1- OHS3.5: The contractor failed to ensure regular inspections are made of the underground de-watering equipment, trailing cable and safe work practices, at intervals that would prevent the development of unsafe working conditions.			
High Risk	Electrical	Order #2 - OHS19.10(2): The low voltage underground portable electrical control switch box and de-watering pump had not been disconnected and the relocation work was not performed by qualified / authorized workers, in accordance the contractor's written safe work procedures.	October 25, 2019		
High Risk	Electrical	Order #3 - OHS19.11(1): The contractor failed to place visible conspicuous signs close to the equipment stating 'danger, energized equipment' for the workers before completing installation and after energizing low voltage electrical equipment.			
Inspection #74: WorkSafeBC conducted an inspection at the left bank cofferdam fishway outlet structures area on the gravity block formwork system failure incident (IMS# 190295) that occurred on October 28, 2019. The orders cited in this report are to address items that need attention prior to conducting formwork installation, concrete placement and inspection procedures noted on site. The manufactured formwork system installed at the fishway gravity block failed while placing the concrete within the formwork, this released approximately 80 cubic metres of unconsolidated concrete mix					
High	Transportation of workers	Order #1 - OHS20.17(2)(b): The contractor failed to ensure that a professional engineer certifies any changes in the worksite-specific plans in accordance with section 20.18			
High	Worksite Plans	Order #2 - OHS20.17(4)(b): The contractor failed to ensure that any changes to the certified worksite-specific plans are available at the worksite before the inspection required for placement of concrete or other intended loading of formwork, falsework and reshoring.	October 28, 2019		



Risk Level	Theme	Inspection reports and orders received	Date of Inspection
High Risk	Certification of Worksite Plans	Order #3 - OHS20.18(b): A professional engineer failed to certify that any changes to the worksite-specific plans met the requirements of section 20.20 of the regulation.	
High Risk	Supervision	Order #4 - OHS20.23(a): The contractor failed to ensure that a qualified supervisor supervised the erection of the formwork.	
High Risk	Equipment requirements	Order #5 - OHS20.24: The contractor failed to ensure that materials or hardware used in the erection, meet the requirements specified in up-to-date worksite-specific plans.	
High Risk	Inspections	Order #6 - OHS20.26(1)(b)(ii): The contractor failed to ensure that, immediately before placement of concrete, a professional engineer issues a certificate that certifies that the formwork have been erected in accordance with up-to-date worksite-specific plans.	
High Risk	Entry/Exit of Excavation	Order #7 - OHS20.87(1): The contractor failed to ensure a safe means of entry and exit are provided for an excavation slope a worker enters.	
Low Risk	Special inspections	Order #8 - OHS3.7: A special inspection must be made when required by malfunction or accident.	
Inspection #75: While conducting a regular compliance inspection in the right bank cofferdam area where BC Hydro is the prime contractor, the WorkSafeBC Officer noted that the first aid assessment for the area was not accurate. It was also noted that the first aid services provided did meet the requirements indicated by the actual site conditions. The assessment document will be updated to current conditions.			
		No Orders	November 8, 2019
Inspection #76: WorkSafeBC conducted an inspection on the general work activities taking place at the time of inspection which included concrete preparation / placement, respirator use and scaffold erection.			
Low Risk	Supervisor Responsibilities	Order #1 - OHS8.8 (a): the contractor supervisor failed to ensure that appropriate personal protective equipment is available to workers	November 13, 2019



Risk Level	Theme	Inspection reports and orders received	Date of Inspection		
High Risk	Personal Protective Equipment	Order #2 - OHS8.32(b): the contractor failed to provide an appropriate respirator and failed to ensure a worker uses an appropriate respirator in accordance with section 8.3 where the worker might be exposed in a workplace to an air contaminant that exceeds a limit that is otherwise determined by the Board under section 5.48 for the air contaminant.			
Inspection at that present at the left back heaters below reported. The tarps added	Inspection #77: WorkSafeBC contacted the contractor via telephone as a result of a reported incident that presented a risk of injury to a worker. The incident (IMS#190816) resulted from falling ice and snow at the left bank diversion inlet transition chamber area while workers were in the process of refueling heaters below. Emergency response protocol was initiated by the employer and minor injuries were reported. The contractor has committed to ensure the hazard area is re-scaled and additional insulated tarps added to contain any further snow and ice accumulation in the area.				
		No orders	November 25, 2019		
Inspection #78: WorkSafeBC conducted an inspection on land clearing site located in Bear Flats area. The contractor is the prime contractor at this OLTC 16 causeway and bridge crossing construction. Two new temporary single span bridge structures consisting of 70.1m and 12.1m in length are being erected to access the Peace River Island, the bridges will be utilized to transport logging equipment to and from the island location during the clearing activities.					
		No Orders	November 26, 2019		
Inspection guideline BC spaces. Spe penstock tub	#79: WorkSafeBC at C Hydro requested g crifically, the portion bes. No orders issue	ttended the workplace to conduct a dispute reso uidance with respect to a dispute about the defi dealing with designed for continuous human oc d.	olution. As per the nition of confined cupancy around the		
		No Orders	November 27, 2019		
Inspection incident that	#80: WorkSafeBC co presented a high ris	onducted an inspection on the grout plant mach k of serious injury to a worker (IMS#190988).	ine as a result of an		
High Risk	De-energization and Lockout	Order #1 - OHS10.3(1)(b): The grout plant equipment was shut down for maintenance, and work was done before a hazard has been effectively controlled.			
High Risk	De-energization and Lockout	Order #2 - OHS10.4(1): Lockout of energy isolating devices was required; such procedures had not been made available to all workers required to work on the machinery or equipment.	November 27, 2019		
Low Risk	Tools, Machinery and Equipment	Order #3 - OHS12.24(2): The suction housing plate guards on a screw-type conveyor tube is not secured by fasteners requiring a tool for removal.			



Risk Level	Theme	Inspection reports and orders received	Date of Inspection	
Low Risk	Tools, Machinery and Equipment	Order #4 – OHS12.13: The physical hazards for the grout plant was not marked in a manner that clearly identifies the hazard to the affected workers.		
Low Risk	Documentation	Order #5 – OHS3.25: The contractor did not keep records of training for the operation, maintenance and cleaning practices for the new worker.		
High Risk	General Duties	Order #6 – WCA115(2)(e): The contractor has not provided their workers with adequate information, instruction, training and supervision to ensure the health and safety of those workers in carrying out their work.		
Inspection generating s	#81: WorkSafeBC co station and spillways	onducted an equipment inspection at the right b civil works. This inspection report contains a st	ank cofferdam op use order.	
High Risk	Tools, Machinery and Equipment	Order #1 – OHS12.2(b): The contractor had not ensured that the grout plant unit was fitted with adequate safeguards which, ensures that a worker cannot access a hazardous point of operation.		
High Risk	Stop Use	Order #2 – WCA190(1): The contractor was ordered to immediately stop use of the grout plant equipment. Based upon the violation cited in this inspection report, WorkSafeBC has reasonable grounds to believe that a thing that is being used or that may be used by a worker in this workplace is either not in safe operating condition or does not comply with this Part or the regulations.	November 27, 2019	
Inspection #82 : WorkSafeBC conducted an equipment inspection at the right bank cofferdam generating station and spillways civil works. This inspection report contains a stop use order.				
High Risk	Tools, Machinery and Equipment	Order #1 – OHS12.2(b): The contractor has not ensured that the grout plant unit is fitted with adequate safeguards which, ensures that a worker cannot access a hazardous point of operation.	November 27, 2019	

Risk Level	Theme	Inspection reports and orders received	Date of Inspection			
High Risk	Stop Use	Order #2 – WCA190(1): The contractor was ordered to immediately stop use of the grout plant equipment. Based upon the violation cited in this inspection report, WorkSafeBC has reasonable grounds to believe that a thing that is being used or that may be used by a worker in this workplace is either not in safe operating condition or does not comply with this part or the regulations.				
Inspection met all the r	#83: WorkSafeBC a equirements.	and the contractor had a pre-tunneling meeting	and the contractor has			
The contrac diversion tur	tor was required to a nnel outlets. The wor	ccess the impact of adjacent work on the ventil k has been done and revealed no concerns.	ation system in the			
The contrac BC Hydro ha	The contractor also required to investigate the impacts of drill and blast on the diversion tunnels. BC Hydro had to provide the analysis and assurance to the contractor that it has been done.					
The final me contractor se	The final measure to ensure safety is review of all drill and blast patterns by BC Hydro prior to the contractor setting off the charges. This also includes schedule of workers and set back.					
		No Orders	December 5, 2019			
Inspection #84 : WorkSafeBC conducted an inspection to verify wood smoke impacts at the site. This inspection report contains one order written to BC Hydro primarily as owner at Site C. The order cites failure to implement measures to protect workers from smoke generated by prime contractors who were burning logging debris as part of reservoir clearing operations.						
Low Risk	Planning and conducting a forestry operation	Order #1 - OHS26.2(1): The owner of a forestry operation must ensure that all activities of the forestry operation are both planned and conducted in a manner consistent with is Regulation and with safe work practices acceptable to WorkSafeBC.	December 6, 2019			
Inspection #85: WorkSafeBC contacted the contractor via telephone as a result of an injury that involved a worker having a suspected lower leg injury, when worker proceed to access a heater at a new work location to connect a heater sock for an erected hoarding during a snowfall and slipped on a snow-covered icy spot, resulting in a fall to the ground. The contractor has ensured additional sand has been applied and further restricted access to the area for the evening, until permanent measures are implemented (IMS#191540).						
		No Orders	December 27, 2019			

Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18)

Appendix C

Workforce Review



	Number of BC Workers and Total Workers	Construction and Non-construction Contractors ²⁰ (Including some Subcontractors). Excludes Work Performed outside of B.C. (e.g., Manufacturing)	Engineers and Project Team ²¹	TOTAL
January 2010	BC Workers	1,927	552	2,479
January 2019	Total Workers	2,579	607	3,186
Echruany 2010	BC Workers	2,185	575	2,760
rebluary 2019	Total Workers	2,855	639	3,494
March 2010	BC Workers	2,293	601	2,894
	Total Workers	3,020	654	3,674
April 2010	BC Workers	2,305	645	2,950
April 2019	Total Workers	3,066	709	3,775
May 2010	BC Workers	2,722	673	3,395
Way 2019	Total Workers	3,648	737	4,385
June 2019	BC Workers	2,870	651	3,521
	Total Workers	3,930	704	4,634
July 2019	BC Workers	2,925	671	3,596
	Total Workers	4,070	727	4,797
August 2019	BC Workers	3,060	641	3,701
	Total Workers	4,177	693	4,870
September 2010	BC Workers	2,949	685	3,634
September 2019	Total Workers	4,057	733	4,790
October 2010	BC Workers	2,954	683	3,637
October 2019	Total Workers	4,092	731	4,823
November 2010	BC Workers	2,769	676	3,445
	Total Workers	3,903	747	4,650
December 2010	BC Workers	2,518	679	3,197
December 2019	Total Workers	3,582	748	4,330

Table C-1Current Site C Jobs Snapshot
(January 2019 to December 2019)19

¹⁹ Employment numbers are direct only and do not capture indirect or induced employment.

²⁰ Construction and Non-Construction Contractors includes work performed on Site C dam site, transmission corridor, reservoir clearing area, public roadwork, worker accommodation and services.

²¹ Engineers and Project Team are comprised of both on-site and off-site workers. The Project Team includes BC Hydro construction management and other offsite Site C Project staff. An estimate is provided where possible if primary residence is not given.



Employment numbers provided by Site C contractors are subject to revision. Data not received by the Project deadline may not be included in the above numbers.

BC Hydro has contracted companies for major contracts, such as main civil works, who have substantial global expertise. During the month of December 2019 there were nine workers in a specialized position working for Site C construction and non-construction contractors, which were subject to the Labour Market Impact Assessment process under the Federal Temporary Foreign Worker Program. Additionally, there were 58 management and professionals working for Site C construction and non-construction contractors through the Federal International Mobility Program.

Month	Number of Apprentices
January 2019	102
February 2019	93
March 2019	118
April 2019	144
May 2019	173
June 2019	189
July 2019	204
August 2019	184
September 2019	185
October 2019	209
November 2019	162
December 2019	158

Table C-2Preliminary Site C Apprentices Snapshot
(January 2019 to December 2019)

Data is subject to change based on revisions received from the contractors.



Table C-3	Current Site C Job Classification
	Groupings

Biologists and laboratory	Carpenters and Scaffolders	Inspectors	Construction managers/ supervisors	Crane operators	Electricians	Engineers
Foresters	Health care workers	Heavy equipment operators	Housing staff	Heating, ventilation, and air conditioning	Kitchen staff	Labourers
Mechanics	Millwrights	Office staff	Pipefitters	Plumbers	Sheet metal workers	Truck drivers
Underground mining	Welders	Surveyors	Security guards	Boilermakers	Cement Masons	Crane Operators
Ironworkers						

Table C-4Indigenous Inclusion Snapshot
(January 2019 to December 2019)

Month	Number of Indigenous Workers
January 2019	293
February 2019	313
March 2019	333
April 2019	283
May 2019	346
June 2019	361
July 2019	377
August 2019	418
September 2019	401
October 2019	428
November 2019	376
December 2019	336

The information shown has been provided by BC Hydro's on-site²² construction and non-construction contractors and their subcontractors that have a contractual requirement to report on Indigenous inclusion in their workforce.

²² On-site includes work performed on Site C dam site, transmission corridor, reservoir clearing area, public roadwork, worker accommodation and services.



Employees voluntarily self-declare their Indigenous status to their employer and there may be Indigenous employees that have chosen not to do so; therefore, the number of Indigenous employees may be higher than shown in the table.

As with any construction project, the number of workers, and the proportion from any particular location, will vary month-to-month and also reflects the seasonal nature of construction work. The number of workers will also vary as a contract's scope of work is completed by the contractor.

Women

In 2019, the number of women working for the Site C construction and non-construction contractors increased throughout the year peaking in August 2019. At the peak the number of women working on site was 14 per cent. The number of women was provided by on-site construction and non-construction contractors and engineers that have a contractual requirement to report on the number of women in their workforce. The following table shows the number of women working on site at the end of each quarter for the 2019 calendar year.

	-
	Number of Women Working for Site C Construction and Non-Construction Contractors
March 31, 2019	400
June 30, 2019	538
September 30, 2019	517
December 31, 2019	433

Table C-5	Number of Women Working for Site C
	Construction and Non-Construction
	Contractors

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Appendix D

Site C Construction Schedule

Construction Activity	2015 2016 201	7 2018 2019	2020 2021	2022 2023 202
Dam Site Area	2015 2016 201	7 2018 2019	2020 2021	2022 2023 202
eering: dam site		A DECK STREET		
cess roads at the dam site				
orker accommodation	the second second			
ace River construction bridge				
cavation and material relocation	0			
fordams and diversion runnels				
nhfill dam				
ler-compacted-concrete buttress				
erating station and spillways				
tbines and generators				- C - C - D
ostation				
verhouse transmission lines				
wpoint construction/landscaping				
nobilization and site reclamation				Concernance of the
Reads and Highways*	2015 2016 201	7 2018 2019	2020 2021	2022 2023 202
lic road improvements				
40 Road	Contract of the local division of the local			
69 Road				
71 Road	and the second second			
Nd Fort Road				
hway 29 realignment				
ache Creek Wast				
Cache Creek/Bear Flat				
falfway River				
ry Creek				
arrell Creek				
arroll Crook East				
ynx Crook				
Peace River / Reservoir Area	2015 2016 201	7 2018 2019	2020 2021	2022 2023 202
ering: Lower reservoir and Moberly Drainage				
aring: Eastern reservoir				
aring: Middle reservoir				
aring: Western reservoir				
ar diversion			1.0	
ervoir filling and operations				
Transmission Works*	2015 2016 201	7 2018 2019	2020 2021	2022 2023 202
insmission line clearing				
insmission line construction		-		
ension of Peace Canyon switchyard		-		
Hudson's Hope Shoreline Protection	2015 2016 201	7 2018 2019	2020 2021	2022 2023 202
tsoh's Hope Berm/				
Thomas Roed upgrades				
requiction & transport of Materials	2015 2016 201	2018 2019	2020 2021	2022 2023 202
th Avenue Industrial Lands				
tage Mountain Quarry				
ist Pine Quarry				
chrich Quarry				

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Appendix E

Technical Advisory Board Meeting Report No. 20

Technical Advisory Board Meeting No. 20

Report

(May 28 to 31, 2019)

May 2019

Site C Clean Energy Project Advisory Board Meeting No. 20 - Report

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1. Introduction

The 20th meeting of the Site C Technical Advisory Board (TAB) was convened in Fort St. John and Vancouver between May 28 and May 31, 2019. A briefing and site tour took place on May 28. The remainder of the week entailed meetings, presentations and discussions in Vancouver. The primary objectives of the meeting were to assess progress and performance of the Project, as well as design-related risks. Technical considerations focussed primarily on the Main Civil Works (MCW).

The agenda for the meeting is included as Attachment A. Attachment B is a list of attendees during the meeting. A debriefing was conducted with the executives of BC Hydro (BCH) and the Project Assurance Board on May 31, 2019.

Four questions were put to the TAB:

- 1. Does the Board have any comment on construction quality?
- 2. Does the Board have any comment on debris management plans for diversion?
- 3. Does the Board have any comment on the Spillway final design details?
- 4. Does the Board have any comment on the Project's assessment and characterization of technical risks? With respect to risks/challenges that may be identified by the Board in relation to the current construction plan and status (over and above what BC Hydro has identified), does the Board have any recommendations?

Detailed responses to these questions are presented below.

The TAB has also provided some additional comments in Section 6.

The TAB wishes to acknowledge the excellent overview and presentations that it received. It recognizes the substantial effort that goes into preparation for the TAB meeting and it appreciates the frank and informative discussions that took place during the meeting.

2. Site Visit

The site visit took place under hot and dry summer conditions. It concentrated on locations of special technical and productivity challenges. In particular the diversion tunnel inlet area was viewed; the tight conditions associated with tunnel lining equipment were recognized and preparation for Inlet Structure construction was noted. In general, the TAB was favourably impressed with the progress of the works at both Inlet and Outlet locations on the Left Bank. This was also true for the appearance of the work of the Generating Station and Spillways (GSS) Civil Works contract at the powerhouse, which was proceeding rapidly.
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The GPS track for the site visit is shown on Figure 1.



Figure 1: GPS track of the site visit.

3. Action List

The Project maintains a TAB Comments and Recommendations Tracking Log to record its response to past recommendations made by the TAB. This was reviewed and the TAB is content that the Project has responded or is in the process of responding to all past recommendations in an appropriate manner.

4. Project Update

The TAB received a brief Project update. River diversion in September 2020 remains a critical milestone. Diversion tunnel construction has progressed to the extent that tunnel excavation is forecast to meet schedule requirements. Roller Compacted Concrete (RCC) placed volume requirements to September 2020 remains challenging. However, production at the end of last season was encouraging. The major challenges associated with meeting the diversion deadline appear to be achieving promised productivity with tunnel lining and the construction of both the Inlet and Outlet Structures in a timely manner. Productivity for these elements remains untested which is identified as a risk by the Project team and a focus of schedule risk mitigation activities.

5. Technical Commentary

5.1 Response to Question 1

Does the Board have any comment on construction quality?

All large projects should prioritize the objectives of Safety, Quality, Schedule and Budget. Second only to Safety, Quality is the most important feature of any construction project.

The BC Hydro Quality Management System operates under a Project Quality Plan. This plan functions under three sub-plans, namely 1) Engineering, 2) Manufacturing Quality, and 3) Resident Engineering. The Site C Field Quality Performance Team operates under Resident Engineering. The Quality Control (QC) function is the Contractor's responsibility; the Quality Assurance function is generally the Owner's responsibility. An updated quality rating and dashboard reporting program was initiated in July of 2018 and is divided into sub-projects and activities with an Assessor assigned to each activity. Threats to quality are assessed against risk to asset performance. Schedule should not influence the quality of the Project.

The Construction Quality inputs and tools used to measure and record performance are:

- Design Change Notices (DCN's)
- Non-Conformance Reports (NCR's)
- Quality Issue Findings
- Corrective Action Reports
- Subject Matter Expert Observations

During previous TAB meetings there were quality concerns as indicated by numerous open NCR's and subject matter experts' observations regarding QC and duration to close NCR's. These concerns have been addressed and now there are several procedures and processes put in place to manage and deliver the quality necessary for the Project. For example, there are monthly Quality Steering Committee meetings with the Contractors. These meeting are effective in identifying concerns and developing corrective actions. There has also been good collaboration between QC and the various production teams, where the quality aspects of the work are most important; at the ground level.

The MCW Contractor has recognized the need for quality and have made several quality improvements:

- MCW Contractor QC staff are more embedded with their construction teams and are seen as a resource and not a hindrance
- Reduction in NCR's are closed out in a timely manner

- There are regular weekly NCR meetings held among BCH/ MCW Contractor QC to discuss close-out of NCR's
- Issues are addressed in the field as opposed to being elevated; good collaboration between BCH/ MCW Contractor QC

Regarding the GSS Civil Works Contractor there was early reluctance to raising issues, such as NCR's; however now they are recognized as helpful indicators of need for quality concerns. There has been good teamwork in utilizing quality steering committee meetings attended by senior leaders from GSS Civil Works Contractor and BCH.

Given all the above quality improvements, there are still some quality concerns that need to be recognized and addressed. Namely, the MCW earthworks department is still the largest offender with 36% of the MCW NCR's. Multiple trials of the diversion tunnel concrete lining placement were conducted. These trials revealed some quality issues remained after lining installation and procedures for managing quality issues have been established. The lining production is on the critical path. Adequate QC staffing is a concern for the GSS Civil Works Contractor.

As described above the TAB recognizes an improved Quality Program at the Site. Maintaining quality and implementing such an extensive program such as Site C is a monumental task. The existing Quality Program seems to be functional and effective. The TAB looks forward to our next visit to the site where we can observe the quality of several features first hand.

With respect to Quality Assurance (QA), the TAB wishes to reemphasize the central role of the as-built construction record as a deliverable of the QA team. Past experience with respect to typical as-built records has revealed their inadequacy and they have been under-valued with respect to their contribution to future dam safety evaluations. The aim should be a construction report that synthesizes the history of the project and captures all critical elements in a GIS framework. This is not just a matter of QC laboratory but more importantly all QA aspects where the specifications reference field approval based on the judgement of the Engineer. All performance observations during construction should also be included. The TAB requests an outline of the intended As-Built Report at the next meeting.

5.2 **Response to Question 2**

Does the Board have any comment on debris management plans for diversion?

For a period of approximately three years, flood flows arriving at the dam site will pass through two large diversion tunnels sited though the left bank. During this period construction of the main permanent works in the main river will continue behind cofferdams across the river. One perceived project risk at this time would be Diversion

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Tunnel inlet blockage due to timber debris mats. This could lead to cofferdam overtopping and extensive delays and costly recovery works for the main construction. A further perceived risk is operational interference of the tunnel intake gates by timber debris at the time of final closure and reservoir impoundment. Both of these potential risks are being mitigated by the provision of debris control measures upstream of the Diversion Tunnels and many possible measures, options and locations were initially proposed.

Following an earlier recommendation from the TAB, a risk analysis was made of the various debris handling options and their likelihood of success against a range of flood events. This has guided the designers towards the current proposals which were summarised to the TAB as follows:

- Provide primary and secondary booms on the Peace River just upstream of the Diversion Tunnel intakes.
- Provide a boom as well as a piled debris barrier, on the Moberly River at its exit into the Peace River.
- Cease work on debris control structure designs at the Halfway River much further upstream.
- Actively pursue the clearance of existing debris throughout the upstream catchment and in particular along the Moberly and Halfway river banks.

The TAB fully concurs with this approach. At the same time the TAB notes that a number of design and operational uncertainties remain concerning the Peace River Booms. The primary boom is being designed by BCH and the TAB would recommend the use of some focused flume modelling of current proposals to guide decisions on remaining uncertainties. This should be coupled with an overview of boom failures elsewhere, including at other BCH projects, to benefit from any applicable lessons learned.

The secondary Peace River boom is planned to be provided by the PRHP but in view of the complexities emerging from the design of the primary boom the TAB considers that BCH should recognize the possibility of having to assume the responsibility for the design and operation of the secondary boom.

The TAB also recommends that particular attention be given to access and to future maintenance and operability of the booms, reflecting any lessons learned from elsewhere. The TAB recommends that this be brought together in an Operations Manual for the booms based around a pro-active approach including alarm trigger levels and required responses for upstream water management.

5.3 **Response to Question 3**

Does the Board have any comment on the Spillway final design details?

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Over two hundred concrete and reinforcement drawings have now been issued for construction of the spillway works. These reflect first stage embedded parts for the gates which are being developed in parallel by the selected gate Contractor. A representative selection of the concrete outline and rebar drawings produced to date were viewed by one member of the TAB who was satisfied with the details proposed and the standard being achieved.

At the previous TAB meeting some early analyses of spillway elements were presented and discussed. The sophistication of design methods and assumptions used had marginally increased concrete and rebar requirements for the spillway headworks. However similar analytical refinements and assumptions permitted significant reductions in the anchoring to the main spillway slab. At the same meeting, analyses by the Designers had indicated that the massive, faced RCC central and side walls to the stilling basin might need to be anchored into the foundations to satisfy the seismic stability criteria required under Canadian Dam Association guidelines. The TAB considered that, "a more sophisticated dynamic time-history analysis would show the walls to displace slightly but still fulfil the DBM requirement of stilling basin operability after an MDE event". The TAB then recommended that the Designers review the designs of the various walls where seismicity has proved to be the factor controlling stability.

The Designers have now done that and presented their latest results to the TAB. The time history analyses showed that the walls would undergo only minor displacements under earthquake loading and so would certainly remain operable for flood passage. This has allowed an RCC counterweight block to be eliminated from the stilling basin right side wall and for the reduction or elimination of anchoring in other spillway walls. Analyses are continuing and further reductions in anchoring requirements are expected.

After its last meeting the TAB was also asked to comment on the initial analyses of the massive stilling basin end weir. These indicated the need for high levels of internal rebar coupled with extensive foundation anchoring. The TAB recommended a more refined assessment of the hydro-dynamic loadings on the weir based on the earlier hydraulic model testing. The results were presented at the current TAB and have produced a 60% reduction in foundation anchor requirements and a considerable reduction in rebar requirements.

Finalization of the spillway design and details continues, and the TAB is satisfied that this is being carried out to a good standard, with details and arrangements typical for this type of work.

Lastly, in the previous TAB report, the TAB noted areas of stilling basin wall where conventionally vibrated concrete (CVC) facing zones incorporating rebar could perhaps be placed concurrently with RCC. Constructing the spillway walls in such a combined, single operation should be simpler, theoretically less expensive and produce a superior

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end-product as compared to forming and anchoring them separately as shown on the RFP. As before the TAB is not advocating such a change at Site C but notes that the matter is currently under active review. The TAB confirms that such a change would receive their support. The TAB also notes a suggested change in internal shutter finish requirements for the stilling basin walls from F4 to F3 and would confirm their agreement to such a change in these locations.

5.4 Response to Question 4

Does the Board have any comment on the Project's assessment and characterization of technical risks? With respect to risks/challenges that may be identified by the Board in relation to the current construction plan and status (over and above what BC Hydro has identified), does the Board have any recommendations?

5.4.1 General

The process whereby the Project develops a risk register was summarized and the TAB was favourably impressed by the outcomes. An extract of the risk registry was provided summarizing the technical risks in the registry. The risk management perspective is understandably concentrated on Project delivery safely, with quality, on schedule and on time. In the experience of the TAB, this perspective can sometimes be unmindful of others, later stakeholders in the Project such as operations and long-term dam safety considerations. The TAB is aware that the Project team consults other stakeholders systematically and appreciates that broad consultation is imbedded in the organization of the design team. For example, early geotechnical data gathering of ground response might have significant long-term benefit for future dam safety evaluation. An example of an investment at this stage that would contribute to long-term safety evaluation would be early experience with newly developed monitoring tools such as InSAR and ground based radar.

5.4.2 Technical Risk

The Project has identified six significant technical risks. The TAB agrees with this selection and it has not identified any others of similar ranking. Detailed commentary follows below:

i. Debris and Diversion Flood Mitigation

The views of the TAB related to this risk are presented under Question 2 above.

ii. Right Bank Foundation

The hazards associated with various ground defects affecting stability have been correctly identified as have risk mitigation efforts based on seepage control and drainage. While

the broad strategy is correct, the TAB is of the view that a greater effort is required to explore the implications of this strategy in the short term.

To this end, the TAB is of the view that it is a high priority to develop a hydrogeological model of the right bank; to calibrate it to existing conditions and to forecast recharge into the right bank following reservoir filling when significant mounding will be expected. This will facilitate a re-evaluation of drainage measures and the effectiveness of the planned grout curtain. The optimal location of the grout curtain should be evaluated together with the drainage requirements essential to maintain stability. The TAB looks forward to an update on this task at its next meeting.

Another aspect of the Right Bank Foundation is the need to construct a geological model with a focus on this location but that is extendable elsewhere on the site. A considerable effort is being expended in mapping the geology, but the effort will not be fully utilized unless the data is integrated in to a 3D site-wide data retrievable model. To this end, the TAB recommends that a task force be assembled to design this model, structured on the geological units that have been established sometime ago. This can also be regarded as an important contribution to the creation of the as-built record.

iii. Stability of Earthfill Dam and Tailrace Wall

The TAB agrees that this is a significant risk and the hazards associated with the weak foundation have been adequately recognized. To respond to this risk assessment the TAB is of the view that the current design should be checked by conducting the following steps:

- 1. Quantify the pore pressure generation/consolidation behaviour for RSEM/L5 and any other loaded areas such as the cofferdams.
- 2. Using the item 1 above, forecast the construction pore pressures associated with dam construction.
- 3. Calculate the Factor of Safety at the end of construction.
- 4. Estimate the boundary loads and pore pressure response during reservoir filling assuming undrained conditions.
- 5. Calculate the Factor of Safety at the end of filling.
- 6. If the above is less than 1.5, evaluate the strategy to meet service conditions.
- 7. Develop instrumentation plans for the above assuming that performance assessments based on observing deformations will be necessary.

The TAB requests an update on this issue at its next meeting.

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Another consideration related to this identified technical risk is the preliminary material balance that is currently under evaluation. The Demand/Capacity Ratio of available fill for the dam may only be about unity depending upon various assumptions. In the experience of the TAB for a Project at this stage, it should be about 1.5 or greater. The TAB supports the various activities underway to evaluate material utilization and expand the volume of available construction material. It seeks an update at its next meeting.

iv. Left Bank: Diversion and Dam Abutment

The TAB received an instructive presentation on the observed performance and the geotechnical analysis and assessment of the left bank. A rapid visual inspection of the slopes in the rock exposed along the toe of the left bank and in the diversion portals and core trench excavations conveyed a favourable impression. There was no significant, uncontrolled seepage from the rock, condition of the shotcrete was satisfactory and also the areas of the cuts left without shotcrete or membrane protection did not indicate significant raveling.

The piles installed for enhanced stabilization of the inlet cut are taking load, movements are attenuating and currently virtually stopping the creep of the ground.

An inclinometer and an extensometer to the left of Tunnel No. 2 continue to indicate local movements in the rock mass. According to the inclinometer, the displacements are directed towards the earlier wedge failure at the portal cut. On the other hand, the monitoring of the slope surface at the portal does not show any deformations in this sector. Moreover, there is an irregular performance of the inclinometer, which could result from a defective behavior of the instrument. A loosened area in the rock mass, having created a connection with the wedge failure at the surface, and an ongoing adjustment in the interior of the slope may explain the phenomenon. Additional instrumentation is being installed to provide a consistent interpretation. For the time being, no further action is required.

At the inlet portal, stability has been assessed and drainage measures introduced to enhance it both under normal conditions as well as rapid drawdown.

Within the inlet channel the effects of drawdown on the colluvium and bedrock are considered utilizing conservative design criteria, as adopted in earthfill dam design. The TAB agrees that this a conservative basis for assessing this risk. As a favourable circumstance in this context, the geological mapping of the channel cut shows the bedding planes to be discontinuous.

Surface monitoring shows deformations of the rock nose left between the two tunnels. The need for strengthening the support of this nose should be checked to prevent deterioration in the long term.

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The tunnels could not be inspected but information on geological logging was provided. The Contractor experienced overbreak in the crown, related to bedding planes in the first 60 metres from the outlet portal. BCH presented a photo showing such feature (see Figure 2). The shale may have locally buckled into the tunnel. As a remedial measure, BCH has required installation of additional stressed rock bolts in the crown. As a further precaution contact grout holes could be extended into the rock in selected locations to stiffen any local soft zones.



Figure 2: Buckling of shale in the crown of Diversion Tunnel No. 2

The upper reaches of the left bank slope, cut in soils, received local protection by hydroseeding and first results are evident. Nevertheless, severe erosion gullies were cut into the slope (see Figure 3) and rainwater infiltration will unnecessarily raise the groundwater levels with adverse effect on local stability. The hydroseeding will not interfere with any other work and should be completed without further delay.

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Figure 3: Gullying in unprotected glacio-lacustrine soils of left bank slope

v. Earthfill Dam Foundation: Grouting

As the observed performance of the valley flanks emphasizes, hydrogeological conditions and phenomena have the potential of decisively affecting the stability of slopes and foundations at the dam site. Simple flushing of a borehole has immediately raised the groundwater levels in an extensive section of the right abutment and has caused displacements on bedding planes. Rainfall has triggered similar effects.

In the current situation, drainage has favourably lowered the groundwater levels and the load of the buttress has compressed the rock mass. However, reservoir filling will raise the groundwater levels and the combination of sealing and drainage measures will have to guarantee safe levels of pore pressures and hydraulic gradients for the downstream slopes.

Making use of the additional information collected with the ongoing construction works, BCH is developing a hydrogeological model, which will allow to probe the hydrogeological scenarios potentially materializing with the reservoir filling, their effect on the geotechnical performance of slopes and foundation of structures, and the efficiency and adequacy of measures to be adopted.

The drainage tunnels, as foreseen in the design, allow the implementation of drains with the possibility for adjustments to effects developing with reservoir filling. Thus, with controlled raising of the lake level, adjustments in the drainage system can be implemented to assist in managing potentially risky conditions.

Concerning the grout curtain, the options for responses to approaching risks are more limited. Especially in the right abutment, groundwater levels rising with the lake are

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capable of jacking open the existing stress relief features and in this process not only raising the hydraulic load on the curtain but also, in the worst case, damaging the curtain by hydrojacking. As a precaution, grouting could be performed such that a safe prestressing of the rock mass against the hazard of hydrojacking is obtained. Such measure has positive precedent but meets with difficulties imposed by the geological and geotechnical conditions prevailing at Site C, which demand careful application of grouting pressures. In this situation, the TAB supports the following considerations:

- Analysis of the maximum grouting pressures that can be admitted, on the basis of data from field tests and model simulation. BCH already took a first step in this direction by evaluating the Lugeon tests. Additional information can probably be obtained from this study by relating the jacking pressures to the gravitational stresses at the test section. Further tests should be carried out in connection with the grouting test.
- Widening of the curtain to reduce the seepage gradient where appropriate.
- Constructing a multiple-line curtain. The outer rows of the curtain with a limited reach of grout penetration would have to serve as containment for a central row to be grouted at higher pressure with highly penetrative grout.

BCH has presented first results of tests on cement based grout slurries but properties are not yet optimized and it may still take time to arrive at suitable batching. Therefore, the Contractor should be urged to intensify activities in this regard.

In the grouting operation, particular care will have to be given to jacking effects, which implies that pressure as well as volume have to be controlled and monitored. Accordingly, suitable parameters of pressure and grout consumption should be developed in the course of grouting tests.

A specific aspect for the grouting works at Site C derives from a dual porosity of the rock:

- 1. The sound rock, as now mapped in the excavations, has a notable fracture density but these fractures are barely opened and will be difficult to penetrate by a particulate slurry.
- 2. The stress relief cracks may be opened several millimetres and loss of grout on such features may be difficult to control.

With this condition, a single type of grout may not suffice to cope with the contrast in groutability. Therefore, up to three grouts may have to be developed:

- 1. A slurry for sealing of open stress relief cracks, with the reach limited by cohesion.
- 2. A stable grout with low viscosity and cohesion and a high-Blaine cement.

3. A grout with ultra-fine cement for treatment of fine fissures.

The geological mapping of the excavations documents a well developed fracturing of the rock mass, with reaches distinguished by different patterns. The boreholes for the grout curtain should be oriented such that an optimal intersection of the dominant fractures is obtained.

The grouting is intended to reduce the permeability with the objective of controlling the seepage from the lake and abating the gradients and uplift pressures generated downstream. But the permeability and the grout takes are not correlated. A major limiting factor for the grout take is the aperture of the fracture, which needs to be large enough to allow a particulate slurry to enter. Thus, a number of fine fissures in the rock to be grouted may give a high permeability but may be too tight for passing the slurry. Therefore, in running the grouting test, the density of fractures in addition to the permeability could be used for assessing the suitability of the applied slurry and methodology. Laminar flow between parallel plates follows a cubic law. Accordingly, the following equation would give an equivalent of the representative aperture of the fissures:

 equivalent aperture ≈ const x ³√(K x Z) with K=permeability, Z=fracture spacing

Utilization of televiewer data will facilitate this characterization.

vi. RCC Thermal Performance and Cracking

The development of thermal cracking, apparent in the RCC placed to date, has been recognized and studies are underway to evaluate their extent and significance. These studies range from measures to mitigate thermally-induced strains in the RCC to mechanical treatment of cracked zones by grouting. In addition, the TAB encourages these activities underway to reduce the peak temperature and regards them as comprehensive. The significance of the observations to date are under evaluation and the TAB is content that the Project has a good understanding of the issues involved. If, ultimately, substantial grouting is necessary to repair such cracks, a complex and costly program could result.

The TAB wishes to be informed on the progress associated with managing this risk and suggest that this be undertaken by means of teleconference update.

6. Additional Comments

6.1 Tailrace Channel Invert Protection

The tailrace channel is bounded on either side by concrete walls. The channel invert starts as a concrete lined rock trap at the exit from the powerhouse draft tube and then proceeds upwards to the river channel first as a short length of 500 mm thick concrete lining. It then

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continues through three units of shale beds comprising Silty Shale, Poorly Bonded Shale and Siltstone/Sandstone. The TAB was asked to comment on current proposals to line the invert over this second area against erosion using 500 mm of rip-rap bedded on a thick filter fabric. The rip rap size proposed was typically 380 mm but with a range up to 500 mm.

Erosion testing on samples of the underlying bed material were carried out by at the Texas A&M University. However, these were to assess the intrinsic erodibility of the intact rock and do not really apply to considerations of likely erodibility of jointed rock masses. The methods proposed by **Example** or **Example** may be more applicable to that. However, the applicability of erodibility under flow falls away if the bed is to be armoured.

A consideration should be the guaranteed reliability of whatever protection layer is used against surging currents and local reverse current under partial turbine operation. Clearance and/or repairs to any tailrace channel bedding protection once the power facility is operating would be difficult and costly and so the potential need should be avoided. The system proposed should be simple and robust.

If rip rap is adopted, then in the view of the TAB a single 500 mm layer bedded on a thick filter fabric may be too unstable. It should be noted that in the main spillway and power intake approach channel, rip-rap thickness of 900 mm or more is foreseen plus 350 mm of underlying granular bedding to ensure its stability. It's recommended that the current review be expanded and include alternates similar to those shown on the main spillway. The continuation of the initial 500 mm thick concrete lining up to a suitable end sill would be another option. An updated memo to the TAB should be prepared outlining the design, constructability and operations considerations with the potential alternatives.

6.2 Diversion Tunnel No. 2 – Internal Orifices

In the final stages of diversion before reservoir impounding, four internal steel orifices will be fitted into Diversion Tunnel No. 2 and that tunnel will then be used to pass and throttle all river flows until the tunnel is eventually closed, and reservoir impoundment begins. The hydraulic load differentials across the orifice plates under flow can be high. At a flow of 535 cumecs the mean load on orifice plate No. 1 will exceed 800 tonnes. When subject to high levels of hydro-dynamic turbulence and pressure oscillations the instantaneous peak load differentials on orifice plate No. 1 will exceed 1,000 tonnes.

The reliable operation of the orifices is imperative if final reservoir impounding is to proceed in a controlled manner. The orifice rings are fabricated in steel and will be backfilled with concrete when in place. At present these steel rings are indicated as being placed against the concrete tunnel lining and secured in place by single linear welds to upstream and downstream steel rings embedded in the tunnel concrete. These welds would have to transmit all hydro-dynamic loads into thickened sections of surrounding

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concrete liner and thence via shear keys into the surrounding rock. The construction of these orifices needs to occur in the constrained window before reservoir filling. The TAB believes that this detail could be made more robust in terms of shear load transmission with some relatively simple changes. This may also have advantages by adopting a belt-and-braces approach and less reliance on welding details for the rapid construction work required in 2023. Options could include forming an annular shear key between the orifice and tunnel concretes or by embedding rebar with surface couplers in the tunnel liner to facilitate rebar connections between orifice and tunnel concretes. Other options will also likely be available and should be considered and studied by the design team and discussed with the Contractor. The TAB recommends a conference call once the design team has considered the potential for these additional design measures.

7. Future Meetings

The TAB has scheduled a field workshop September 12 and 13, 2019.

The TAB recommends that the next TAB meeting be held in Vancouver January 7 to 10, 2020.

Respectfully submitted,



Attachment A – Meeting Agenda



Power smart

I^{FT} Site C Clean Energy Project Technical Advisory Board Meeting No. 20 May 27 - 31, 2019

Location: 745 Thurlow Street, Vancouver, BC and Construction Site near FSJ

Day 1 (Monday, May 27, 2019) Workshop with Peter Mason, Meeting Room 12-046 and Travel to Construction Site

Time	Title	Presenter / Time Allocated
8:30 to 10:30	Peter Mason: Debris Management Workshop and Update	NorthWest Hydraulic / BC Hydro
10:30 to 11:00	Break	
11:00 to 14:00	Peter Mason: Spillway Design Update and Response to TAB Recommendations	
14:00 to 15:00	Peter Mason: Powerhouse Tailrace Protection Design Brief Update	
16:30	Arrive at YVR and remaining members of TAB	
17:35 to 19:16	Depart for FSJ AC8197	
19:16 to 20:00	Travel to Northern Grande and check-in	

Day 2 (Tuesday, May 28, 2019) Construction Site, Travel to Vancouver

Time	Title	Presenter / Time Allocated
6:00 to 7:00	Breakfast at Hotel and check-out	
7:00 to 7:30	Travel to Site Office	
7:30 to 7:50	Meet in the Site Office	
7:50 to 8:30	Agenda, Project Update and Schedule	
8:30 to 9:00	Geological Mapping	
9:00 to 9:30	Debris Management Update	
9:30 to 10:00	RCC Update	
10:00 to 10:30	Left Bank Update	
10:30 to 11:15	Construction Quality Update	
11:15 to 12:00	Lunch and Safety Orientation	
12:00 to 15:50	Site Visit	
15:30 to 16:15	Travel to FSJ Airport	
17:15 to 19:00	AC8186 to YVR	
19:00 to 20:00	Travel to Four Seasons Hotel	



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Site C Clean Energy Project Technical Advisory Board Meeting No. 20 May 27 - 31, 2019

Location: 745 Thurlow Street, Vancouver, BC and Construction Site near FSJ

Day 3 (Wednesday, May 29, 2019) Meeting Room 05-005

Time	Title	Presenter / Time Allocated
8:00 to 8:20	Review Agenda and Tracking Log	/
8:20 to 8:50	Report from Independent Engineer	
8:50 to 10:30	Right Bank Performance Updates and Design Basis	
10:30 to 10:45	Break	
10:45 to 11:30	Core Trench, Grouting and Earthfill Dam Update	
11:30 to 12:30	Diversion Tunnels and Portals, Structures and Lining Update	
12:30 to 13:00	Lunch	
13:00 to 13:45	Risk Overview	1
13:45 to 14:30	Schedule and Cost Risk Analysis Update	
14:30 to 14:45	Break	
14:45 to 15:15	Generating Station and Spillways Design Update	
15:15 to 15:45	Offsite Manufacturing and Offsite Quality Mgmt.	
15:45 to 16:15	Balance of Plant Design Update	
16:15 to 17:30	Open Discussion	

Day 4 (Thursday, May 30, 2019) Meeting Room 12-046

Time	Title	Presenter / Time Allocated
8:00 to 12:00	Open Discussion / TAB prepare Report	
12:00 to 13:00	Lunch	
13:00 to 17:00	TAB prepare Report	
18:30 to 20:00	TAB dinner	TBD



Power smart

Site C Clean Energy Project Technical Advisory Board Meeting No. 20 May 27 - 31, 2019

Location: 745 Thurlow Street, Vancouver, BC and Construction Site near FSJ

Day 5 (Friday, May 31, 2019) Meeting Room 12-046, and 333 Dunsmuir 18th floor for Report out

Time	Title	Presenter / Time Allocated
8:00 to 12:00	TAB prepare Report	
12:00 to 13:00	Lunch	
13:00 to 14:00	Travel to 333 Dunsmuir	
14:00 to 16:00	TAB Report out 333 Dunsmuir 18 th floor	

Site C Clean Energy Project Advisory Board Meeting No. 20 - Report

Attachment B - List of Meeting Attendees



Site C Clean Energy Project

Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18)

Appendix F

Environmental Management Plans and Report

As a result of the Environmental Assessment Certificate and the Federal Decision Statement conditions, the Site C Clean Energy Project is required to submit a number of plans and reports to various agencies. These plans and reports are posted on the Site C Project website at <u>www.sitecproject.com</u> as they are issued. This appendix contains a list of all issued documents as at December 31, 2019.

Aboriginal Plant Use Mitigation Plan	https://www.sitecproject.com/sites/default/files/Aboriginal_Plant_Use _Mitigation_Plan.pdf
Aboriginal Training and Inclusion Plan	https://www.sitecproject.com/sites/default/files/Aboriginal_Training_a nd_Inclusion_Plan.pdf
Accidents and Malfunctions Plan	https://www.sitecproject.com/sites/default/files/Accidents_and_Malfunctions_Plan.pdf
Agricultural Mitigation and Compensation Plan	https://www.sitecproject.com/sites/default/files/site-c-agricultural-mitigation-compensation-plan-final-september-2017.pdf
Agricultural Mitigation and Compensation Plan Framework	https://www.sitecproject.com/sites/default/files/SiteC-Agriculture-Mitigation-Compensation-Framework.pdf
Agricultural Monitoring and Follow-up Program	https://www.sitecproject.com/sites/default/files/Agricultural%20Monit oring%20and%20Follow-up%20Program.pdf
Business Participation Plan	https://www.sitecproject.com/sites/default/files/BPP-20150605.pdf
Construction Environmental Management Plan	https://www.sitecproject.com/sites/default/files/Construction%20Envi ronmental%20Management%20Plan%20%28CEMP%29.pdf
Construction Safety Management Plan	https://www.sitecproject.com/sites/default/files/Construction%20Safe ty%20Management%20Plan.pdf
Cultural Resources Mitigation Plan	https://www.sitecproject.com/sites/default/files/Cultural_Resources_ Mitigation_Plan_0.pdf
Del Rio Pit Development Plan	https://www.sitecproject.com/sites/default/files/Del%20Rio%20Pit%2 0Development%20Plan.pdf
Emergency Services Plan	https://www.sitecproject.com/sites/default/files/Emergency_Services Plan.pdf
Fisheries and Aquatic Habitat Management Plan	https://www.sitecproject.com/sites/default/files/Fisheries_and_Aquati c_Habitat_Management_Plan.pdf
Fisheries and Aquatic Habitat Monitoring and Follow-up Program	https://www.sitecproject.com/sites/default/files/Fisheries-and-Aquatic -Habitat-Monitoring-and-Follow-up-Program.pdf

Table F-1Mitigation, Management and MonitoringPlans



Health Care Services Plan	https://www.sitecproject.com/sites/default/files/Health_Care_Service s_Plan.pdf
Heritage Resources Management Plan	https://www.sitecproject.com/sites/default/files/Heritage_Resources_ Management_Plan_0.pdf
Housing Plan and Housing Monitoring and Follow-up Program	https://www.sitecproject.com/sites/default/files/Housing-Plan-Housing-Monitoring-and-Follow-up-Program-Rev2.pdf
Labour and Training Plan	https://www.sitecproject.com/sites/default/files/Labour_and_Training Plan.pdf
Outdoor Recreation Mitigation Plan	https://www.sitecproject.com/sites/default/files/site-c-outdoor-recreat ion-mitigation-plan_0.pdf
Recreation Program	https://www.sitecproject.com/sites/default/files/Recreation%20Progr am.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan	https://www.sitecproject.com/sites/default/files/Veg_and_Wildlife_Mit
Vegetation Clearing and Debris Management Plan	https://www.sitecproject.com/sites/default/files/Veg_Clearing_and_D ebris_Mgmt_Plan.pdf
West Pine Quarry Development Plan	https://www.sitecproject.com/sites/default/files/West_Pine_Quarry_D evelopment_Plan.pdf
Wuthrich Quarry Development Plan	https://www.sitecproject.com/sites/default/files/Wuthrich_Quarry_Development_Plan.pdf
85th Avenue Industrial Lands Detailed Operations Plan	https://www.sitecproject.com/sites/default/files/Final-Detailed-Operat ions-Plan-85th%20Ave%20Industrial%20Lands-20161122.pdf

Table F-2 Site C Project Reports

Aboriginal Group Communication Plan	https://www.sitecproject.com/sites/default/files/Report-annual-Aborigi
2015-2016 Annual Report	nal-Group-Communication-Plan-2015-2016-20160705.pdf
Aboriginal Group Communications Plan	https://www.sitecproject.com/sites/default/files/aboriginal-group-com
2016-2017 Annual Report	munications-plan-2016-2017-annual-report.pdf
Aboriginal Group Communications Plan	https://www.sitecproject.com/sites/default/files/Aboriginal-Group-Co
2017-2018 Annual Report	mmunications-Plan-2017-2018-Annual-Report.pdf
Aboriginal Plant Use Mitigation Plan 2015-2016	https://www.sitecproject.com/sites/default/files/Report-annual-Aborigi
Annual Report	nal-Plant-Use-Mitigation-Plan-2015-2016-20160705.pdf
Aboriginal Plant Use Mitigation Plan 2016-2017	https://www.sitecproject.com/sites/default/files/aboriginal-plant-use-
Annual Report	mitigation-plan-2016-2017-annual-report.pdf
Aboriginal Plant Use Mitigation Plan 2017-2018	https://www.sitecproject.com/sites/default/files/aboriginal-plant-use-
Annual Report	mitigation-plan-2017-2018-annual-report_0.pdf
Aboriginal Training and Inclusion Plan	https://www.sitecproject.com/sites/default/files/Report-annual-Aborigi
2015-2016 Annual Report	nal-Training-Inclusion-Plan-2015-2016-20160705.pdf
Aboriginal Training and Inclusion Plan 2016-2017 Annual Report	https://www.sitecproject.com/sites/default/files/aboriginal-training-inclusion-plan-2016-2017-annual-report.pdf



Aboriginal Training and Inclusion Plan 2017-2018 Annual Report	https://www.sitecproject.com/sites/default/files/Aboriginal-Training-and-Inclusion-Plan-2017-2018-Annual-Report.pdf
Accidents and Malfunctions Plan 2015 Annual Report	https://www.sitecproject.com/sites/default/files/Annual-Update-Accid ents-and-Malfunctions-Plan-2015.pdf
Accidents and Malfunctions Plan 2016 Annual Update	https://www.sitecproject.com/sites/default/files/accidents-malfunction s-plan-2016.pdf
Accidents and Malfunctions Plan 2017 Annual Update	https://www.sitecproject.com/sites/default/files/accidents-malfunction s-plan-annual-update-2017 0.pdf
Acid Rock Drainage and Metal Leachate Management Plan – Water Quality Annual Report 2015	https://www.sitecproject.com/sites/default/files/Annual-Update-Water -Quality-2015-FDS-Condtion-7-5_0.pdf
Acid Rock Drainage and Metal Leachate Management Plan – Water Quality Annual Report 2016	https://www.sitecproject.com/sites/default/files/acid-rock-drainage-m etal-water-quality-annual-report-2016.pdf
Acid Rock Drainage and Metal Leachate Management Plan – Water Quality Annual Report 2017	https://www.ceaa.gc.ca/050/documents/p63919/122317E.pdf
Agricultural Monitoring and Follow-up Program 2016 Annual Report	https://www.sitecproject.com/sites/default/files/Agricultural-Monitorin g-Annual-Report-2016.pdf
Agriculture Monitoring and Follow-up Program 2017 Annual Report	https://www.sitecproject.com/sites/default/files/agriculture-monitoring -annual-report-2017.pdf
Agriculture Monitoring and Follow-up Program 2018 Annual Report	https://www.sitecproject.com/sites/default/files/Ag-Monitoring-Annual -Report-2018.pdf
Air Quality Management Plan 2015 Annual Report	https://www.sitecproject.com/sites/default/files/Appendix-A-RWDI-Site-C-Climate-and-Air-Quality-Monitoring-Annual-Report-2015.pdf
Air Quality Management Plan 2016 Annual Report	https://www.sitecproject.com/sites/default/files/climate-air-quality-an nual-report-2016.pdf
Air Quality Management Plan 2017 Annual Report	https://www.sitecproject.com/sites/default/files/Air-Quality-Managem ent-Plan-2017-Annual-Report.pdf
Annual Compliance Report - Status of Compliance with EAC Conditions and Schedule B $-$ 2015-2016	https://projects.eao.gov.bc.ca/api/document/5b0722d24972950024b 6e21c/fetch
Annual Compliance Report – Status of Compliance with EAC Conditions and Schedule B – 2016-2017	https://projects.eao.gov.bc.ca/api/document/5a9dc9f66f07af0024d5a 246/fetch
Annual Compliance Report – Status of Compliance with EAC Conditions and Schedule B -2017-2018	https://projects.eao.gov.bc.ca/api/document/5b328d38d46d3f002426 863f/fetch
Business Participation Plan 2015-2016 Annual Report	https://www.sitecproject.com/sites/default/files/business-participation -plan-annual-report-july-29-2016.pdf
Business Participation Plan 2016 – 2017 Annual Report	https://www.sitecproject.com/sites/default/files/business-participation -plan-annual-report-year-two-july-2017.pdf



Business Participation Plan 2017 - 2018 Annual Report	https://www.sitecproject.com/sites/default/files/Business-Participatio n-Plan-Annual-Report-July-27-2018.pdf
Construction Communications 2015-2016 Annual Report	https://www.sitecproject.com/sites/default/files/Site-C-Construction-C ommunications-Annual-Report-2016.pdf
Construction Communications 2016 – 2017 Annual Report	https://www.sitecproject.com/sites/default/files/site-c-construction-communications-annual-report-july-2017.pdf
Construction Communications 2017 - 2018 Annual Report	https://www.sitecproject.com/sites/default/files/Site-C-Construction-C ommunications-Annual-Report-July-2018.pdf
Cultural Resources Mitigation Plan 2015 Annual Report	https://www.sitecproject.com/sites/default/files/Report-annual-Cultural-Resources-Mitigation-Plan-2015-2016-20160705.pdf
Cultural Resources Mitigation Plan 2016-2017 Annual Report	https://www.sitecproject.com/sites/default/files/cultural-resources-mit igation-plan-2016-2017-annual-report.pdf
Cultural Resources Mitigation Plan 2017-2018 Annual Report	https://www.sitecproject.com/sites/default/files/Cultural-Resources-M itigation-Plan-2017-2018-Annual-Report.pdf
Fisheries and Aquatic Habitat Management Plan 2015-2016 Annual Report	https://www.sitecproject.com/sites/default/files/Annual-Report-Fisheries-Aquatic-Habitait-Managment-Plan-2015-2016.pdf
Fisheries and Aquatic Habitat Management Plan 2016-2017 Annual Report	https://www.sitecproject.com/sites/default/files/fisheries-aquatic-habit at-management-plan-annual-report-2016.pdf
Fisheries and Aquatic Habitat Management Plan 2017 Annual Report	https://www.sitecproject.com/sites/default/files/fisheries-aquatic-habit at-management-plan-annual-report-2017_0.pdf
Fisheries and Aquatic Habitat Monitoring and Follow Up Program 2015-2016 Annual Report	https://www.sitecproject.com/sites/default/files/fisheries-aquatic-habit at-monitoring-follow-up-program-annual-report.pdf
Fisheries and Aquatic Habitat Monitoring and Follow up Program 2017 Annual Report	https://www.sitecproject.com/sites/default/files/report-annual-fahmfp- 2017-20180301.pdf
Heritage Resources Management Plan 2015 Annual Report	https://www.sitecproject.com/sites/default/files/Report-annual-BCH-t o-CEAA-Heritage-Rsrcs-Mgt-Plan-20160705.pdf
Heritage Resources Management Plan 2016 Annual Report	https://www.sitecproject.com/sites/default/files/heritage-resource-management-plan-annual-report-2016.pdf
Heritage Resource Management Plan 2017 Annual Report	https://www.sitecproject.com/sites/default/files/Heritage-Resource-M anagement-Plan-2017-Annual-Report.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2015 Annual Report	https://www.sitecproject.com/sites/default/files/vegetation-and-wildlif e-mitigation-and-monitoring-plan-annual-report-2015.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2015 Annual Report Appendices Part 1	https://www.sitecproject.com/sites/default/files/vegetation-and-wildlif e-mitigation-and-monitoring-plan-annual-report-2015-appendices-pa rt-1.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2015 Annual Report Appendices Part 2	https://www.sitecproject.com/sites/default/files/vegetation-and-wildlif e-mitigation-and-monitoring-plan-annual-report-2015-appendices-pa rt-2.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2016 Annual Report	https://www.sitecproject.com/sites/default/files/vegetation-wildlife-mitigation-monitoring-plan-2016.pdf



Vegetation Wildlife Mitigation and Monitoring Plan 2017 Annual Report	https://www.sitecproject.com/sites/default/files/vegetation-wildlife-mitigation-monitoring-plan-annual-report-2017.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2017 Annual Report Appendices Part 1	https://www.sitecproject.com/sites/default/files/vegetation-wildlife-mitigation-monitoring-plan-annual-report-2017-appendices-part-1_0.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2017 Annual Report Appendices Part 2	https://www.sitecproject.com/sites/default/files/vegetation-wildlife-mitigation-monitoring-plan-annual-report-2017-appendices-part-2_0.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2017 Annual Report Appendices Part 3	https://www.sitecproject.com/sites/default/files/vegetation-wildlife-mit igation-monitoring-plan-annual-report-2017-appendices-part-3.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2017 Annual Report Appendices Part 4	https://www.sitecproject.com/sites/default/files/vegetation-wildlife-mit igation-monitoring-plan-annual-report-2017-appendices-part-4.pdf
Vegetation and Wildlife Mitigation and Monitoring Plan 2017 Annual Report Appendices Part 5	https://www.sitecproject.com/sites/default/files/vegetation-wildlife-mit igation-monitoring-plan-annual-report-2017-appendices-part-5.pdf

Site C Clean Energy Project

Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18)

Appendix G

Environmental Assessment Certificate

Annual Compliance Report

Environmental Assessment Certificate #14-02 Annual Compliance Report

Site C Clean Energy Project March 29, 2019

Site C Clean Energy Project Status of Compliance with the Conditions of the EAC #14-02 March 29, 2019

Background

The Site C Clean Energy Project (the Project) will be the third dam and generating station on the Peace River that will provide up to 1,100 megawatts (MW) of capacity and about 5,100 gigawatt hours (GWh) of energy each year to the province's integrated electricity system. On October 14, 2014, the BC Provincial Minister of Environment and Minister of Forests, Lands and Natural Resource Operations decided that the Project is in the public interest and that the benefits identified by the Project outweigh the risks of significant adverse environmental, social and heritage effects. The assessment leading to the conclusion noted that the effects of the Project will largely be mitigated through careful, comprehensive mitigation programs and ongoing monitoring during construction and operation.

On October 14, 2014, the Ministers issued Environmental Assessment Certificate (EAC) #14-02 setting 77 conditions under which the Project can proceed. On November 14, 2018, the Environmental Assessment Office added one additional condition to the EAC, following an amendment to Schedule A of the EAC (Project Description). Table 1 provides a list of amendments that have been made to both Schedule A (Project Description) and Schedule B (List of Conditions) of the EAC since issuance.

EAC #14-02 requires that BC Hydro submit a report to "EAO Compliance and Enforcement staff on the status of compliance with the Conditions of this Certificate, and the conditions in Schedule B ... on or before March 31 in each year during construction and operation phases of the Project." The following report is being submitted in accordance with this requirement, and covers the period April 1, 2018 to December 31, 2018. The report submitted in March 2020 will cover the period January 1, 2019 to December 31, 2019.

Summary of Compliance

EAC #14-02 contains 78 conditions which comprise 608 unique requirements relating to the following areas:

- Aquatic Environment
- Fish and Fish Habitat
- Vegetation and Ecological Communities
- Wildlife Resources

- Current Use of Lands and Resources for Traditional Purposes
- Land and Resource Use
- Transportation
- Outdoor Recreation
- Community

- Human Health
- Heritage Resources
- Environmental Protections and Management

- Environmental Management Plans, Follow-up and Monitoring
- Dam Safety
- West Pine Haul Route Traffic Management Plan

BC Hydro has assessed compliance of conditions as a whole, as well as with the individual requirements of each condition. This assessment is based on evidence collected through a comprehensive compliance program which requires monitoring and reporting by contractors, an Independent Environmental Monitor, and by BC Hydro.

Compliance with 78 Conditions

Of the 78 conditions in EAC #14-02:

- No conditions have been assessed as being in non-compliance
- One condition has been assessed as being in partial-compliance
- 14 conditions have not yet required implementation all of the requirements in these conditions are in an initial planning stage and will be implemented at a future time, such as during reservoir filling or operations
- 64 conditions are underway and are in various stages of implementation. The requirements in these conditions have either been completed, are ongoing, or are not yet required to have started

Summary of Compliance with 608 Requirements

Table 2 summarizes the status of compliance with each of the requirements in the 78 conditions of EAC #14-02. The table shows that 475 of the requirements are assessed as being in compliance, 2 as being in partial-compliance (See Condition #3) and 131 as future requirements.

Summary of Inspections by EAO

BC Hydro was inspected by regulatory agencies multiple times during the reporting period, including five inspections by the Environmental Assessment Office. During this reporting period, the EAO issued two Orders regarding erosion and sediment control at Portage Mountain Quarry and the dam site area respectively. Corrective actions for these Orders have been implemented and the related EAC conditions brought into compliance. Details regarding the Orders and corrective actions are described in Table 3 and the compliance report, per relevant conditions.

The EAO also issued four inspection reports covering the five inspections. These reports identified 13 separate findings of non-compliance related to site specific and often isolated

issues, such as missing spill trays, deficient erosion and sediment control, and dust control. BC Hydro responded to each finding of non-compliance, corrected the deficiencies, and provided evidence of corrections to the Environmental Assessment Office.

Summary of Inspections by BC Hydro

BC Hydro has developed an Active Compliance Management Tool (ACMT), to monitor, track and report on compliance with environmental conditions for the Project. The ACMT includes a mobile inspection tool that provides geography-specific and theme-specific record of environmental compliance at site. These themes are: Aquatic and Environment; Fish and Fish Habitat; Vegetation and Ecological Communities; Wildlife Resources; Transportation; Community; Human Health; Heritage Resources; and Environmental Management Plans, Follow-up Monitoring. In June 2017 BCH launched the ACMT on the Site C Project, enhancing the ability to share inspection results with contractors and driving environmental compliance.

In the ACMT, an inspection is defined as a single inspection against one compliance requirement within an Environmental Protection Plan. Between April 1, 2018 to December 31, 2018 BC Hydro used the ACMT to conduct 22,862 inspections for the Site C Project.

The inspections showed that contractors were compliant with their Environmental Protection Plans 91% of the time. Where deficiencies were found -- for example, 8% of the time for requirements related to fish and fish habitat, 11% of the time for vegetation ecological communities, and 5% of the time for wildlife resources -- BC Hydro actively worked with its contractors to remedy the deficiencies. The majority of deficiencies were corrected when identified in the field, and some deficiencies were corrected following formal communication between BCH and responsible contractors. As of December 31, 2018 less than .004% of the deficiencies identified between April 1, 2018 and December 31, 2018 were open.

Updates to Mitigation/Monitoring Plans

Both the Heritage Resources Mitigation Plan (HRMP) and Cultural Resources Mitigation Plan (CRMP) were revised on November 19, 2018 incorporating feedback from the EAO and new information from Indigenous groups. A description of the revisions is provided in the compliance report for Condition 62 (HRMP) and Condition 63 (CRMP).

Proposed revisions to the Construction Environmental Management Plan and Vegetation Clearing and Debris Management Plan were provided to regulators and Indigenous groups in early 2019, with final revisions incorporating feedback submitted on February 15, 2019. Because these revisions took place outside of the reporting period of April 1, 2018 to December 31, 2018, compliance with the previous versions of these plans is covered in this report.

Conclusion

BC Hydro is committed to meeting all the conditions of its Environmental Assessment Certificate for the Site C Clean Energy Project, including the 78 EAC Conditions and the 608 unique requirements.

In this Annual Compliance Report for April 1, 2018 to December 1, 2018, BC Hydro has provided evidence to demonstrate compliance with all EAC #14-02 Conditions.

Table 1 liet) + > 2 + • FAC #F14-03

Table 1. LIST OF Amer	idments to EAC	, #E14-U2
Amendment No.	Issued	Amendment to EAC #E14-02
1	March 12, 2018	 Amends Schedule A (Project Description) Sections 4.3.1, 4.3.1.4 and 4.3.1.5 of Schedule A regarding the design of the Generating Station and Spillway as follows: The location of the transformers changed from the draft tube deck to upstream of the generator units on the transformer deck the spillway design changed from seven gates to three radial gates and six low level outlets the discharge capacity changed from 10,100 m3/s at the maximum normal reservoir level and 17,300 m3/s at the maximum flood level to 11,000 m3/s at the maximum
2	October 26, 2018	Amends Schedule A (Project Description) Section 4.3.4.1 and Figure 4.32 of Schedule A to increase the length of the Halfway River Bridge from 305m up to 1,100m in length, eliminate the causeway, and increase the number of bridge piers up to 19.
ω	November 14, 2018	 Amends Schedule A (Project Description) Section 4.3.5.2.3 and 4.3.5.2.4, Table 4.7 and 4.9 of Schedule A to permit the use West Pine Quarry, in addition to Portage Mountain Quarry, as a source of excavated material for the construction of Highway 29 realignment, Hudson's Hope shoreline protection, and areas along the reservoir requiring protection during reservoir filling. Amends Schedule B (Conditions) in response to Amendment #3 above to require that BC Hydro develop a Traffic Management Plan for the West Pine Quarry Haul Route, in consultation with Saulteau First nations, West Moberly First Nations, the District of Hudson's Hope, the District of Chetwynd, and the Ministry of Transportation and Infrastructure.
4	February 12, 2019	Amends Schedule B Conditions #4 and #13 to maintain a 15 m machine free zone adjacent to watercourses during reservoir clearing, except where worker safety prohibits manual tree falling and vegetation removal methods and as addressed in a site-specific prescription prepared and endorsed by a QEP. The rationale for the safety exemption must be documented in the prescription.

Appendix G

Table 2. Summary	of Compliance with	n Requiremen	its of EAC #14-02 (Conditions		
Area	Category	# of Conditions	Total # of Requirements	# of Future Requirements	# of Requirement "in Compliance"	# of Requirements "Partially in Compliance"
					(Completed	or Ongoing)
Aquatic	Hydrology	1	11	11	0	0
Environment	Fluvial					
	Geomorphology	Ц	17	0	17	0
	and Sediment					
	Water Quality	1	12	0	10	2
Fish and Fish	Fish and Fish	4	51	27	24	0
ומטומנ	ומטומנ					
Vegetation and	Vegetation and					
Ecological	Ecological	7	66	0	66	0
Communities	Communities					
Wildlife	Wildlife	10	БЛ	D	6A	Ð
Resources	Resources	ΟT	04	c	c t	c
Current Use of	Current Use of					
Lands and	Lands and					
Resources for	Resources for	4	20	2	18	0
Traditional	Traditional					
Purposes	Purposes					
Land and	Harvest of Fish	۷	J	D	J	D
Resource Use	and Wildlife	F	~	c	~	c
	Agriculture	2	25	0	25	0
	Other Resource	υ	21	ת	7	Ð
	Industries	J	CT	C	<i>'</i>	c
Transportation	Transportation	4	41	0	41	0
Outdoor	Outdoor	υ	<u>л</u>	U	2	D
Docrostion and	Docroation and	L	L	L	77	c

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Recreation and Recreation and

				(Combined wi	Annual Pro th Quarterly Progi January 2019	ogress Report No. 4 ress Report No. 18) to December 2019 Appendix G
Area	Category	# of Conditions	Total # of Requirements	# of Future Requirements	# of Requirement "in Compliance"	# of Requirements "Partially in Compliance"
					(Completed	or Ongoing)
Tourism	Tourism					
Community	Community					
	Infrastructure	6	31	6	25	0
	and Services					
	Housing	2	18	0	18	0
	Regional					
	Economic	6	34	1	33	0
	Development					
Human Health	Potable and					
	Recreational	1	ω	1	2	0
	Water Quality					
	Ambient Air	Ц	11	1	10	0
	Quality					
	Noise and	2	14	1	13	0
	Vibration	ſ	н -	ł		
	Methylmercury	1	13	13	0	0
Heritage	Visual	Ц	4	0	4	0
Resources	Resources					
	Physical					
	Heritage and	ω	27	ת	15	5
	Cultural	U	77	c	ΟT	c
	Heritage					
Environmental	GHG					
Protection and	Monitoring	1	7	7	0	0
Management	9					

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Area	Category	# of Conditions	Total # of Requirements	# of Future Requirements	# of Requirement "in Compliance"	# of Requirements "Partially in Compliance"
					(Completed	or Ongoing)
Environmental	Environmental					
Management	Management					
Plans, Follow-up	Plans, Follow-	10	86	31	67	0
and Monitoring	up and					
	Monitoring					
Dam Safety	Dam Safety	2	3	3	0	0
West Pine Haul	West Pine Haul					
Route Traffic	Route Traffic	۷	10	1)	ـ	D
Management	Management	F	CT	71	F	c
Plan	Plan					
TOTAL		78	608	131	477	0

Date of Order	Date of Inspection	Condition	Order	Summary of Order
May 14, 2018	May 1 to May 3, 2018	EAC 2, 69	Water and sediment control	Issue: Failure to adhere to implement measures to control runoff water and sediment following clearing of the Portage Mountain Quarry. Order/Corrective Action: to immediately implement measures to control runoff water, soil erosion and sediment transport on site in accordance with the CEMP.
Sep 21, 2018	Sep 11 to Sep 13, 2018	EAC 69	Water and sediment control	Issue: Failure to adhere to implement measures to control runoff water and sediment transport prior to commencing operations in Area 30, as specified by the Area 30 (Operations) Environmental Protection Plan. Order/Corrective Action : Immediately implement measures to control runoff water and sediment transport to wetlands adjacent to Area 30, and ensure measures are in place to intercept and control selenium laden water at Area 30 in accordance with the CEMP and Area 30 EPP.

Table 3. Section 34 Orders Issued by EAO, April 1, 2018 to December 31, 2018
Acronyms and Abbreviations

APUMP	Aboriginal Plan Use Mitigation Plan
CEAA	Canadian Environmental Assessment Act
CEMP	Construction Environmental Management Plan
СМНС	Canada Mortgage and Housing Corporation
CRMP	Cultural Resources Mitigation Plan
CSMP	Construction Safety Management Plan
DFO	Department of Fisheries and Oceans Canada
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office
EPP	Environmental Protection Plan
FAHMFP	Fisheries and Aquatic Habitat Management Follow-up Program
FAHMP	Fisheries and Aquatic Habitat Management Plan
FLNR	Ministry of Forests, Lands and Natural Resource Operations
FNHA	First Nations Health Authority
GHG	Greenhouse Gas
HRMP	Heritage Resources Management Plan
IEM	Independent Environmental Monitor
IWMAMP	Invasive Weed Mitigation and Adaptive Management Plan
MOE	Ministry of Environment
MOTI	Ministry of Transportation and Infrastructure
MOU	Memorandum of Understanding
NHA	Northern Health Authority
OEMP	Operations Environmental Management Plan
OHWM	Ordinary High Water Mark
PAG	Potentially Acid Generating
PRRD	Peace River Regional District
QEP	Qualified Environmental Professional
QP	Qualified Professional
SARA	Species at Risk Act
RAA	The Regional Assessment Area
RSEM	Relocated Surplus Excavated Material
RVMA	Riparian Vegetation Management Area
TSFA	Terrain Stability Field Assessments
TSS	Total Suspended Solids
TU	Treatment Unit
VCDMP	Vegetation Clearing and Debris Management Plan
VWMMP	Vegetation and Wildlife Mitigation and Monitoring Plan
VWTC	Vegetation and Wildlife Technical Committee
WHIMS	Workplace Hazardous Materials Information System

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EAC 01	EAC 01	EAC 01	EAC 01	EAC 01	EAC 01	EAC 01			No.
 Provisions for obtaining information on any current impacts to infrastructure attributable to low water flows caused by the Project; 	 Provisions for obtaining baseline and operational flow information; 	 The Plan must include at least the following: Provisions for assessing potential risks to infrastructure caused by low water flows as a result of the Project; 	The Holder must work with the Government of Alberta to jointly develop an Adaptive Management Plan to manage potential risks to infrastructure downstream of the Site C dam to the Town of Peace River, Alberta caused by low water flows during reservoir filling and operation of the Project. For the purposes of the Plan infrastructure must include water intakes, ferry crossings and any other activities identified by the Proponent and the Government of Alberta.	 The Holder must estimate downstream flows at minimum, average and maximum rates of reservoir filling in order to identify the approach that would minimize impacts on downstream flows and water level conditions. 	· The Holder must maintain a minimum release of 390 cubic meters per second from the Site C dam	The EAC Holder must address potential risks to infrastructure downstream of the Site C dam as far as Peace River, Alberta caused by low flows, caused by the Project, during reservoir filling and operation by implementing the following measures:	Hydrology	AQUATIC ENVIRONMENT	EAC Condition
Initial Planning	Initial Planning	Initial Planning	Initial Planning	Initial Planning	Initial Planning	Initial Planning			Implementation Status
Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement			Compliance Status
BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition. BC Hydro continues to collect present state field data to inform and future changes and associate downstream impact assessments and future discussion with the Government of Alberta.	BC Hydro acknowledges and understands this condition. BC Hydro has included this requirement within the design of the generating station and spillways and overall operation of the dam. BC Hydro will be developing an Owner's Operation, Maintenance and Surveillance Manual that will also include this requirement.	BC Hydro acknowledges and understands this condition. BC Hydro has included this requirement within the design of the generating station and spillways and overall operation of the dam. BC Hydro will be developing an Owner's Operation, Maintenance and Surveillance Manual that will also include this requirement during the operating period.	BC Hydro acknowledges and understands this condition. BC Hydro has entered into agreements with the downstream communities that identify potential infrastructure impacts and establish commitments to either monitor and mitigate or mitigate- such as the District of Taylor Water intake. Additionally, BC Hydro continues to collect present state field data to Inform and future changes and associate downstream impact assessments.			Description

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EAC 01

Identification of any impacts to infrastructure attributable to

Initial Planning

Future Requirement BC Hydro acknowledges and understands this condition.

Implementation Status

Compliance Status

Description

EAC Condition

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	AC 01	AC 01	AC 01		AC 02		AC 02	AC 02	AC 02
low water flows caused by the Project; and	• The Mitigation measures such as additional flow regulation, adjustment to Alberta infrastructure and notifying the Government of Alberta of prolonged low water flow conditions, necessary to avoid or minimize impacts attributable to low water flows caused by the Project.	The EAC Holder must submit the plan to EAO a minimum of 30 days prior to reservoir filling.	The EAC Holder must implement the Plan and report on the results annually to EAO commencing from reservoir filling to the end of year 5 of operations.	Fluvial Geomorphology and Sediment Transport	The EAC Holder must manage adverse Project effects on water quality by managing erosion and sediment transport, as detailed in an Erosion Prevention and Sediment Control Plan.		The Erosion Prevention and Sediment Control Plan must be developed by a Qualified Environmental Professional (QEP).	The Plan must identify areas of high erosion and sediment potential. The Erosion Prevention and Sediment Control Plan must include at least the following:	 Manage water (e.g. rainfall, snowmelt,) to control runoff and direct it away from work areas where excavation, spoil placement, and staging activities occur.
	Initial Planning	Initial Planning	Initial Planning		Ongoing		Completed	Ongoing	Ongoing
	Future Requirement	Future Requirement	Future Requirement		In Compliance		In Compliance	In Compliance	In Compliance
	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.		The Erosion and Sediment Control Plan is described in Section 4.4 of the Construction Environmental Management Plan (CEMP).	The final CEMP (Revision 1) was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published). Revision 4 of the CEMP contains a new Appendix, Appendix I, which provides details on the Project's erosion and sediment control requirements, including the requirement for Contractors to retain their own Erosion and Sediment Control QPs.	Section 6.0 of the CEMP lists the Qualified Environmental Professional (QEP) who prepared the plan. Appendix I sets out the credential requirements of the Erosion and Sediment Control QPs and require that QPs approve and oversee the implementation of site- specific erosion and sediment control plans.	The CEMP requires that contractors identify and isolate work areas to prevent sediment from entering the downstream environment. BC Hydro audits compliance with this requirement by reviewing contractor Environmental Protection Plans (EPPs) and conducting environmental audits during construction to verify implementation of EPPs.	The CEMP requires that Contractor EPPs identify water management plans to control runoff and direct it away from work areas where excavation, soil placement and staging activities locrur. RC Hwite audits compliance with these requirements by reviewing contractor EPPs.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 02	 Adjust the timing of construction activities to coincide with periods of high background sediment levels. 	Ongoing	In Compliance	The CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of the EPP.
EAC 02	 Use clean rock materials for riprap construction. 	Ongoing	In Compliance	The CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of the EPP.
EAC 02	 Manage equipment production rates during construction to reduce sediment generation. 	Ongoing	In Compliance	The CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of the EPP.
EAC 02	 Identify and isolate work areas to prevent sediment from entering the downstream environment. 	Ongoing	In Compliance	BC Hydro is implementing and adhering to the final Erosion Prevention and Sediment Control Plan as well as additional commitments including quality inspections and regular reporting on plan progress. To date, many of the areas that experienced high rates of erosion between 2017 and 2018 have been restored, revegetated, and in some cases augmented with additional ditching, sediment control ponds or other measures to prevent erosion and reduce sediment loading from runoff.
				This program involves Qualified Erosion and Sediment Control Professionals who review work areas for Erosion and Sediment Control risks, author prescriptions with due dates based on risk, oversee the implementation of these prescriptions, prescribe re-inspection dates, and have overall responsibility for Erosion and Sediment Control measures in their work areas. This Program was initiated in October 2016 with results reported to the EAO weekly up to late 2017 and monthly since then.
				On May 14, 2018, EAO issued an Order under Section 34 of the Environmental Assessment Act for failure to adhere to implement measures to control runoff water and sediment following clearing of the Portage Mountain Quarry. In response, BC Hydro immediately

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implemented measures to control runoff water, soil erosion and sediment transport on site

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 02	 Leave stumps in place to reduce soil disturbance, erosion and sediment transport in the headpond during reservoir clearing to reduce soil disturbance and potential sedimentation issues. 	Ongoing	In Compliance	The CEMP requires contractors to leave stumps in place to reduce soil disturbance, and erosion and sediment transport in the headpond during reservoir clearing. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. Note that stumps are removed for road construction associated with reservoir clearing as described in the Project's Environmental Impact Statement and Vegetation Clearing and Debris Management Plan (VCDMP). BC Hydro has determined that stump removal
				described in the Project's Environmental Impact Statement and Vegetation Clearing and Debris Management Plan (VCDMP). BC Hydro has determined that stump removal associated with road construction is consistent with this condition.
EAC 02	 Manage vegetation and soil stripping, taking into consideration proximity to sensitive habitats as determined by a QEP (e.g. wetlands) and slope stability. 	Ongoing	In Compliance	The CEMP requires contractors to manage vegetation and soil stripping, taking into consideration proximity to sensitive habitat and slope stability as determined by a QEP. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 02	 Salvage and stockpile clean surface soils for site restoration. 	Ongoing	In Compliance	The CEMP requires contractors to salvage and stockpile clean surface soils for site restoration. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. To date, several soil stockpiles have needed to be relocated due to construction To date, and the relocation and preservation of these piles is audited by BC Hydro.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 02	 Establish vegetative cover on the soils stockpiled to prevent erosion. 	Ongoing	In Compliance	The CEMP requires contractors to establish vegetative cover on the soils stockpiled to prevent erosion.
				BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
				The Main Civil Work Contractor, Peace River Hydro Partner's (PRHP) has hydro seeded and hand seeded new soil stockpiles in 2018 and has seeded many of the existing pre-2018 stockpile locations. Signage has been installed at larger stockpile areas to prevent disturbance. Topsoil stockpiles are monitored to assess the re- vegetation success as well as invasive occurrences by both BC Hydro and PRHP's QEP's. Some off dam site topsoil stripping occurred in 2018 including locations on Highway 29, 85th Avenue borrow area, south bank side-channel construction and limited topsoil stripping at transmission tower and access road construction sites.
EAC 02	 Develop construction schedules such that reservoir clearing in the winter is maximized. 	Ongoing	In Compliance	To date, reservoir clearing has coincided with winter conditions. The final stages of lower reservoir and Moberly River clearing commenced in late fall 2018 and continued into winter 2019. Other eastern and middle reservoir clearing areas commenced in late fall 2018 and continued into winter 2019.
EAC 02	 Isolate in-stream work areas from flowing water except as permitted by the on-site environmental monitor. 	Ongoing	In Compliance	BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. Some instream work has occurred on the Project in compliance with the Project's Fisheries Act Authorizations (both early works and dam construction). This work has not always been completed in isolation of the Peace river but was conducted under the supervision of the on-site environmental monitor, and was monitored for compliance with the Fisheries Act Authorizations' severity of ill effects limits.
EAC 02	The EAC Holder must provide this draft Erosion Prevention and Sediment Control Plan to BC Ministry of Forests, Lands and Natural Resource Operations (FLNR), BC Ministry of Environment (MOE), Aboriginal Groups, Peace River Regional District, City of Fort St. John, and District of Hudson's Hope for review a minimum of 90 days prior	Completed	In Compliance	The Erosion Prevention and Sediment Control Plan is described in Section 4.4 of the CEMP for the Project. The Draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014.

to commencement of construction activities.

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o address potential environmental effects of acid generation and netal leaching from construction activities and reservoir creation, AC Holder must develop a water quality monitoring program.	Vater Quality	The EAC Holder must develop, implement and adhere to the final irosion Prevention and Sediment Control Plan, and any amendments o the final Erosion Prevention and Sediment Control Plan, to the atisfaction of Environmental Assessment Office (EAO).	The EAC Holder must file the final Erosion Prevention and Sediment Control Plan with EAO, FLNR, MOE, Aboriginal Groups, Peace River Regional District, City of Fort St. John and District of Hudson's Hope a minimum of 30 days prior to commencement of construction activities.	EAC Condition
Ongoing		Ongoing	Completed	Implementation Status
In Compliance		In Compliance	In Compliance	Compliance Status
Section 4.14 and Appendix E of the CEMP sets out the water quality management program that contractors are required to adhere to, including associated measures to address potential effects of acid generation and metal leaching. BC Hydro audits compliance with Section 4.14 and Appendix E of the CEMP by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.		The Erosion and Sediment Control Plan is described in Section 4.4 of the Construction Environmental Management Plan (CEMP). This program involves Qualified Erosion and Sediment Control Professionals who review work areas for Erosion and Sediment Control risks, author prescriptions with due dates based on risk, oversee the implementation of these prescriptions, prescribe re-inspection dates, and have overall responsibility for Erosion and Sediment Control measures in their work areas. This Program was initiated in October 2016 with its results reported to the EAO weekly up to late 2017 and monthly since then.	The final CEMP (Revision 1) was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).	Description

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	. Monitoring of parameters;	. Baseline sampling of parameters;	 Identification of the geographic extent and duration of the monitoring; 	The water quality monitoring program must include: - Identification of water quality parameters to be monitored; -	EAC Condition
	Ongoing	Ongoing	Ongoing	Ongoing	Implementation Status
	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
	Surface water monitoring in the Peace River, at runoff locations at the dam site, and in PAG-contact RSEM sediment ponds (as required by the CEMP, Appendix E) is ongoing. Installation of groundwater wells at RSEM Areas R5a and R5b occurred between September and November 2016, with baseline monitoring completed shortly after installation and quarterly monitoring ongoing through 2018.	Baseline sampling is specific to each type of monitoring program. For example, a quarterly baseline water quality monitoring program at sampling locations in the Peace River commenced in 2015 and is ongoing. Baseline sampling at groundwater wells installed at PAG-contact RSEM facilities was conducted prior to placement of PAG at those RSEMs.	Appendix E of the CEMP identifies the geographic extent and duration of the water quality monitoring requirements based on the source and type of potential PAG contact water (e.g., surface water, groundwater, sediment pond water). The plan describes the monitoring frequency, duration, and parameters, which vary by monitoring sub-program. For example, the geographic extent of the monthly Peace River water quality monitoring program extends from a control point upstream of the construction footprint to a far-field location downstream of all RSEM discharges where the Peace River and RSEM discharge is completely mixed. The duration of the monitoring corresponds with the duration of RSEM sediment pond operation and discharge, except when monitoring poses an undue risk to worker health and safety.	CEMP Appendix E identifies water quality parameters to be monitored based on the source and type (e.g., surface water, groundwater, sediment pond water) of Potentially Acid Generating (PAG) contact water. The plan describes the monitoring frequency, duration, and parameters, which vary by monitoring sub-program. Parameters of interest for Relocated Surface Excavated Material (RSEM) discharges containing PAG have currently been identified as Cd, Co, Cu, Zn, TSS, and pH (CEMP Appendix E, Table 2), in addition to a requirement for acute toxicity testing. These parameters are subject to reassessment as the Project gathers additional information from water quality and toxicity assessments.	Description

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EAC 03	EAC 03	EAC 03	EAC 03		EAC 03	No.
The final water quality monitoring program must be detailed in the Acid Rock Drainage and Metal Leachate Management Plan,	The EAC Holder must report on the results annually to the EAO every June 1.	The EAC Holder must file the final water quality monitoring program with EAO, Environment Canada, Natural Resources Canada, MOE, FLNR, Aboriginal Groups, Peace River Regional District and City of Fort St. John a minimum of 30 days prior to commencement of construction.	The EAC Holder must provide this draft water quality monitoring program to Environment Canada, Natural Resources Canada, MOE, FLNR, Aboriginal Groups, Peace River Regional District and the City of Fort St. John for review a minimum of 90 days prior to commencement of construction.		 Process for implementing mitigation measures to address water quality impacts. 	EAC Condition
Completed	Ongoing	Completed	Completed		Ongoing	Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance		Partial Compliance	Compliance Status
The water quality monitoring program is described in Section 4.14 and Appendix E - Section 7.0 of the CEMP (Revision 4).	A water quality report covering 2017 construction activities was submitted to the EAO on March 29, 2018. The next report (covering 2018 construction activities) will be submitted to the EAO by June 1, 2019.	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).	The Water Quality Monitoring Program is described in Section 4.14 and Appendix E - Section 7.3 of the CEMP. The draft CEMP was provided to regulatory agencies, governments and Indigenous groups on October 17, 2014.	In 2018, a mobile water treatment facility was procured to the dam site to treat PAG- contact water for elevated metals (commissioned as of July). For the reporting period, PAG-contact water quality exceedance events were noted associated with dam site road cuts (at River Road) and RSEM sediment pond discharges (at RSEM R5b and RSEM R6). Mitigations have been and continue to be implemented in response to these exceedances as per QP (ARD) recommendations. On September 8 and 9, 2018, a discharge of approximately four million litres of partially treated storm water into the Peace River occurred during a 55-mm rain event. The discharge was a relatively small volume of approximately 1.2 million litres per second. As such, the water was immediately diluted with no harmful effects observed. Following this event, the Comptroller of Water Rights requested a review of the capacity of the care of water system on the right bank approach channel. Environment Canada is also investigating the incident. BC Hydro is taking action to increase the holding capacity and effectiveness of the care of water system and to remove the weathered acidic rock to reduce the potential for a similar reoccurrence.	The process for implementing mitigation measures if water quality impacts are observed is described in CEMP Appendix E, Section 7.4.	Description

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			(Com	Annual Progress Report No. 4 bined with Quarterly Progress Report No. 18) January 2019 to December 2019 Appendix G
No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 03	The EAC Holder must develop, implement and adhere to the final water quality monitoring program, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	The water quality monitoring program, as outlined in Appendix E of the CEMP, is being implemented and adhered to, with responsibilities specific to BC Hydro and the Contractor as outlined.
				Water quality monitoring reports have been submitted annually by June 1 of each year to cover monitoring conducted in conjunction with construction in the preceding year. The nex report (covering 2018 construction activities) will be submitted to the EAO on or before June 1, 2019.
	FISH AND FISH HABITAT			
EAC 04	The EAC Holder must manage harmful Project effects on fish and fish habitats during the construction and operation phases by	Ongoing	In Compliance	BC Hydro developed a Fisheries and Aquatic Habitat Management Plan and is implementing measures in accordance with the plan.
	implementing mitigation measures detailed in a Fisheries and			

March 31, 2020. Revision 5 of the Construction Environmental Management Plan and Revision 2 of the Vegetation Clearing and Debris Management Plan were initiated in 2019 to incorporate this of April 1, 2018 to December 31, 2018 it is not included in this report. Compliance with this amendment will be documented in the next Annual EAC Compliance Report to be submitted to the EAO by ¹ BC Hydro received an Amendment to Condition No.4 of the EAC #14-02 on February 12, 2019. The condition now reads "Maintain a 15m machine free zone adjacent to watercourses during amendment. Compliance with these revisions will also be described in the next Annual EAC Compliance Report to be submitted to the EAO by March 31, 2020. prescription prepared and endorsed by a QEP. The rationale for the safety exemption must be documented in the prescription." As this amendment was received outside of the reporting window reservoir clearing (as measured from the Ordinary High Water Mark), except where worker safety prohibits manual tree falling and vegetation removal methods and as addressed in a site-specific

EAC 04

Mark)...¹

during reservoir clearing (as measured from the Ordinary High Water

Maintain a 15 m machine free zone adjacent to watercourses

Ongoing

In Compliance

Management) required that Contractor EPPs identify that the Contractor will maintain a 15 m

machine free zone adjacent to watercourses during reservoir clearing. BC Hydro audited compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.

Please refer to footnote below regarding the amendment to this Condition in February 2019, allowing for the selective use of mechanical clearing in riparian zones where safety prohibits manual falling. Future compliance reports will describe compliance with the condition as

revised in February 2019

During the reporting period, Section 4.5 of the CEMP (Fisheries and Aquatic Habitat

during construction to verify implementation of EPPs.

Section 4.5 of the CEMP (Fisheries and Aquatic Habitat Management) requires that Contractor Environmental Protection Plans (EPPs) identify how the Contractor will remove temporary structures as soon as they are no longer required. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits EAC 04

The Fisheries and Aquatic Habitat Management Plan must be

Aquatic Habitat Management Plan.

EAC 04

developed by a QEP

least the following:

The Fisheries and Aquatic Habitat Management Plan must include at

Ongoing

In Compliance

Completed

In Compliance

who prepared the plan

Section 8.0 of the Fisheries and Aquatic Habitat Management Plan (FAHMP) lists the QEPs

Remove temporary structures as soon as they are no longer

required.

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EAC	EAC	EAC	EAC	EAC	EAC	EAC	EAC	EAC	EAC	z
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Plant a 15 m wide riparian area along the reservoir shoreline diacent to BC Hydro-owned farmland where necessary to provide	Cap material repositioning areas with gravel and cobble, and ontour to enhance fish habitat conditions.	Contour Highway 29 borrow sites prior to decommissioning to rovide littoral fish habitat in the reservoir.	Construct the Hudson's Hope shoreline protection with large anatomical that will provide replacement fish habitat. Incorporate ditional fish habitat features (e.g., shear zones and point bars) into the final design of the Hudson's Hope shoreline protection.	Include fish habitat features (e.g., shears, large riprap point ars, etc.) in the final design of the north bank haul road bed naterial that would be placed in the Peace River.	ncorporate fish habitat features into the final design of the Highway I 9 roadway that would border the reservoir, east of Lynx Creek.	Contour and cap with gravels and cobble substrate the spoil rea between elevations 455 m and 461 m to provide a productive	Incorporate fish habitat features into the final capping of aterial relocation sites upstream of the dam.	Contour mainstream bars to reduce potential for fish stranding, s advised by FLNR.	Place material relocation sites (R5a, R5b, and R6) 15 m back om the mainstem to avoid affecting Peace River fish habitat.	EAC Condition
Initial Planning	Initial Planning	Initial Planning	Initial Planning	Completed	Initial Planning	Initial Planning	Initial Planning	Ongoing	Ongoing	Implementation Status
Future Requirement	Future Requirement	Future Requirement	Future Requirement	In Compliance	Future Requirement	Future Requirement	Future Requirement	In Compliance	In Compliance	Compliance Status
BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	Fish habitat features have also been incorporated into the design of the north bank haul road bed material placed in the Peace River; this work was completed in the Spring of 2016.	BC Hydro acknowledges and understands this condition. Section 6.2.3.2 of the FAHMP (Highway 29 Realignment Fish Habitat) describes this requirement.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	Section 6.2.1.1 of the FAHMP (Peace River Channel Contouring and Side Channel Enhancement) describes the contouring of mainstream bars associated with this condition. Initial stages of mainstem channel contouring are underway with completion expected by 2021.	Material relocation sites (R5a, R5b and R6) were designed to be at least 15 m from the imainstem of the Peace River as required by this condition.	Description

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EAC 05	EAC 04	EAC 04	EAC 04	EAC 04	EAC 04	EAC 04	EAC 04	EAC 04	EAC 04	No.
EAC Holder must manage harmful Project effects on fish during reservoir filling, turbine commissioning and operations by developing and implementing mitigation measures detailed in operational procedures developed by a QEP to:	The EAC Holder must develop, implement and adhere to the Final Plan, and any amendments, to the satisfaction of EAO.	The EAC Holder must file the Final Plan with EAO, FLNR, MOE and Aboriginal Groups a minimum of 30 days prior to commencement of construction.	This draft Plan must be provided to FLNR, MOE and Aboriginal Groups for review a minimum of 90 days prior to commencement of construction.	The EAC Holder must manage construction footprints to reduce the harmful Project effects on fish and fish habitat, in accordance with the conditions of the applicable Fisheries Act authorization(s) and direction provided by FLNR.	 Develop a feasible strategy for the salvage and relocation of stranded fish in habitats that are at risk of dewatering. 	 If the reservoir deviates from the normal operating range, the EAC Holder must report the event in accordance with water licence requirements. 	 Manage reservoir fluctuation within a 1.8 m maximum normal operating range from the maximum operating level of 461.8 m. 	 Enhance side channel complexes between the dam site and the confluence of the Peace and Pine rivers during low flows. 	 Increase wetted habitat by creating new wetted channels and restoring back channels on the south bank island downstream of the dam. 	EAC Condition
Initial Planning	Ongoing	Completed	Completed	Ongoing	Ongoing	Initial Planning	Initial Planning	Ongoing	Initial Planning	Implementation Status
Future Requirement	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	Future Requirement	Future Requirement	In Compliance	Future Requirement	Compliance Status
BC Hydro acknowledges and understands this condition.	The Fisheries and Aquatic Habitat Management Plan is being implemented as planned.	The Final Fisheries and Aquatic Habitat Management Plan was submitted to regulatory agencies, governments, and Indigenous groups on June 1, 2015.	The Draft Fisheries and Aquatic Habitat Management Plan was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014.	Construction footprints to reduce the harmful Project effects on fish and fish habitat are being managed in accordance with Fisheries Act authorizations 15-HPAC-00170 for site preparation activities and 15-HPAC-01160 for dam construction, reservoir preparation and filling, as well as any direction provided by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development.	Section 4.5 (Fisheries and Aquatic Habitat Management) of the CEMP requires that Contractor EPPs contain a feasible strategy for the salvage and relocation of stranded fish in habitats that are at risk of dewatering. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro commenced construction of Side Channel 108R, located on the right bank of the Peace River downstream of the dam site, in October 2018, per the FAHMP.	BC Hydro acknowledges and understands this condition. Section 6.2.1.1 of the FAHMP (Peace River Channel Contouring and Side Channel Enhancement) describes new and restored back channels on the south bank island downstream of dam, associated with this condition.	Description

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				Appendix G
No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 05	 Minimize levels of total dissolved oxygen gas in the tailwater; 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 05	 Minimize levels of dissolved gas super-saturation 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 05	These operational procedures must be developed in consultation with FLNR and MOE prior to reservoir filling, and include monitoring activities.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 06	The EAC Holder must implement mitigation measures, as detailed in a Fish Passage Management Plan.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 06	The Fish Passage Management Plan must be developed by a QEP.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 06	The Fish Passage Management Plan must include at least the following: - Establish a periodic capture data base/protocol/methodology for small-fish species to assess genetic exchange between upstream and downstream fish populations. Data must be provided annually to the relevant federal and provincial agencies. the relevant federal and provincial agencies.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition. The Fish Passage Management Plan included in the EIS (Volume 2 Appendix Q) describes the approach to manage fish passage. Following EAC condition 6, a Fish Passage Management Plan, which will include updates since submission of the EIS, will be prepared by QEPs and submitted identified the river diversion phase of construction as the first Project activity that is expected to affect upstream fish passage. The EIS (Volume 2 Section 12) identified the river diversion on the progress of the design and construction of the EIS has been received and taken into account, information on the progress of the design and construction of the temporary and permanent fish passage facilities, as well as plans for the operation of the facilities. The plan will also reference the monitoring of fish movement and fish passage that is described in the project's Fisheries and Aquatic Habitat Monitoring and Follow-up Program.

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No.	EAC 06	EAC 06	EAC 06	EAC 06	EAC 06	EAC 07	EAC 07	EAC 07
EAC Condition	 Address genetic differences exceeding beyond a pre- defined threshold (to be determined through discussion with the agencies) by implementing a translocation program. 	Design the installation and use of a trap and haul facility.	This draft Fish Passage Management Plan must be provided to FLNR, MOE and Aboriginal Groups for review a minimum of 90 days prior to Project activities that may impact upstream fish passage.	The EAC Holder must file the final Fish Passage Management Plan with EAO, FLNR, MOE and Aboriginal Groups a minimum of 30 days prior to Project activities that may impact upstream fish passage.	The EAC Holder must develop, implement and adhere to the final Fish Passage Management Plan, and any amendments, to the satisfaction of EAO.	The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project's effects.	The Fisheries and Aquatic Habitat Monitoring and Follow-up Program must be developed by a QEP.	The Program must include monitoring during construction for at least the following: - Effectiveness of standard mitigation measures for reducing sedimentation and fish stranding in the construction headpond and proximal reach of the river downstream of the dam.
Implementation Status	Initial Planning	Initial Planning	Initial Planning	Initial Planning	Initial Planning	Ongoing	Completed	Ongoing
Compliance Status	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	In Compliance	In Compliance	In Compliance
Description	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	A Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP) was submitted to the EAO on December 22, 2015. The FAHMFP provides for: a) monitoring fish and fish habitat during construction and operation of the Site C Clean Energy Project (the Project), and b) an outline for a procedure to evaluate and implement future mitigation and compensation options during operation of the Project. The types of monitoring and the outline of procedures for evaluation and implementation required by Condition 7 of the EAC are provided for in this FAHMFP. The monitoring will provide information that can be used to assess the effectiveness of the mitigation measures described in the Fisheries and Aquatic Habitat Management Plan.	Section 7.0 of the FAHMFP lists the QEPs who prepared the program.	These requirements are addressed in Mon-3 Peace River Physical Habitat Monitoring and Follow-up Program, and Mon-12 Site C Fish Stranding Monitoring Program, which are included in the FAHMFP as Appendices C and M, respectively. Data collection/monitoring for Mon-3 is scheduled to occur in future years. Monitoring of fish stranding sites is ongoing for Mon-12, the fish stranding monitoring program.

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No.	EAC Condition	Implementation Status	Compliance Status	
EAC 07	 Accuracy of predictions about physical changes to habitat in the reservoir area during the development and operation of the construction headpond during the diversion stage of the Project. 	Initial Planning	Future Requirement	3C Hydro acknc Mon-3 Peace Ri he FAHMFP. D
EAC 07	 Documenting, at an appropriate scale, spatial and temporal changes occurring in physical environmental conditions resulting from headpond hydrology, and in localized areas in relation to the effects of construction activities and mitigation procedures. 	Initial Planning	Future Requirement	3C Hydro ackr Vlon-3 Peace I he FAHMFP. I
EAC 07	 Effectiveness of mitigation measures for management of predicted effects of sediment and fish stranding, and provide information required to adjust the mitigation program to reduce unforeseen adverse effects, as required. 	Ongoing	In Compliance	Fhese requ Mon-12 Sit Data collec Ìsh strand
EAC 07	· Total dissolved gas.	Initial Planning	Future Requirement	3C Hydro Mon-11 S he FAHN
EAC 07	 The Fisheries and Aquatic Habitat Monitoring and Follow-up Program must include monitoring during operations for a period of twenty years for at least the following: Continued effectiveness of environmental protection measures undertaken during construction to mitigate effects on fish and fish habitat. 	Ongoing	In Compliance	-AHMFP Q of the
EAC 07	· Total dissolved gas.	Initial Planning	Future Requirement	3C Hyd Mon-1: he FAH

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Appendix G

NO. EAC 07 EAC 07 EAC 07	EAC 07
 EAC Condition Meeting monitoring commitments as per the Fish Passage Management Plan. Implement on-site monitoring of fish habitat areas in the side channel and mainstream margins, resulting from water fluctuations. Fish and fish habitat productivity, for reservoir, reservoir tributaries, and for downstream Peace River. 	 Fish and fish habitat productivity, for reservoir, reservoir tributaries, and for downstream Peace River.
Initial Planning Ongoing Ongoing	Ongoing
Compliance Status Future Requirement In Compliance	In Compliance
Description BC Hydro acknowledges and understands this condition. This requirement is addressed in: 1) Mon-13 Site C Fishway Effectiveness Monitoring; 2) Mon-14 Site C Trap and Haul Fish Release Location Monitoring Program; and 3) Mon-15 Site C Small Fish Species Translocation Monitoring Program. These monitoring plans are included as Appendices N – P of the FAHMFP. Data collection/monitoring for Mon-13, Mon-14, and Mon-15 are scheduled to occur in future years. These requirements are addressed in Mon-3 Peace River Physical Habitat Monitoring, and Mon-12 Site C Fish Stranding Monitoring, included as Appendices C and M of the FAHMFP. Data collection/monitoring for Mon-3 is scheduled to occur in future years. Monitoring of fish stranding sites is ongoing for Mon-12, the fish stranding monitoring program. This requirement is addressed in the following programs (status in parenthesis): 1) Mon-1a Site C Reservoir Fish Community Monitoring Program (scheduled to occur in future years) 2) Mon-1b Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Peace River Buil Trout Spawning Assessment is ongoing; Site C Reservoir Tributaries fish population indexing survey has been completed) 3) Mon-2 Peace River Fish Community Monitoring Program (ongoing)	 This requirement is addressed in the following programs (status in parenthesis): 1) Mon-1a Site C Reservoir Fish Community Monitoring Program (scheduled to occur in future years) 2) Mon-1b Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Peace River Bull Trout Spawning Assessment is ongoing; Site C Reservoir Tributaries fish population indexing survey has been completed) 3) Mon-2 Peace River Fish Community Monitoring Program (ongoing) 4) Mon-3 Peace River Fish Community Monitoring Program (ongoing) 5) Mon-4 Site C Reservoir Riparian Vegetation Monitoring Program (scheduled to occur in future years) 6) Mon-5 Peace River Riparian Vegetation Monitoring Program (scheduled to occur in future years) 9) Mon-7 Peace River Fish Food Organisms Monitoring Program (scheduled to occur in future years) 9) Mon-7 Peace River Fish Food Organisms Monitoring Program (scheduled to occur in future years) 9) Mon-7 Peace River Fish Food Organisms Monitoring Program (scheduled to occur in future years) 9) Mon-8 Site C Reservoir Water and Sediment Quality Monitoring Program (scheduled to occur in future years) 10) Mon-9 Peace River Water and Sediment Quality Monitoring Program (scheduled to occur in future years) 10) Mon-9 Reace River Water and Sediment Quality Monitoring Program (scheduled to occur in future years)

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and operations beginning 180 days following commencement of construction and operations phases, or in accordance with the applicable Fisheries Act authorization(s).	The EAC Holder must provide this draft Fisheries and Aquatic Habitat Monitoring and Follow-up Program to FLNR, MOE and Aboriginal Groups for review within 90 days following the commencement of the construction and operations phases.	The EAC Holder must file the final Fisheries and Aquatic Habitat Monitoring and Follow-up Program with EAO, FLN, MOE and Aboriginal Groups within 150 days following the commencement of the construction and operations phases.	The EAC Holder must develop, implement and adhere to the final Fisheries and Aquatic Habitat Monitoring and Follow-up Program, and any amendments, to the satisfaction of EAO.	
	Completed	Completed	Ongoing	
	In Compliance	In Compliance	In Compliance	
describe the status of each component of the FAHMFP.	The draft FAHMFP was submitted to regulatory agencies and Indigenous groups on June 1, 2015.	The final FAHMFP was submitted to regulatory agencies and Indigenous groups on December 22, 2015.	BC Hydro submitted the 2018 Annual Report for the FAHMFP on March 1, 2019. The report describes the status of each component of the FAHMFP. All of the monitoring programs that were scheduled to occur in 2018 were implemented. In support of meeting Fish and Fish Habitat conditions, a Fisheries and Aquatic Habitat Mitigation and Monitoring Technical Committee has been established with MOE, FLNR and Fisheries and Oceans Canada (DFO) staff to:	 review the approach and outcome of mitigation and monitoring plans, provide technical recommendations to BC Hydro and regulatory agencies, and endorse relevant plans, provide technical advice during plan implementation, provide recommendations for adaptive management where needed, and provide a mechanism to resolve areas of disagreement on technical or policy matters.

EAC 07

implemented.

options that are technically and economically feasible will be follow-up monitoring, as well as procedures for how compensation and compensation options after reservoir development and Program must outline a procedure for evaluating future mitigation

Program reporting must occur at least annually during construction The Fisheries and Aquatic Habitat Monitoring and Follow-up

Ongoing

In Compliance

BC Hydro submits Annual Reports for the FAHMFP on March 1 each year, with the first

report submitted March 1, 2017, and the most recent on March 1, 2019. These reports

EAC 07

The Fisheries and Aquatic Habitat Monitoring and Follow-up

Completed

In Compliance

Future Compensation Actions).

This requirement is addressed in Section 7.0 of the FAHMFP (Framework to Implement

Description

Implementation Status

Compliance Status

EAC Condition

<u>N</u>0.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
	VEGETATION AND ECOLOGICAL COMMUNITIES			
EAC 08	The EAC Holder must develop a Soil Management, Site Restoration, and Re-vegetation Plan to effectively manage disturbed soils, and to reclaim and revegetate disturbed construction areas to a safe and environmentally acceptable condition.	Completed	In Compliance	The Soil Management, Site Restoration, and Re-vegetation Plan is described in Section 4.1 of the CEMP for the Project. The final CEMP (Revision 1) was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016, Revision 4 in July 2016 (Revision 3 w not formally published). In addition to adding new CEMP requirements regarding soil management and site restoration, in July 2017 BC Hydro retained a new QEP responsible site restoration and invasive weed management, based out of the Construction Office at s
EAC 08	The Soil Management, Site Restoration, and Re-vegetation Plan must be developed by a QEP.	Completed	In Compliance	The Soil Management, Site Restoration, and Re-vegetation Plan is described in Section 4 of the Construction Environmental Management Plan (CEMP). Section 6.0 of the CEMP 1 the QEPs who prepared the plan. In 2016, the Soil Management, Site Restoration, a Re-vegetation Plan was reviewed and revised by the VWTC composed of members from MOE, the MFLNRO and Canadian Wildlife Services. In July 2017 BC Hydro retained a new QEP responsible for site restoration and invasive we management, based out of the Construction Office at site.
EAC 08	The Soil Management, Site Restoration, and Re-vegetation Plan must include at least the following: · Soil storage and handling measures that will maximize native soil use in restoration efforts, and manage incidental introduction and spread of invasive species.	Ongoing	In Compliance	Section 4.12 of the CEMP requires that Contractor EPPs address this requirement. BC Hydr audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. BC Hydro also developed the Invasive Weed Mitigation and Adaptive Management Plan (Rev 6 August 2017) and it has been issued to contractors to incorporate into their plans.

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EAC 08

areas where excavation, spoil placement, and staging activities

Manage run-off so that it is directed around soil stockpiles and

Ongoing

In Compliance

Implementation Status

Compliance Status

EAC Condition

No.

EAC 08 ·

Progressive closure and reclamation of any temporary

Ongoing

In Compliance

Section 4.12 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro

environmental audits during construction to verify implementation of EPPs.

audits compliance with this requirement by reviewing contractor EPPs and conducting Section 4.3 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro

Description

occur.

	EAC 08	EAC 08	EAC 08	EAC 08	EAC 08	EAC 09
disturbance. Disturbed sites are replanted within one year with ground cover, shrubs, or trees that are regionally appropriate once erosion concerns have been addressed.	 Identify native seed mixes used for site restoration and revegetation purposes. 	 Identify traditional use plants for revegetation purposes, in consultation with Aboriginal Groups. 	The EAC Holder must provide this draft Plan to FLNR, MOE, Aboriginal Groups, Peace River Regional District, City of Fort St. John and the District of Hudson's Hope for review a minimum of 90 days prior to the commencement of construction.	The EAC Holder must file the final Soil Management, Site Restoration, and Re-vegetation Plan with EAO, FLNR, MOE, Aboriginal Groups, Peace River Regional District, City of Fort St. John and the District of Hudson's Hope a minimum of 30 days prior to the commencement of construction.	The EAC Holder must develop, implement and adhere to the final Soil Management, Site Restoration, and Re- vegetation Plan, and any amendments, to the satisfaction of EAO.	The EAC Holder must develop a Vegetation and Invasive Plant Management Plan to protect ecosystems, plant habitats, plant communities, and vegetation with components applicable to the construction phase.
	Ongoing	Ongoing			Ongoing	Ongoing
	In Compliance	In Compliance			In Compliance	In Compliance
audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Appendix H of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Plant species of high traditional Indigenous value are being identified (per EAC 25) and will be included in the mix of species considered for re-vegetation activities conducted under the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP). See EAC conditions 25 and 26 below.	The Soil Management Site Restoration, and Re-vegetation Plan is described in Section 4.12 of the CEMP for the Project. The Draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).	Appendix H of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.15 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.

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				Appendix G
No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 09	 Invasive plant control measures to manage established invasive species populations and to prevent invasive species establishment. 	Completed	In Compliance	Section 4.15 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
				The Invasive Weed Mitigation and Adaptive Management Plan (IWMAMP) includes herbicide based invasive plant management in the dam site area, and the expansion of the vehicle cleanliness program, including the use of vehicle inspection forms. Rev 6 of the IWMAMP was completed and has been rolled out to some contractors.
				To date, contractors have completed the following: invasive plant removal through hand pulling, on-going inventories of invasive plant locations, extensive hydroseeding of exposed slopes across the Project area, regular vehicle inspections and cleaning through various methods to ensure vehicles are clean and free of dirt and invasive plants when transitioning
				Management Contractor that completed a control program across the dam site in September and October 2017. That contractor has continued into 2018 across all areas of the project and this will continue for the remainder of the project lifespan.
				The Main Civil Works contractor has retained an invasive plant species specialist to advise on invasive plant species management. BC Hydro installed two temporary wash stations at Gate A and Gate B in July 2017. The temporary wash stations were decommissioned at the onset of winter conditions in 2017 and procurement was completed for a permanent wash station which will be installed in spring 2019.

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				Appendix G
No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 09	Rare Plants and Sensitive Ecosystems The EAC Holder must expand its modelling, including completing field work, to improve identification of rare and sensitive plant communities and aid in delineation of habitats that may require extra care, 90 days prior to any Project activities that may affect these rare or sensitive plant communities	Completed	In Compliance	Field surveys in support of expanding modelling to improve the identification of rare and sensitive plant communities were completed in 2015. The results of these field surveys are described in the 2015 Annual Report for the VWMMP, provided to agencies on January 22, 2016.
EAC 09	 The EAC Holder must, with the use of a QEP, complete an inventory in areas not already surveyed and use rare plant location information as inputs to final design of access roads and transmission lines. 	Ongoing	In Compliance	Field surveys for rare plants along access roads and the Highway 29 realignment corridors not previously surveyed were conducted in 2018. The complete 2018 program report will be provided in the 2018 Annual Report for the VWMMP, which will be provided to agencies by 31 March 2019.
EAC 09	These pre- construction surveys must target rare plants as defined in Section 13.2.2 of the EIS —including vascular plants, mosses, and lichens.	Ongoing	In Compliance	Pre-construction surveys are targeting rare plants as defined in Section 13.2.2 of the EIS. The complete 2018 program report will be provided in the 2018 Annual Report for the VWMMP, which will be provided to agencies by 31 March 2019.
EAC 09	 The EAC Holder must create and maintain a spatial database of known rare plant occurrences in the vicinity of Project components that must be searched to avoid effects to rare plants during construction activities. 	Ongoing	In Compliance	A spatial database of rare plant occurrences in the vicinity of Project Components is captured on the Environmental Features Map. The Environmental Features Map was updated with the 2018 rare plant data on 20 August 2018 and provided to contractors for use in planning.
EAC 09	The database must be updated as new information becomes available and any findings of new rare plant species occurrences must be submitted to Environment Canada and MOE using provincial data collection standards.	Ongoing	In Compliance	A spatial database of rare plant occurrences in the vicinity of Project Components is captured on the Environmental Features Map. The Environmental Features Map was updated with the 2018 rare plant data in August 2018 and provided to contractors for use in planning. The 2018 rare plant data were submitted to the Program Botanist at the BC Conservation Data Center, MOE on 11 January, 2019.

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EAC 09

away from wetlands and known rare plant occurrences.

corridors, and construct transmission towers and temporary roads reduce the impact to rare plants, maximize use of existing access The EAC Holder must implement construction methods to

Ongoing

In Compliance

BC Hydro finalized the layout of access roads and laydown areas to avoid as many rare plant

buffers were established to avoid impacting rare plant occurrences.

plant occurrences located next to a planned access road needed for reservoir clearing. These occurrences as feasible. In 2018, "no disturbance" buffers were established around rare

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	Holder will engage the services of a Rare Plant g construction to design and implement an are plant translocation program in consultation v BC MOE's Guidelines for Translocation of Plant in BC (Maslovat, 2009).	Holder will engage the services of a Rare Plant g construction to design and implement an are plant translocation program in consultation v BC MOE's Guidelines for Translocation of Plant In BC (Maslovat, 2009). In BC (Maslovat, 2009). Plan to Environment Canada, FLNR, MOE, and ups for review a minimum of 90 days prior to nd operation phases.
	vith	vith Plant Completed
In Com		In Com
	npliance	npliance
	BC Hydro engaged the services of rare plant biologists to design the rare plant translocation program. Development of the program began in 2016 following the steps outlined in the VWMMP (June 5, 2015) and in "Guidelines for Translocation of Plant Species at Risk in Britis Columbia", by C. Maslovat, C. 2009. The 2018 Annual Report for the VWMMP, which will be submitted to regulatory agencies and Indigenous groups by March 31, 2019, outlines the status of the program as of December 2018.	BC Hydro engaged the services of rare plant biologists to design the rare plant translocation program. Development of the program began in 2016 following the steps outlined in the VWMMP (June 5, 2015) and in "Guidelines for Translocation of Plant Species at Risk in British Columbia", by C. Maslovat, C. 2009. The 2018 Annual Report for the VWMMP, which will be submitted to regulatory agencies and Indigenous groups by March 31, 2019, outlines the status of the program as of December 2018. The Vegetation and Invasive Plant Management Plan is described in Section 8.1 of the VWMMP. The draft and first revision of the VWMMP was submitted to regulatory agencies and Indigenous groups on October 17, 2014, and April 7, 2015, respectively.

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No.	AC 10		:AC 10	AC 10	EAC 11	EAC 11	AC 11
EAC Condition	The EAC Holder must fund or undertake directly with the use of a Rare Plant Botanist the following, during construction: Targeted surveys in the RAA (as defined in the amended EIS) to identify occurrence of the 18 directly affected tare plant encine for	identify occurrences of the 18 directly affected rare plant species (as defined in the amended EIS), and rare plant species identified by the MOEs Conservation Framework requiring additional inventories.	 A study focused on clarifying the taxonomy of Ochroleucus bladderwort (Utricularia ochroleuca), including field, herbaria, and genetic work in consultation with FLNR and the MOE (BC Conservation Data Centre). 	The EAC Holder must provide FLNR and MOE (BC Conservation Data Centre) with the findings and analysis of results from the surveys and taxonomic study.	The EAC Holder must compensate for the loss of rare and sensitive habitats and protect occurrences of rare plants by developing, or funding the development and implementation of a compensation program, during construction, that includes:	- Assistance (financial or in-kind) to the managing organization of suitable habitat enhancement projects in the RAA (RAA as defined in the amended EIS).	 Direct purchase of lands in the RAA and manage these lands and suitable existing properties owned by the EAC Holder to enhance or retain rare plant values where opportunities exist.
Implementation Status	Ongoing		Completed	Completed	Ongoing	Ongoing	Ongoing
Compliance Status	In Compliance		In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description	The requirement for targeted surveys in the Regional Assessment Area (RAA) is addressed in Section 7.4.7 Part B Supplemental Regional Rare Plant Surveys (see also S. 8.2.2) of the WWMMP.	Targeted surveys in the RAA began in 2016 and were completed in 2017. The final report of the targeted rare plant surveys in the RAA was included in the 2017 Annual Report for the VWMMP, which was submitted to regulatory agencies and Indigenous groups in March, 2018.	On March 22, 2016, BC Hydro submitted a letter to the Conservation Data Centre indicating that the taxonomy of Ochroleucus bladderwort had been completed by the BC MOE, and therefore no further work was required by BC Hydro. On March 24, 2016, the Conservation Data Centre confirmed the same understanding. Based on this information no further work is planned.	Results of the targeted surveys are provided to FLNR and MOE in the 2017 Annual Report for the VWMMP. The 2017 rare plant data were submitted to the Program Botanist at the BC Conservation Data Center, MOE on 2 November 2017 and 6 February 2018. As noted above, no further work is required on taxonomy of Ochroleucus bladderwort.	BC Hydro finalized its experimental rare plant translocation program in early 2018. This program will enhance habitat by increasing the density of rare plans in suitable habitat, using propagules that were salvaged from all areas that will be impacted by the Project. Work to salvage rare plants under this program occurred in 2018.	Habitat enhancement activities to compensate for the loss of rare and sensitive habitats and for protecting occurrences of rare plants are being conducted through Ducks Unlimited for wetland compensation activities and Ecologic Consultants through the Saulteau-EBA Environmental Services Joint Venture for the Rare Plant Translocation Program.	In 2014 BC Hydro purchased the Marl Fen property, located outside Hudson's Hope. This property supports several rare plant species. This property is being managed to maintain rare plants along with other wildlife and vegetation values. Results of surveys documenting species that are using the property are provided in the 2015 Annual Reports for the VWWMP.

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No. EAC 11	EAC 11	EAC 12	EAC 12	EAC 12	EAC 12
EAC Condition The EAC Holder must engage with FLNR, MOE and Aboriginal Groups	The EAC Holder must engage with FLNR, MOE and Aboriginal Groups with regard to the development of the compensation program.	The EAC Holder must develop a Wetland Mitigation and Compensation Plan.	The Wetland Mitigation and Compensation Plan must include an assessment of wetland function lost as a result of the Project that is important to migratory birds and species at risk (wildlife and plants).	The Wetland Mitigation and Compensation Plan must be developed by a QEP with experience in wetland enhancement, maintenance and development.	 The Wetland Mitigation and Compensation Plan must include at least the following: Information on location, size and type of wetlands affected by the Project;
Implementation Status Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Compliance Status In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description The compensation plan is described in the VWIMIP, Section 7.4.4 Part D. The draft and first	The compensation plan is described in the VWMMP, Section 7.4.4 Part D. The draft and first revision of the VWMMP was submitted to regulatory agencies and Indigenous groups on October 17, 2014, and April 7, 2015, respectively. The final VWMMP was submitted to regulatory agencies and Indigenous groups on June 5, 2015. Consultation is ongoing. An Environmental Forum was held in Fort St. John on November 13, 2018 to discuss ongoing aspects of the Rare Plant Translocation Program and the Wetland Compensation Program with interested Indigenous groups. Indigenous groups have also been asked for input regarding potential wetland compensation opportunities.	The Wetland Mitigation and Compensation Plan is described in Section 7.3 (see also Section 8.4) of the VWMMP. Details of the Wetland Mitigation and Compensation Plan continue to be developed as wetland enhancement projects are identified and implemented in the Peace Region.	Drafts of the assessment of wetland function were provided in the 2015 and 2016 Annual Report for the VWMMP. A revised assessment of wetland function is provided in the 2018 Annual Report for the VWMMP.	The Wetland Mitigation and Compensation Plan is described in Section 7.3 (see also Section 8.4) of the VWMMP. Section 2.3 of the Plan lists the QPs who prepared the plan.	Data on wetland location, size and type gathered during baseline surveys are summarized in Section 7.3.3 of the VWMMP. To gather additional site specific data on wetlands within the Project footprint, BC Hydro, in cooperation with Ducks Unlimited, has developed a wetland monitoring plan as a component of the assessment of wetland function. Wetland monitoring has been occurring in various aspects of the Local Assessment Area (as defined in the Project's Environmental Impact Statement) prior to and during construction, but this monitoring plan will provide additional structure to identify and fill key information gaps needed to better understand Project impacts to wetlands and to help inform the determination of appropriate compensation. The wetland monitoring plan was implemented in Spring of 2018.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 12	 If roads cannot avoid wetlands, culverts will be installed under access roads to maintain hydrological balance, and sedimentation barriers will be installed; 	Ongoing	In Compliance	Culverts are installed under access roads where necessary to maintain hydrological balance, and sedimentation barriers installed as required, as described in Section 4.4 of the CEMP.
EAC 12	 Stormwater management will be designed to control runoff and direct it away from work areas where excavation, spoil placement, and staging activities occur. 	Ongoing	In Compliance	Stormwater across the site is managed by contractors under the Erosion and Sediment Control Program. Management includes installation of sedimentation ponds and interception ditches. Interception ditches capture and divert stormwater away from construction areas into the sedimentation ponds. Water from the sedimentation ponds is discharged into surrounding environment.
EAC 12	 Develop, with the assistance of a hydrologist, site-specific measures prior to construction to reduce changes to the existing hydrologic balance and wetland function during construction of the Jackfish Lake Road and Project access roads and transmission line. 	Ongoing	In Compliance	BC Hydro has engaged a forestry consultant to design access roads and clearing prescriptions along the transmission line. A hydrology of wetlands along the forestry consultant has reviewed the design to ensure that the hydrology of wetlands along the transmission line is maintained Due to a voluntary suspension of work in 2018 as a result of an injunction application by the West Moberly First Nations, several sections of the transmission line were not cleared nor were access roads built within these areas. This clearing and access road construction resumed when the injunction was dismissed by the BC Supreme Court in October 2018. The balance of access road construction works are expected to be complete by October 2019. The design and construction of these roads continues to involve input from the consultant hydrologist to ensure compliance with this condition.
EAC 12	 All activities that involve potentially harmful or toxic substances, such as oil, fuel, antifreeze, and concrete, must follow 	Ongoing	In Compliance	Section 4.13 of the CEMP requires contractors to follow approved work practices and BMPs with regard to potentially harmful or toxic substances. BC Hydro audits compliance with this

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from time to time).

Develop with Care (BC Ministry of Environment 2012 or as amended approved work practices and consider the provincial BMP guidebook

construction to verify implementation of EPPs.

requirement by reviewing contractor EPPs and conducting environmental audits during

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EAC 12	EAC 12	EAC 12	EAC 12	No.
The EAC Holder must file the final Wetland Mitigation and Compensation Plan with EAO, Environment Canada, FLNR, MOE, Peace River Regional District, District of Hudson's Hope and Aboriginal Groups, a minimum of 30 days prior to any activity affecting the wetlands.	The EAC Holder must provide this draft Wetland Mitigation and Compensation Plan to Environment Canada, FLNR, MOE, Aboriginal Groups, Peace River Regional District and District of Hudson's Hope for review a minimum of 90 days prior to any activity affecting the wetlands.	The EAC Holder must monitor construction and operation activities that could cause changes in wetland functions.	 A defined mitigation hierarchy that prioritizes mitigation actions to be undertaken, including but not limited to: Avoid direct effects where feasible; Minimize direct effects where avoidance is not feasible; o Maintain or improve hydrology where avoidance is not feasible; o Replace like for like where wetlands will be lost, in terms of functions and compensation in terms of area; Improve the function of existing wetland habitats; and Create new wetland habitat 	EAC Condition
Completed	Completed	Ongoing	Ongoing	Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
The final VWMMP was submitted to regulatory agencies and Indigenous groups on June 5, 2015.	The draft and first revision of the VWMMP was submitted to regulatory agencies and Indigenous groups on October 17, 2014, and April 7, 2015, respectively.	BC Hydro requires its contractors to describe in their EPPs construction activities that could cause changes in wetland functions, including how those construction activities will be monitored and at what frequency. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	The CEMP describes how impacts to wetlands are avoided or minimized to the degree feasible, including through the maintenance or improvement of hydrology. In 2016 BC Hydro and Ducks Unlimited initiated the process of identifying wetland mitigation opportunities that could become components of the wetland mitigation plan. To date, BC Hydro has secured 2 properties for wetland compensation and is in the process of identifying compensation opportunities on Crown land to contribute towards fulfilling the plan requirements while also facilitating the current use of lands and resources by Indigenous groups. The construction guidelines for Area A, a new wetland area to be completed as part of the dam site reclamation area, were submitted with the June 5, 2015 VWMMP, and have been incorporated as requirements in the Main Civil Works contract covering this area. Creation of this new wetland is planned to occur toward the end of the 8 year construction period, and will contribute toward wetland compensation requirements.	Description

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No.	EAC 12	EAC 13	EAC 13	EAC 13	EAC 13	EAC 13	EAC 13	EAC 13
EAC Condition	The EAC Holder must develop, implement and adhere to the final Wetland Mitigation and Compensation Plan, and any amendments, to the satisfaction of EAO.	The EAC Holder must develop the Vegetation Clearing and Debris Management Plan.	The Vegetation Clearing and Debris Management Plan must be developed by a QEP.	The Vegetation Clearing and Debris Management Plan must ensure that clearing would be conducted in the approved Project Activity Zone only.	And construction would be monitored by the QEP to prevent any unnecessary clearing.	Specific to the transmission line component of the Project: The EAC Holder must not grub the right of way with the exception of transmission tower foundation pads, temporary work spaces and laccess roads.	• Where conductor clearance allows, the EAC Holder must not remove riparian vegetation along watercourses or waterbodies crossed by the transmission corridor.	To reduce erosion along steep or unstable slopes, the EAC Holder must apply best management practices for reservoir clearing along riparian areas and watercourses.
Implementation Status	Ongoing	Completed	Completed	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Compliance Status	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description	BC Hydro has partnered with Ducks Unlimited and procured property to start fulfilling the Plan's wetland compensation requirements, with wetland compensation activities ongoing. In addition to work on private lands, BC Hydro and Ducks Unlimited are in the process of identifying wetland compensation opportunities on Crown land to contribute towards fulfilling wetland compensation requirements while also facilitating the current use of lands and resources by Indigenous groups.	Revision 1 of the VCDMP was submitted to regulatory agencies and Indigenous groups on June 5, 2015.	Section 11.0 of the VCDMP lists the QPs who prepared the plan.	BC Hydro prepares the clearing plans for all work on the Site C Project. As part of this plan preparation, BC Hydro ensures that clearing boundaries are within the Project activity Zone.	BC Hydro requires its contactors to prepare EPPs that include an explanation of environmental monitoring effort and that this monitoring occur by a QEP or under the supervision of a QEP.	BC Hydro requires its transmission line clearing and construction contractors to describe in their EPPs construction activities that comply with this condition's requirement. These EPPs are reviewed and accepted by BC Hydro and BC Hydro inspects the contractors for compliance with their EPPs. No observations of non- compliance with this condition were recorded during 2018 inspections.	BC Hydro acknowledges and understands this condition. A special prescription is in place for transmission line clearing that requires retention of low growing willow species that are not expected to grow into the overhead conductor's limits of approach.	The Riparian Vegetation Management Area (RVMA) buffer is established 15m back from the Ordinary High Water Mark (OHWM). Terrain Stability Field Assessments (TSFAs) are done by a terrain specialist to ensure any clearing on or near Terrain Class V (high likelihood of landslide initiation following timber harvesting or road construction) areas will not increase slope instability. Areas of potential instability will be removed until a TSFA can be completed. Steep areas will be handfelled (fall and leave) where safe to do so. Areas deemed unsafe or unstable will be left standing until inundation occurs. Boundary limits for clearing activities are flagged (orange ribbon) in the field.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 13	Practices must include but not limited to the following: Retention of all trees on steep, unstable slopes that would be highly susceptible to landslides if the vegetation was removed. 	Ongoing	In Compliance	Clearing plans for the dam site area Moberly River drainage and eastern reservoir have all ha extensive Terrain Stability Field Assessments (TSFA) completed. All layouts have incorporated the recommendations of a geotechnical specialist and a spreadsheet recording recommendations and how they have been addressed in the field (with associated map references) has been developed by our forestry consultant. BC Hydro has also been provided the clearing plans and TSFA reports to review as the owner's geotechnical specialists.
EAC 13	 Retention of non-merchantable trees and vegetation in riparian areas within a 15 m buffer from the Ordinary High Water Mark. 	Ongoing	In Compliance	Clearing prescriptions include descriptions on how Riparian Vegetation Management Area clearing is to be conducted and the level of Riparian Vegetation Management Area (RVMA) retention within each treatment unit (TU). The RVMA buffer is flagged in the field, 15m back from the Ordinary High Water Mark (OHWM) (as per the Approved Work Practices for Managing Riparian Vegetation Guide, 26 Oct 2003).
EAC 13	Merchantable trees and vegetation that may protrude above 455 m elevation may still be removed using clearing practices to maintain a 15 m machine-free zone from the OHWM. ²	Ongoing	In Compliance	During the reporting period, the Vegetation Clearing and Debris Management Plan required that the Contractor maintain a 15 m machine free zone adjacent to watercourses during reservoir clearing. BC Hydro audited compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. Please refer to footnote below regarding the amendment to this Condition in February 2019,

² BC Hydro received an Amendment to Condition No.13 of the EAC #14-02 on February 12, 2019. The condition now reads "Merchantable trees and vegetation that may protrude above 455 m elevation may still of April 1, 2018 to December 31, 2018 it is not included in this report. Compliance with this amendment will be documented in the next Annual EAC Compliance Report to be submitted to the EAO by March 31, site-specific prescription prepared and endorsed by a QEP. The rationale for the safety exemption must be documented in the prescription." As this amendment was received outside of the reporting window be removed using clearing practices to maintain a 15 m machine-free zone from the OHWM except where worker safety prohibits manual tree falling and vegetation removal methods and as addressed in a regulators on February 15, 2019. Compliance with these revised plans will be described in the next Annual EAC Compliance Report to be submitted to the EAO by March 31, 2020. 2020. Note that the Construction Environmental Management Plan and Vegetation Clearing and Debris Management Plan were updated to reflect this amendment (as well as other changes), and submitted to

allowing for the selective use of mechanical clearing in riparian zones where safety prohibits

manual falling. Future compliance reports will describe compliance with the condition as

revised in February 2019.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 13	The EAC Holder must provide this draft Vegetation Clearing and Debris Management Plan to Environment Canada, FLNR, MOE, Aboriginal Groups, Peace River Regional District and District of Hudson's Hope for review a minimum of 90 days prior to commencement of construction.	Completed	In Compliance	The draft VCDMP was submitted to regulatory agencies, governments, and Indigenous groups October 17, 2014.
EAC 13	The EAC Holder must file the final Vegetation Clearing and Debris Management Plan with EAO, Environment Canada, FLNR, MOE, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups, a minimum of 30 days prior to commencement of construction.	Completed	In Compliance	The final VCDMP was submitted to regulatory agencies, governments, and Indigenous groups on June 5, 2015, respectively.
EAC 13	The EAC Holder must develop, implement and adhere to the final Vegetation Clearing and Debris Management Plan, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	The VCDMP is being implemented as planned. Please refer to footnote below regarding revisions to the VCDMP to be described in the next EAC Compliance Report reporting period.
EAC 14	The EAC Holder must develop a Vegetation and Ecological Communities Monitoring and Follow-up Program for the construction phase and first 10 years of the operations phase.	Completed	In Compliance	This requirement is addressed in Section 7.4.4, Part C of the VWMMP.
EAC 14	The Vegetation and Ecological Communities Monitoring and Follow-up Program must be developed by a QEP.	Completed	In Compliance	The Vegetation and Ecological Communities Monitoring and Follow-up Program is described in Section 7.4.4, Part C of the VMMMP. Section 2.3 of the VMMMP lists the QPs who prepared the plan.
EAC 14	The Vegetation and Ecological Communities Monitoring and Follow-up Program must include at least the following: Definition of the study design for the rare plant	Ongoing	In Compliance	Development of the Rare Plant Translocation program began in 2016. The 2018 Annual Report for the VWMMP, to be submitted by March 31, 2019, provides an update on the status of the translocation program.

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EAC 14

translocation program (see condition 9).

under the supervision of a Rare Plant Botanist.

assess the survival and health of translocated rare plant species,

Plan for following-up monitoring of any translocation sites to

Ongoing

In Compliance

status of the translocation program.

Development of the Rare Plant Translocation program began in 2016. The 2018 Annual Report for the VWMMP, to be submitted by March 31, 2019, provides an update on the

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 15	If lighting cannot be directed away from surrounding areas, the EAC Holder must ensure additional mitigation measures are implemented to reduce light pollution, including light shielding.	Ongoing	In Compliance	The requirement to focus lighting into work areas is included in Section 4.17 of the CEMP. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. Lighting was focused on the work site in all construction locations.
EAC 15	 A mandatory environmental training program for all workers so that they are informed that hunting in the vicinity of any work site/Project housing site is strictly prohibited for all workers. 	Completed	In Compliance	The requirement for all workers to receive environmental training is included in Section 3.0 of the CEMP V4. Section 4.17 of the CEMP V4 clarifies some of the activities that are prohibited and the training that is required: "Project workers shall be prohibited from hunting while on construction sites, Project built roads or worker housing sites, Cleaning game at construction sites Project built roads or worker housing sites. All workers are required to attend both a BC Hydro orientation and a contractor specific orientation(s) prior to starting work on-site. A component of these training sessions is environmental training for workers. Completion of these sessions required prior to the issuance of site access cards."
EAC 15	The EAC Holder must ensure that all workers are familiar with the Wildlife Management Plan.	Ongoing	In Compliance	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation EPPs.
EAC 15	The EAC Holder must submit this draft Wildlife Management Plan to Environment Canada, FLNR, MOE and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.	Completed	In Compliance	The Wildlife Management Plan is described in Section 4.17 of the CEMP and Section 8.6.2 of the VWMMP. The Draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014. The draft and first revision of the VWMMP wa submitted to regulatory agencies and Indigenous groups on October 17, 2014, and April 7, 2015, respectively.

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EAC 15

of EAO.

The EAC Holder must develop, implement and adhere to the final

Ongoing

In Compliance

and Indigenous groups on June 5, 2015.

The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. The final VWMMP was submitted to regulatory agencies

environmental audits during construction to verify implementation of EPPs.

Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting

Wildlife Management Plan, and any amendments, to the satisfaction

EAC 15

The EAC Holder must file the final Wildlife Management Plan with

Completed

In Compliance

EAO, Environment Canada, FLN, MOE and Aboriginal Groups, a

minimum of 30 days prior to commencement of construction.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 16	If loss of sensitive wildlife habitat or important wildlife areas cannot be avoided through Project design or otherwise mitigated, the EAC Holder must implement the following measures, which must be described in the Vegetation and Wildlife Mitigation and Monitoring Plan.	Ongoing	In Compliance	All required measures of EAC condition 16 are identified in the WWMIP. The final WWMMP was submitted to regulatory agencies and Indigenous groups on June 5, 2015.
EAC 16	The Vegetation and Wildlife Mitigation and Monitoring Plan must include the following compensation measures: Compensation options for wetlands must include fish-free areas to manage the effects of fish predation on invertebrate and amphibian eggs and larvae and young birds.	Ongoing	In Compliance	Section 8.7.2 of the VWMMP sets out the specifications for the new wetland area (Area A of the dam site area), which is to include fish-free areas. Additional compensation options for wetlands, still in development, will also include fish-free areas.
EAC 16	 Mitigation for the loss of snake hibernacula, artificial dens must be included during habitat compensation. 	Ongoing	In Compliance	BC Hydro has engaged a contractor to develop and implement construction and monitoring of artificial snake hibernacula. The mitigation and monitoring plan for snakes has been reviewed by the VWTC and was deemed complete in 2018. Installation of snake hibernacula is planned for 2019.
EAC 16	• Management of EAC Holder-owned lands adjacent to the Peace River suitable as breeding habitat for Northern Harrier and Short-eared Owl.	Ongoing	In Compliance	BC Hydro continues to manage three BC Hydro owned properties identified for retention and wildlife management. All three properties provide suitable habitat for non-wetland birds, including the northern harrier and short-eared owl. Surveys in 2016 documented short-eared owl on one property and northern harrier on all three properties.
EAC 16	 Establishment of nest boxes for cavity-nesting waterfowl developed as part of wetland mitigation and compensation plan, and established within riparian vegetation zones established along the reservoir on BC Hydro-owned properties. 	Ongoing	In Compliance	The establishment of nest boxes for cavity-nesting waterfowl is addressed in the Section 7.3.6 of the VWMMP (Wetland compensation). An expanded nest box program to mitigate for the loss of nesting sites for cavity nesting bird species has been developed based on discussions with the VWTC. Implementation began in 2017 after review by the VWTC.
EAC 16	 A design for bat roosting habitat in HWY 29 bridges to BC Ministry of Transportation and Infrastructure (MOTI) for consideration into new bridge designs located within the Peace River valley. 	Completed	In Compliance	BC Hydro received notification on 25 October 2018 from the Regional Manager of Environmental Services, MOTI, that MOTI does not support the placement of bat roosting boxes on bridges. Therefore, the bat boxes will not be integrated into the designs of any new bridges, including the planned Farrell Creek, Halfway River, Cache Creek and Lynx Creek bridges.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 16	 Following rock extraction at Portage Mountain, creation of hibernating and roosting sites for bats. 	Ongoing	In Compliance	The Portage Mountain Quarry development plan has been altered to avoid impacting bat hibemacula, through the VWTC. Section 4.2 of the CEMP states that blasting will be prohibited within 300 m of bat hibernacula from September 15 to May 15. A monitoring plan has also been developed through the VWTC to detect any changes to bat use of the hibemacula at Portage Mountain due to quarrying activity, if any. Test blasts occurred in summer of 2018, outside of the restricted activity period that was established to mitigate impacts to bat use of the hibernacula (i.e., September 15 to May 15). Noise monitoring conducted at the site determined that noise and vibration caused by test blasts did not exceed thresholds at hibernacula locations, as defined in Best Management Practices for Bats in BC (2016).
EAC 16	 Creation of natural or artificial piles of coarse woody debris dispersed throughout the disturbed landscape to maintain foraging areas and cold-weather rest sites, and arboreal resting sites, for the fisher population south of the Peace River. 	Ongoing	In Compliance	Twenty-five (25) coarse woody debris piles for fisher have been created within the dam site area and 31 were constructed along the transmission line. A map of the CWD piles created by October 2018 will be included in the 2018 Annual Report for the VWMMP. BC Hydro has installed signs that advise people to remain distant from the piles. Additional piles are planned to be installed along the transmission line ROW at a target installation rate of one per kilometer where adjacent habitat is appropriate for fisher.
EAC 16	The EAC Holder must provide this draft Vegetation and Wildlife Mitigation and Monitoring Plan to Environment Canada, FLNR, MOE, and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.	Completed	In Compliance	The draft and first revision of the VWMMP was submitted to regulatory agencies and Indigenous groups on October 17, 2014, and April 7, 2015, respectively.
EAC 16	The EAC Holder must file the final Vegetation and Wildlife Mitigation and Monitoring Plan with EAO, Environment Canada, FLNR MOE, and Aboriginal Groups, a minimum of 30 days prior to commencement of construction.	Completed	In Compliance	The final VWMMP was submitted to the same recipients on June 5, 2015. Section 2.0 of the VWMMP provides a concordance table which shows how each of the requirements of Condition 16 is addressed in the Plan, including references to the CEMP as appropriate.
EAC 16	The EAC Holder must develop, implement and adhere to the final Vegetation and Wildlife Mitigation and Monitoring Plan, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	The 2015 Annual Report for the VWMMP describes implementation of the plan to date. Please refer to responses related to EAC Condition 19 for mitigation specific to reducing the risk of injury and mortality to amphibians and snakes.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 17	As part of the Vegetation Clearing and Debris Management Plan, if the EAC Holder must conduct clearing activities during these specified critical time periods: Songbirds: May 1 through July 31; Trumpeter swan, raptors and owls: April 1 through July 31; and Sharp-tailed grouse: mid-April and mid-July (lek to nesting to hatching).	Ongoing	In Compliance	Section 3.5 of the VCDMP and Section 4.17 of the CEMP describe mitigation for addressing the requirements outlined in Condition 17. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify appropriate implementation of the EPP.
EAC 17	The EAC Holder must first develop and implement a nest and lek search protocol, in consultation with the FLNR and MOE.	Ongoing	In Compliance	The nest search protocol was revised in 2016, was included as Appendix 2 of the 2016 Annua Report for the VWMMP, and submitted to regulatory agencies and Indigenous groups on March 31, 2017. An expanded Sharp-tailed Grouse lek mitigation program was developed based on discussions with the VWTC and provided in Section 4.17 of CEMP Revision 4 issued July 26, 2016. The Sharp-tailed Grouse lek mitigation program has been revised in discussions with the VWTC.
EAC 17	The EAC Holder must provide FLNR and MOE with all known nest and lek locations.	Ongoing	In Compliance	BC Hydro provides FLNR and MOE with all known nest and lek locations annually. All 2017 data on known nest locations will be provided to FLNR and MOE by March 31, 2018. No new leks were identified in 2017.
EAC 17	The EAC Holder must flag these sites and require employees and contractors to avoid these sites.	Ongoing	In Compliance	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 17	The nest and lek search protocol must include specifications for buffers around active nest sites and flagging, as required by FLNR.	Ongoing	In Compliance	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 18	The EAC Holder must avoid human-wildlife conflicts during the construction phase by implementing measures detailed in a Human-Wildlife Conflict Management Plan.	Ongoing	In Compliance	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 18	 The Human-Wildlife Conflict Management Plan must include at least the following: Prior to the commencement of work, the EAC Holder must ensure that all crews have participated in Bear Aware or a similar training program. 	Ongoing	In Compliance	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 18	 Prohibit feeding of wildlife at work sites. 	Ongoing	In Compliance	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.

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No.	EAC 18	AC 18	AC 18	AC 18	AC 18	EAC 18		AC 18
EAC Condition	 Ensure that all construction areas and worker housing sites are kept clean and free of discarded anthropogenic food sources, with garbage securely stored in verified bear-proof containers or removed from site. 	 Prohibit work crews from hunting while on any work sites, Project built roads and worker housing sites. 	 Prohibit work crews from cleaning game at construction sites. Project built roads and worker housing sites. 	 Measures to minimize road mortality, including posted speed limits, provision of alternative transportation options including, for example, carpooling, 	 Procedures for reporting dangerous human-wildlife incidents and incidents of wildlife mortality. 	 Prompt notification to the appropriate authorities of incidences of roadkill, or, in the event a wildlife act permit to manage road kill is obtained by the EAC Holder, the EAC Holder must implement management measures as per permit requirements. 	 Review of effectiveness of measures to manage dangerous human-wildlife interactions. 	
Implementation Status	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	
Compliance Status	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	
Description	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. These inspections have identified on a few occasions the presence of non- animal proof waste containers; but in all cases these containers were either removed entirely or replaced with animal-proof containers within 2-weeks.	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.17 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	

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Annual Progress Report No. 4

	(Combined with Quarterly Progress Report No. 18) January 2019 to December 2019	Appendix G
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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 18	The EAC Holder must file the final Human-Wildlife Conflict Management Plan with EAO and the MOE Conservation Officer Service a minimum of 30 days prior to the commencement of construction.	Completed	In Compliance	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).
EAC 18	The EAC Holder must develop, implement and adhere to the final Human-Wildlife Conflict Management Plan, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of the EPP.
EAC 19	The EAC Holder must use reasonable efforts to avoid and reduce injury and mortality to amphibians and snakes on roads adjacent to usetlanck and other areas where amphibians or snakes are known to	Ongoing	In Compliance	BC Hydro is using reasonable efforts to avoid and reduce injury and mortality to amphibians and snakes.
	migrate across roads including locations with structures designed for wildlife passage			Section 4.17 of Rev 4 of the CEMP outlines mitigation for amphibians. For amphibian salvage and relocation, BC Hydro has obtained Wildlife Act permit FJ16-226024, which is valid until 31 December 2023.
				BC Hydro developed the Site C Western Toad Management Procedure, which describes a protocol for conducting amphibian assessments within and adjacent to work sites, halting work when necessary, and translocating migrating toads along their way and past dangerous work areas. The Site C Western Toad Management Procedure was developed through and deemed complete by the VWTC. This Procedure has been passed to all relevant contractors since its completion 21 July 2017, for inclusion in appropriate EPPs. Also, BC Hydro implemented barrier fencing to prevent migration of toads across roads at Portage Mountain quarry, and also incorporated special amphibian crossing culverts into the design of the road to the quarry.
				Amphibian salvage and translocation activities in 2018 are described in the 2018 Annual Report for the VWMMP, to be submitted by March 31, 2019.

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No.	EAC 19		EAC 20	EAC 21	EAC 21	EAC 21	EAC 21
EAC Condition	The EAC Holder must consult with Environment Canada, FLNR and MOE with regard to the size and number of the proposed structures prior to construction.		The EAC Holder must use reasonable efforts to minimize disturbance to wildlife during the construction phase by scheduling construction activities in accordance with the Construction Environmental Management Plan.	The EAC Holder must ensure that measures implemented to manage harmful Project effects on wildlife resources are effective by implementing monitoring measures detailed in a Vegetation and Wildlife Mitigation and Monitoring Plan.	The Vegetation and Wildlife Mitigation and Monitoring Plan must be developed by a QEP.	 The Vegetation and Wildlife Mitigation and Monitoring Plan must include at least the following: Monitor Bald Eagle nesting populations adjacent to the reservoir, including their use of artificial nest structures. 	 Monitor waterfowl and shorebird populations and their use of natural wetlands, created wetlands, and artificial wetland features.
Implementation Status	Ongoing		Ongoing	Ongoing	Completed	Ongoing	Ongoing
Compliance Status	In Compliance		In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description	BC Hydro has developed a Western Toad Management Procedure, which was deemed complete by the VWTC in 2017, to salvage amphibians where they are observed along roads adjacent to wetlands and in other areas where they are known to migrate across roads. That procedure calls for installation of crossing structures after 3 years of documenting amphibian migration across a road in the same location. At this time no migration areas across roads have been identified through this protocol.	The precautionary installation of crossing mitigation structures is planned across roads at Portage Mountain quarry, and may be considered elsewhere in the Project area. BC Hydro will consult with Environment Canada, FLNR and MOE with regard to the size and number of the proposed structures prior to construction.	Section 4.17 of the CEMP describes how requirements for EPPs in minimizing disturbance to wildlife during the construction phase, including conducting works within the least risk timing windows. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	The final VWIMP was developed and submitted to regulatory agencies, governments and Indigenous groups on June 5, 2015.	Section 2.3 of the VWMMP lists the QEPs who prepared the plan.	Monitoring of the Bald Eagle nesting population occurred three times over May and June in 2018. Twenty-eight (28) bald eagle nests were identified as active in 2018, of which 22 were observed containing at least one chick. The annual bald eagle nest monitoring report will be provided in the 2018 Annual Report of the VWMMP, which will be submitted by March 31, 2019.	Spring and fall waterfowl and shorebird (i.e., waterbird) surveys were conducted along the Peace River and the transmission line ROW in 2018. The annual waterbird monitoring report will be provided in the 2018 Annual Report of the VWMMP, which will be submitted by March 31, 2019.

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EAC 21	EAC 21	EAC 21	EAC 21	EAC 21	EAC 21	EAC 21	No.
The EAC Holder must develop, implement and adhere to the final Vegetation and Wildlife Mitigation and Monitoring Plan, and any amendments, to the satisfaction of EAO.	The EAC Holder must file the final Vegetation and Wildlife Mitigation and Monitoring Plan must with EAO, FLNR, MOE, Environment Canada and Aboriginal Groups a minimum 30 days prior to the commencement of construction.	The EAC Holder must provide this draft Vegetation and Wildlife Mitigation and Monitoring Plan to FLNR, MOE, Environment Canada and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.	 Require annual reporting during the construction phase and during the first 10 years of operations to EAO, beginning 180 days following commencement of construction. 	 Survey the distribution of western toad and garter snake populations downstream of the Site C dam to the Pine River. 	 Survey songbird and ground-nesting raptor populations during construction and operations. 	 Monitor amphibian use of migration crossing structures installed along Project roads. 	EAC Condition
Ongoing	Completed	Completed	Ongoing	Ongoing	Ongoing	Ongoing	Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
The VWMMP was submitted in June 2015, and is being implemented and adhered to. Implementation of the VWMMP in 2018 will be summarized in the 2018 Annual Report for the VWMMP, which will be submitted by March 31, 2019.	The final VWMMP was submitted to regulatory agencies and Indigenous groups on June 5, 2015.	The draft and first revision of the VWMMP was submitted to regulatory agencies and Indigenous groups on October 17, 2014, and April 7, 2015, respectively. The final VWMMP was submitted to the same recipients on June 5, 2015.	Results of monitoring surveys and other programs are described in the 2018 Annual Report for the VWMMP, which will be submitted to regulatory agencies and Indigenous groups by March 31, 2019.	BC Hydro developed the Downstream Western Toad and Garter snake Monitoring Program, which was deemed complete by the VWTC in 2018. Implementation of the program began in 2018. The results of this program for 2018 will be included in the 2018 Annual Report of the VWMMP, which will be submitted by March 31, 2019.	Songbirds and ground-nesting raptors were surveyed in separate monitoring programs in 2018. The 2018 results of those surveys will be included in the 2018 Annual Report of the VWMMP, which will be submitted by March 31, 2019.	BC Hydro incorporated special amphibian crossing culverts into the design of the road to the Portage Mountain quarry, which remains in development. BC Hydro developed a Western Toad Management Procedure, which was deemed complete by the VWTC in 2017. That procedure calls for installation of crossing structures after 3 years of documenting amphibian migration across a road in the same location. At this time no migration areas across roads have been identified through this protocol. Monitoring of structures will occur in future years as required.	Description

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No	EAC 2	EAC 2		EAC 2	EAC 2
EAC Condition	2 The EAC Holder must implement measures that reduce the potential for new or increased public access via roads constructed for the Project, by using pre-existing routes where feasible, decommissioning temporary access roads as soon as practicable after use,	2 And proposing to FLNR Project access roads that should be closed to the public in areas known to be important to Aboriginal groups.	2 The EAC Holder must develop mitigation measures in collaboration with FLNR and the Saulteau, West Moberly, Halfway River, Doig River, Blueberry River and Prophet River First Nations, and McLeod Lake Indian Band.	3 The EAC Holder must maintain current knowledge of Project effects on the status of listed species by tracking updates for species identified by the Province, the Committee on the Status of Endangered Wildlife in Canada, and the Species at Risk Act.	
Implementation Status	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Compliance Status	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description	Appendix A of the VCDMP describes how the requirements of Condition 22 are being met during construction. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Specific access routes will be identified in relevant permit applications, such as the Forest Act Occupant Licence to Cut permits. Consultation on these permits is undertaken with the groups identified in the condition, which allows for discussion about the selection of new or pre-existing access routes, and decommissioning requirements.	Specific access routes will be identified in relevant permit applications, such as the Forest Act Occupant Licence to Cut permits. Consultation on these permits is undertaken with the groups identified in the condition, which allows for discussion about the selection of new or pre-existing access routes, and decommissioning requirements. The draft and final VCDMP were submitted to regulatory agencies, governments, and Indigenous groups for comment on October 17, 2014 and June 5, 2015, respectively.	Rare plants: In 2018, for plants with ranges that overlap with the Site C Project footprint, the BC CDC status of 28 species changed. Of those, the BC CDC statuses of 18 species that were formerly Blue-listed or Red-listed in BC became Vellow-listed, and eight species changed from Red-listed to Blue-listed. In addition, Fulgensia subbracteata was determined to be Red-listed by the BC CDC (formerly not tracked), while Rorippa calycina was changed from Red-listed to no longer tracked. The conservation status of the other relevant plant species remained the same. Wildlife: There were no changes to the provincial or federal status of wildlife with ranges that overlap with the Site C Project footprint in 2018.	Due to the listing of bank swallow as Threatened on Schedule 1 of SARA, BC Hydro is developing a bank swallow mitigation and monitoring plan collaboratively through the VWTC. The plan remains in development through one oing discussions with the VWTC.

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				Appendix G
No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 24	The EAC Holder must identify suitable lands for ungulate winter range by the end of the first year of construction, on BC Hydro- owned lands, or Crown lands, in the vicinity of the Project in consultation with FLNR.	Completed	In Compliance	BC Hydro fulfilled this condition in 2015. Section 8.11 of the VWMMP addresses this condition. Suitable winter range on BC Hydro owned land was identified in Figures 9, 10 and 11 of the VWMMP, and in Forest Act Occupant Licence to Cut permit applications overlapping with provincially designated winter range.
EAC 24	If FLNR determines that identified winter range is required, the EAC Holder must identify and maintain suitable BC Hydro- owned lands for ungulate winter range to the satisfaction of FLNR and for the length of time determined by FLNR.	Completed	In Compliance	BC Hydro fulfilled this condition in 2015. Section 8.11 of the VWMMP addresses this condition. Suitable winter range on BC Hydro owned land was identified in Figures 9, 10 and 11 of the VWMMP, and in Forest Act Occupant Licence to Cut permit applications overlapping with provincially designated winter range.
	CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES			

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No.	EAC 25				
EAC Condition	The EAC Holder must undertake a ground truthing program of traditional plants currently used by Aboriginal Groups in collaboration with Aboriginal Groups prior to construction.				
Implementation Status	Ongoing				
Compliance Status	In Compliance				
Description	BC Hydro has initiated ground truthing programs with the purpose of engaging with Indigenous land users, including registered trapline holders, to verify and accurately locate Indigenous land use information, and to identify concerns related to specific features, or sites that may be affected by the Project. BC Hydro has provided funding to Indigenous groups for ground truthing through Consultation and Capacity Funding Agreements. During this reporting period, ground truthing was undertaken by Doig River, Halfway River, Blueberry River, McLeod Lake, Horse Lake and Saulteau First Nations.	BC Hydro remains engaged with Saulteau registered trapline holders whose tenure areas are affected by project construction and operations. BC Hydro contacts registered trapline holders in advance of any ground disturbance work planned to take place within their respective trapline areas, BC Hydro also shares the quarterly Notices of Construction Activities with registered trapline holders and advises it is available to meet to discuss any questions regarding the activities in the notice.	BC Hydro continues to consult with Indigenous groups regarding construction plans, and has sent invitation letters in April 2017, September 2017, January 2018, June 2018 and August 2018 highlighting areas where construction is planned in order that Indigenous groups could ground truth areas of traditional significance prior to construction. Ground-truthing information received continues to be used to support and inform mitigation measures and relevant mitigation plans.	BC Hydro is coordinating with interested nearby/proximal Indigenous groups to coordinate pre-clearing harvesting activities in construction areas prior to ground disturbance or clearing activities.	

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No. EAC Condition Implementation Status Compliance Status Description EAC 32 Where specific plants are known to be harvested by Aboriginal Groups, the EAC Holder maker reasonable efforts to consult interested Aboriginal Groups using the results of the ground truthing to inform the development and implementation of mitigation and compensation measures to accommodate adverse effects of the Project on plants traditionally used by Aboriginal Groups. In Compliance In Compliance for an information plant is traditionally used by Aboriginal Groups. In Compliance mitigation Plan (APUMP) annual reports. The 2017-2018 APUMP Annual Report, describing and is share form June 2017 through March 2019, 2018, was submitted to the EAO on March 29, 2018 and is shared with indigenous groups on the project website along with previous APUMP annual reports. Indigenous groups are notified when reports are shared through March 2017, 2018 APUMP Annual Report, describing and is shared with indigenous groups on the project website along with previous APUMP annual reports. Indigenous groups are notified when reports are shared through the bi-weekly Site C information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. EC Hydro continues to work with indigenous groups to identify plant species will be incorporated into recharation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the polici on plants traditional indigenous groups they increase and will be project on plants are developed to address the adverse will be project on plants traditional plans are increase on signed to reclease and included in the micro protes on sinder maton poxide through future ground truthing, plants of high					Appendix G
EAC 25 Where specific plants are known to be harvested by Aboriginal Groups. the EAC Holder must make reasonable efforts to consult interested Aboriginal Groups using the results of the ground truthing to inform the development and implementation of mitigation and compensation measures to accommodate adverse effects of the Project on plants traditionally used by Aboriginal Groups. In Compliance Based on the results of ground truthing (APUNP) annual reports. The 2017-2018 Adv/PA Annual Report, describing activities from June 2017 through March 2018, was submitted to the EAO on March 29, 2018 and is stared with indigenous groups are notified when reports are shared through the bi-weekly Stec Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. BC Hydro continues to work with indigenous groups are notified when reports are shared through the bi-weekly Stec Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. BC Hydro continues to work with indigenous groups to identify plant species will be incorporated into reclamation plans are appropriate. A draft reclamation plans are developed to activities. These species will be indigenous groups they will be provided to indigenous Groups for review and comment. Through this process, as well as new information provided through future ground truthing, Maragement, Site Restoration and Revegetation conducted under the YMMNP and the Soil Maragement, Site Restoration and Revegetation Plan (Appendix H of the CEMP).	No.	EAC Condition	Implementation Status	Compliance Status	Description
Indigenous groups are notified when reports are shared through the bi-weekly Site C Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. BC Hydro continues to work with Indigenous groups to identify plant species of traditional Indigenous value through ongoing groundtruthing activities. These species will be incorporated into reclamation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the project on plants traditionally used by Indigenous groups they will be provided to indigenous Groups for review and comment. Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-expectation conducted under the VWMWP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP).	EAC 25	Where specific plants are known to be harvested by Aboriginal Groups, the EAC Holder must make reasonable efforts to consult interested Aboriginal Groups using the results of the ground truthing to inform the development and implementation of mitigation and compensation measures to accommodate adverse effects of the Project on plants traditionally used by Aboriginal Groups.	Ongoing	In Compliance	Based on the results of ground truthing to date, a number of plants species with cultural, food and medicinal value have been identified and are listed in the Aboriginal Plant Use Mitigation Plan (APUMP) annual reports. The 2017-2018 APUMP Annual Report, describing activities from June 2017 through March 2018, was submitted to the EAO on March 29, 2018 and is shared with Indigenous groups on the project website along with previous APUMP and other annual reports.
BC Hydro continues to work with Indigenous groups to identify plant species of traditional Indigenous value through ongoing groundtruthing activities. These species will be incorporated into reclamation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the project on plants traditionally used by Indigenous groups they will be provided to Indigenous Groups for review and comment. Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation conducted under the VWMMP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP).					Indigenous groups are notified when reports are shared through the bi-weekly Site C Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019.
Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation conducted under the VWMMP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP).					BC Hydro continues to work with Indigenous groups to identify plant species of traditional Indigenous value through ongoing groundtruthing activities. These species will be incorporated into reclamation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the project on plants traditionally used by Indigenous groups they will be provided to Indigenous Groups for review and comment.
					Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation conducted under the VWMMP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP).

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Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18)

				January 2019 to December 2019 Appendix G
	EAC Condition	Implementation Status	Compliance Status	Description
26	The EAC Holder must develop an Aboriginal Plant Use Mitigation Plan to describe how the effects of the Project on plants currently harvested by Aboriginal Groups will be mitigated, including through	Ongoing	In Compliance	The Aboriginal Plant Use Mitigation Plan (June 2015) is available on the Project website at https://www.sitecproject.com/sites/default/files/Aboriginal_Plant_Use_Mitigation_Plan.p
	compensation measures.			Based on the results of ground truthing to date, a number of plants species with cultural, food and medicinal value have been identified and are listed in the Aboriginal Plant Use Mitigation Plan (APUMP) annual reports. The 2017-2018 APUMP Annual Report, describing activities from June 2017 through March 2018, was submitted to the EAO on March 29, 20 and is shared with Indigenous groups on the project website along with previous APUMP an other annual reports.

No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 26	The EAC Holder must develop an Aboriginal Plant Use Mitigation Plan to describe how the effects of the Project on plants currently harvested by Aboriginal Groups will be mitigated, including through	Ongoing	In Compliance	The Aboriginal Plant Use Mitigation Plan (June 2015) is available on the Project website at https://www.sitecproject.com/sites/default/files/Aboriginal_Plant_Use_Mitigation_Plan.pdf
	compensation measures.			Based on the results of ground truthing to date, a number of plants species with cultural, food and medicinal value have been identified and are listed in the Aboriginal Plant Use Mitigation Plan (APUMP) annual reports. The 2017-2018 APUMP Annual Report, describing activities from June 2017 through March 2018, was submitted to the EAO on March 29, 2018 and is shared with Indigenous groups on the project website along with previous APUMP and other annual reports.
				Indigenous groups are notified when reports are shared through the bi-weekly Site C Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019.
				BC Hydro continues to work with Indigenous groups to identify plant species of traditional Indigenous value through ongoing groundtruthing activities. These species will be incorporated into reclamation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the project on plants traditionally used by Indigenous groups they will be provided to Indigenous Groups for review and comment.

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No.	EAC 26					EAC 26	EAC 26
EAC Condition	The Aboriginal Plant Use Mitigation Plan must include at least the following: · Identify within the Project footprint including areas being reclaimed potential sites for relocation of medicinal and food plants;				Relocate when deemed necessary by a QEP.		
Implementation Status	Ongoing					Initial Planning	Initial Planning
Compliance Status	In Compliance					Future Requirement	Future Requirement
Description	Based on the results of ground truthing to date, a number of plants species with cultural, food and medicinal value have been identified and are listed in the Aboriginal Plant Use Mitigation Plan (APUMP) annual reports. The 2017-2018 APUMP Annual Report, describing activities from June 2017 through March 2018, was submitted to the EAO on March 29, 2018 and is shared with Indigenous groups on the project website along with previous APUMP and other annual reports.	Indigenous groups are notified when reports are shared through the bi-weekly Site C Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019.	BC Hydro continues to work with Indigenous groups to identify plant species of traditional Indigenous value through ongoing groundtruthing activities. These species will be incorporated into reclamation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the project on plants traditionally used by	Indigenous groups they will be provided to Indigenous Groups for review and comment.	Indigenous groups they will be provided to Indigenous Groups for review and comment. Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation conducted under the VWMMP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP).	Indigenous groups they will be provided to Indigenous Groups for review and comment. Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation conducted under the VWMMP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP). BC Hydro acknowledges and understands this condition.	Indigenous groups they will be provided to Indigenous Groups for review and comment. Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation conducted under the VWMMP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP). BC Hydro acknowledges and understands this condition. Rare plant species impacted, or potentially impacted, by project construction activities may be included in the experimental rare plant translocation program (described in section 8.2 of the VWMMP) based on the characteristics of the species, and availability of suitable locations and habitat conditions near to the construction area.

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EAC 26	EAC 26	No.
And undertake restoration of those ecological communities where deemed necessary by a QEP.	. Identify within the Project footprint including areas being reclaimed opportunities to restore ecological communities that support species of high traditional use value for affected Aboriginal Groups Groups	EAC Condition
Initial Planning	Ongoing	Implementation Status
Future Requirement	In Compliance	Compliance Status
BC Hydro acknowledges and understands this condition. Plant species of traditional Indigenous value will be identified and will be incorporated into reclamation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the project on plants traditionally used by Indigenous groups they will be provided to Indigenous Groups for review and comment. Additionally, plants of traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation plan (Appendix H of the CEMP).	 Based on the results of ground truthing to date, a number of plants species with cultural, food and medicinal value have been identified and are listed in the Aboriginal Plant Use Mitigation Plan (APUMP) annual reports. The 2017-2018 APUMP Annual Report, describing activities from June 2017 through March 2018, was submitted to the EAO on March 29, 2018 and is shared with Indigenous groups on the project website along with previous APUMP and other annual reports. Indigenous groups are notified when reports are shared through the bi-weekly Site C Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. BC Hydro continues to work with Indigenous groups to identify plant species of traditional Indigenous value through ongoing groundtruthing activities. These species will be incorporated into reclamation plans, as appropriate. As draft reclamation plans are developed to address the adverse effects of the project on plants traditionally used by Indigenous groups they will be provided to Indigenous Groups for review and comment. Through this process, as well as new information provided through future ground truthing, plants of high traditional Indigenous value will continue to be identified and included in the mix of species considered for re-vegetation conducted under the VWMMP and the Soil Management, Site Restoration and Revegetation Plan (Appendix H of the CEMP). 	Description

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No.	EAC 26	EAC 26	EAC 26	EAC 26	EAC 26		
EAC Condition	 Identify opportunities and provide financial support for propagation of indigenous plant species for use in reclamation programs, such as that offered through the indigenous nursery owned by the West Moberly First Nation and Saulteau First Nation. 	The EAC Holder must make reasonable commercial efforts to obtain up to \$1 million in commercial service contracts with indigenous nurseries for provision of plants.	The EAC Holder must make reasonable efforts to develop the Aboriginal Plant Use Mitigation Plan in collaboration with FLNR and Aboriginal Groups, at least 90 days prior to Project activities that may affect traditional plants.	The EAC Holder must file the final Aboriginal Plant Use Mitigation Plan with EAO, FLNR and Aboriginal Groups at least 30 days prior to Project activities that may affect traditional plants.	The EAC Holder must develop, implement and adhere to the final Aboriginal Plant Use Mitigation Plan, and any amendments, to the satisfaction of EAO.		
Implementation Status	Ongoing		Completed	Completed	Ongoing		
Compliance Status	In Compliance		In Compliance	In Compliance	In Compliance		
Description	BC Hydro has entered into a contract with Twin Sisters Nursery (an indigenous nursery owned by West Moberly First Nations and Saulteau First Nations) for supply and delivery of live native grass seeds suitable for dry or hydro seed application to support re-vegetation and reclamation activities. Seeds of local plant species of traditional Indigenous value have been collected by Twin Sisters and will be available for use in reclamation plans as required.	BC Hydro has entered into a contract with Twin Sisters Nursery (an indigenous nursery owned by West Moberly First Nations and Saulteau First Nations) for supply and delivery of live native grass seeds suitable for dry or hydro seed application to support re-vegetation and reclamation activities. Seeds of local plant species of traditional Indigenous value have been collected by Twin Sisters and will be available for use in reclamation plans as required.	The draft Aboriginal Plant Use Mitigation Plan (APUMP) was submitted to regulatory agencies and Indigenous groups on October 17, 2014.	The final Aboriginal Plant Use Mitigation Plan was submitted to regulatory agencies and Indigenous groups on June 5, 2017.	The APUMP describes the scope of the ground truthing program and how the information gained during ground truthing is used to inform mitigation measures related to plants of traditional Indigenous value.	The 2017-2018 APUMP Annual Report, describing activities from June 2017 through March 2018, was submitted to the EAO on March 29, 2018 and is shared with Indigenous groups on the project website along with previous APUMP and other annual reports. Indigenous groups are notified when reports are shared through the bi-weekly Site C Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019.	BC Hydro will update the plan as required based on new information. Initiatives described in the Aboriginal Plant Use Mitigation Plan will continue to be implemented through project construction.

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EAC 27

In order to manage adverse effects on Aboriginal plant, fish and

Ongoing

In Compliance

construction activities that may affect harvesting opportunities.

groups are notified when reports are shared through the bi-weekly Site C Information on the project website along with previous AGCP and other annual reports. Indigenous 2018, was submitted to the EAO on August 24, 2018 and is shared with Indigenous groups The 2017-2018 AGCP Annual Report, describing activities from July 1, 2017 through March the CEMP) which describes the measures being taken to inform Indigenous groups about

BC Hydro has developed an Aboriginal Group Communication Plan (AGCP; see Appendix D of

Description

Implementation Status

Compliance Status

EAC Condition

fish, and game, as well as access to those opportunities

activities that may affect their harvesting opportunities for plants, (Program) for informing Aboriginal harvesters about construction Construction Communication Plan, a communications program of the Project, the EAC Holder must develop, as part of the game harvesters during both the construction and operations phases No.

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The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and	In Compliance	Completed	The EAC Holder must file the final Program with EAO, FLNR and Aboriginal Groups at least 30 days prior to any activities that may	EAC 27
The draft Aboriginal Group Communications Plan is described in Appendix D of the CEMP for the Project. The Draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014.	In Compliance	Completed	The EAC Holder must make all reasonable efforts to develop the draft Program in collaboration with FLNR and Aboriginal Groups, at least 90 days prior to Project activities that may affect Aboriginal harvesting opportunities.	EAC 27
The 2017-2018 AGCP Annual Report, describing activities from July 1, 2017 through March 2018, was submitted to the EAO on August 24, 2018 and is shared with Indigenous groups on the project website along with previous AGCP and other annual reports. Indigenous groups are notified when reports are shared through the bi-weekly Site C Information Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019.	In Compliance	Completed	The Program must also include information regarding how fish monitoring programs will be used to inform Aboriginal harvesters about changes in fish community composition during operations.	EAC 27
Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. The AGCP will be updated as required to reflect evolving project communications with Indigenous Groups through to the end of construction.				

Site C Clean Energy Project Annual Compliance Report for EAC #14-02, March 29, 2019

EAC 27

Program, and any amendments, to the satisfaction of EAO

The EAC Holder must develop, implement and adhere to the final

Ongoing

In Compliance

Revision 4 in July 2016 (Revision 3 was not formally published).

on the project website along with previous AGCP and other annual reports. Indigenous

2018, was submitted to the EAO on August 24, 2018 and is shared with Indigenous groups The 2017-2018 AGCP Annual Report, describing activities from July 1, 2017 through March

groups are notified when reports are shared through the bi-weekly Site C Information

Update. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March

31, 2019.

affect Aboriginal harvesting opportunities

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EAC Condition	n order to mitigate the loss of use and access to structures used in boriginal traditional and current harvesting (e.g. cabins associated vith tenured trap lines) as a result of Project reservoir flooding, the AC Holder must make all reasonable efforts to consult with boriginal Groups and FLNR to identify the locations of such tructures, including permanent, untenured structures.			Vhere the loss of such structures are identified and confirmed inrough ground-truthing, the EAC Holder must make reasonable fforts to consult with Aboriginal groups and FLNR to establish reasures to compensate for the loss of such structures prior to the ss of the structures.		
Implementation Status	Ongoing			Ongoing		
Compliance Status	In Compliance			In Compliance		
Description	BC Hydro remains engaged with Saulteau registered trapline holders whose tenure areas are affected by project construction and operations. BC Hydro contacts registered trapline holders in advance of any ground disturbance work planned to take place within their respective trapline areas, BC Hydro also shares the quarterly Notices of Construction Activities with registered trapline holders and advises it is available to meet to discuss any questions regarding the activities in the notice. Indigenous groups have also identified two areas containing structures within or near the project area that are used for cultural purposes. BC Hydro is continuing to engage with the	project area that are used for cultural purposes. BC Hydro is continuing to engage with the respective Indigenous groups on their cultural interests and potential measures to avoid or mitigate impacts to these structures.	BC Hydro has a standing invitation to Indigenous groups to meet and discuss any issues or concerns regarding the project as construction proceeds, and remain committed to conducting ground truthing with any interested Indigenous groups in the project activity zone.	BC Hydro remains engaged with Saulteau registered trapline holders whose tenure areas are affected by project construction and operations. BC Hydro contacts registered trapline holders in advance of any ground disturbance work planned to take place within their respective trapline areas, BC Hydro also shares the quarterly Notices of Construction Activities with registered trapline holders and advises it is available to meet to discuss any questions regarding the activities in the notice.	Indigenous groups have also identified two areas containing structures within or near the project area that are used for cultural purposes. BC Hydro is continuing to engage with the respective Indigenous groups on their cultural interests and potential measures to avoid or mitigate impacts to these structures.	BC Hydro has a standing invitation to Indigenous groups to meet and discuss any issues or concerns regarding the project as construction proceeds, and remain committed to

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EAC Condition	
Implementation Status	
Compliance Status	(Con
Description	Annual Progress Report No. 4 bined with Quarterly Progress Report No. 18) January 2019 to December 2019 Appendix G

No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 28	The EAC Holder must implement a process for the identification of, and compensation for untenured structures that are culturally important to Aboriginal Groups at least 30 days prior to the commencement of construction activities.	Ongoing	In Compliance	BC Hydro remains engaged with Saulteau registered trapline holders whose tenure areas are affected by project construction and operations. BC Hydro contacts registered trapline holders in advance of any ground disturbance work planned to take place within their respective trapline areas, BC Hydro also shares the quarterly Notices of Construction Activities with registered trapline holders and advises it is available to meet to discuss any questions regarding the activities in the notice.
				Indigenous groups have also identified two areas containing structures within or near the project area that are used for cultural purposes. BC Hydro is continuing to engage with the respective Indigenous groups on their cultural interests and potential measures to avoid or mitigate impacts to these structures.
				BC Hydro has a standing invitation to Indigenous groups to meet and discuss any issues or concerns regarding the project as construction proceeds, and remain committed to conducting ground truthing with any interested Indigenous groups in the project activity zone.
	LAND AND RESOURCE USE			
	Harvest of Fish and Wildlife Resources			
EAC 29	In order to appropriately manage effects on disruption of access to registered trapline holders and Guide Outfitters during construction, the EAC Holder must make reasonable efforts to conclude access agreements with these affected registered third parties, unless there are safety concerns involved.	Ongoing	In Compliance	BC Hydro is in discussions with all trapline holders and guide outfitters within whose territory construction activities are planned for 2018 and beyond. To date, a total of 11 trapline holders will be impacted by construction activities in 2019. Eight agreements have been reached with trapline holders; three agreements are under development. Agreements have also been reached with the 2 out of 4 guide outfitters impacted by construction activities in 2019.
EAC 29	Efforts undertaken by the EAC Holder to reach access agreements must be made to the satisfaction of EAO prior to the disruption of access to trapline holders and guide outfitters	Ongoing	In Compliance	BC Hydro is in discussions with all trapline holders and guide outfitters within whose territory construction activities are planned for 2018 and beyond. To date, a total of 11 trapline holders will be impacted by construction activities in 2019. Eight agreements have been reached with trapline holders; three agreements are under development. Agreements have also been reached with the 2 out of 4 guide outfitters impacted by construction activities in 2019.
	Agriculture			

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No.	EAC 30 Th Co Ho aft	EAC 30 Th Co of aft	EAC 30 Th an cor	EAC 30 Th Ag arr	EAC 31 In Ag Wh Yea	EAC 31 Th lea uti for the Prc
EAC Condition	e EAC Holder must provide this draft Agricultural Mitigation and mpensation Plan to the affected agricultural land owners and nure holders, Peace River Regional District, District of Hudson's pe, Ministry of Agriculture and FLNR for review within 18 months er the commencement of construction.	e EAC Holder must file the final Agricultural Mitigation and mpensation Plan with EAO, Peace River Regional District, District Hudson's Hope the Ministry of Agriculture and FLNR within 2 years er the commencement of construction.	e EAC Holder must develop, jointly with agricultural land owners d tenure holders, individual farm mitigation plans throughout the nstruction phase for all farms directly affected by the Project.	e EAC Holder must develop, implement and adhere to the final ricultural Mitigation and Compensation Plan, and any rendments, to the satisfaction of EAO.	addition to and separate from the compensation funding and tigation funding the EAC Holder must fund and develop an riculture Monitoring and Follow-up Program for a 10 year period lich includes the five years prior to reservoir filling and the first five ars of operation.	e Agriculture Monitoring and Follow-up Program must include at ist the following: Monitoring for Project-induced changes in wildlife habitat lization, and evaluation of associated crop or feed storage damage ; agricultural operations within 5 km of the reservoir, to assess if ere is an increase in wildlife-related crop depredation due to ject-related habitat losses. Monitoring must include pre- and st- reservoir filling field surveys, wildlife monitoring, farm operator erviews, and analysis of relevant records related to wildlife-related
Implementation Status	Completed	Completed	Ongoing	Ongoing	Completed	Ongoing
Compliance Status	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description	The final Agriculture Mitigation and Compensation Plan was submitted on July 27, 2017. The draft and final Agricultural Mitigation and Compensation Plan and Framework for the plan were both developed and submitted in accordance with the condition.	BC Hydro submitted the final Agricultural Mitigation and Compensation Plan on July 27, 2017. BC Hydro submitted Rev 1 of the Agricultural Mitigation and Compensation Plan on September 25, 2017.	Section 2.4 of the final Agricultural Mitigation and Compensation Plan describes the process that will be undertaken to develop individual farm mitigation plans with directly affected agricultural land owners and tenure holders. Development of individual farm mitigation plans is underway as part of the property acquisition process.	The final Agriculture Mitigation and Compensation Plan was submitted on July 27, 2017. BC Hydro submitted Rev 1 of the Agricultural Mitigation and Compensation Plan on September 25, 2017. The draft and final Agricultural Mitigation and Compensation Plan and Framework for the plan were both developed and submitted in accordance with the condition.	The draft and final Agricultural Monitoring and Follow-up Programs were submitted to regulatory agencies and governments on October 23, 2015 and December 22, 2015, respectively. Section 3.0 of the Agricultural Monitoring and Follow-up Program contains a concordance table which shows how each of the requirements of Condition 31 is addressed in the Program. A summary update is also provided below.	Appendix A of the final Agriculture Monitoring and Follow-up Program describes the wildlife habitat utilization monitoring program. BC Hydro completed procurement of a qualified professional to carry out the program in early 2019 and monitoring will begin five years prior to reservoir filling in spring 2019.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 31	 Monitoring for Project-induced changes to humidity within 3 km of the reservoir, and evaluate associated effects on crop drying within this area. Monitoring must include collection and analysis of climate data, calculation of crop drying indices, and farm operator interviews. 	Ongoing	In Compliance	Appendix B of the final Agriculture Monitoring and Follow-u monitoring of potential effects on crop drying program. Agri years prior to reservoir filling in spring 2019. Baseline climati on-going since the environmental assessment.
EAC 31	 Monitoring for Project-induced changes to groundwater elevations within 2 km of the reservoir (the area potentially influenced by groundwater elevation changes), and evaluate associated effects on crop productivity. Monitoring must include field surveys and farm operator interviews. 	Ongoing	In Compliance	Appendix C of the final Agriculture Monitoring and Follow-u monitoring of potential groundwater effects program. Agric years prior to reservoir filling in spring 2019.
EAC 31	Monitoring for climatic factors to estimate moisture deficits and to estimate irrigation water requirements in the vicinity of the reservoir to provide information for potential future irrigation projects. Data collection will be undertaken before reservoir filling, and in the 5 years after reservoir filling, and data will be reviewed as required for proposed irrigation projects.	Ongoing	In Compliance	Appendix D of the final Agriculture Monitoring and Follow-up monitoring to estimate irrigation requirements. Baseline clim on-going since the environmental assessment.
EAC 31	The Agriculture Monitoring and Follow-up Program reports must be provided annually during the monitoring and follow-up period to affected agricultural land owners and tenure holders, and Ministry of Agriculture. The results of the Agriculture Monitoring and Follow-up Program must inform the Farm Mitigation Plans.	Ongoing	In Compliance	BC Hydro provided the third annual report on the implement: monitoring and Follow-up Program in July 2018. The fourth a July 2019.
EAC 31	Reporting must begin 180 days after the commencement of the monitoring and follow-up program that is to begin 180 days after commencement of construction.	Ongoing	In Compliance	BC Hydro provided the third annual report on the implement monitoring and Follow-up Program in July 2018. The fourth a July 2019.
EAC 31	The EAC Holder must provide this draft Agriculture Monitoring and Follow-up Program to the Ministry of Agriculture, Peace River Regional District and the District of Hudson's Hope for review within 90 days after the commencement of construction.	Completed	In Compliance	The draft Agricultural Monitoring and Follow-up Program was agencies and governments on October 23, 2015.
EAC 31	The EAC Holder must file the final Agriculture Monitoring and Follow-up Program with EAO, Ministry of Agriculture, Peace River Regional District and the District of Hudson's Hope within 150 days of commencement of construction.	Completed	In Compliance	The final Agricultural Monitoring and Follow-up Program was s agencies and governments on December 22, 2015.

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NO.	EAC 33	EAC 33	EAC 34	EAC 34	
	Strategy for the EAC Holder to stockpile surplus rock material at the West Pine, Wuthrich, and Portage Mountain quarries.	The EAC Holder commitments as outlined in the MOU must be implemented and adhered to, to the satisfaction of the MOTI.	The EAC Holder must discuss any overlap with the Project activity zone and preliminary reservoir impact lines with affected mineral and aggregate tenure holders.	Where conflicts exist, the EAC Holder must make reasonable efforts to enter into agreements with mineral and aggregate tenure holders, to the satisfaction of EAO, to resolve conflicts with mineral and aggregate tenure holders. aggregate tenure holders.	
	Ongoing	Ongoing	Completed	Completed	
	In Compliance	In Compliance	In Compliance	In Compliance	
near ibrion	BC Hydro is currently stockpiling surplus excavated material for MOTI at West Pine and Wuthrich Quarries. A site for surplus stockpiled material has been identified at Portage Mountain Quarry.	BC Hydro continues to work with MoTI to satisfy these commitments in the MOU. Current commitments include: coordination of Hwy 29 management, procurement construction and decommissioning. BCH continues to work with MoTI on pursuing material sources for future MoTI requirements from inundated sources.	No mineral tenures appear to overlap with the Project Activity Zone and preliminary impact lines. The dam site, reservoir and transmission line are covered by no registration reserves or conditional registration reserves. No mineral claims may be made in no registration reserves. No activity may be undertaken without prior consent of BC Hydro in conditional registration reserves. Further the entire District of Hudson's Hope, the Peace Moberly Tract and the Proposed Peace Boudreau Protected area are also covered by no registration reserves. Portions of the preliminary impact lines on the north bank are not protected by any reserve, however, no mineral claims appear to have been made.	No mineral tenures appear to overlap with the Project Activity Zone and preliminary impact lines. The dam site, reservoir and transmission line are covered by no registration reserves or conditional registration reserves. No mineral claims may be made in no registration reserves. No activity may be undertaken without prior consent of BC Hydro in conditional registration reserves. Further the entire District of Hudson's Hope, the Peace Moberly Tract and the Proposed Peace Boudreau Protected area are also covered by no registration reserves. Portions of the preliminary impact lines on the north bank are not protected by any reserve, however, no mineral claims appear to have been made. Other than reserves held by the MOTI, BC Hydro is not aware of any tenures issued to 3rd parties for the purposes of aggregate production on Crown land that overlap with the Project Activity Zone and preliminary impact lines.	

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 34	Efforts made by the EAC Holder to enter into such agreements must be documented.	Completed	In Compliance	No mineral tenures appear to overlap with the Project Activity Zone and preliminary impact lines.
				The dam site, reservoir and transmission line are covered by no registration reserves or conditional registration reserves. No mineral claims may be made in no registration reserves. No activity may be undertaken without prior consent of BC Hydro in conditional registration reserves. Further the entire District of Hudson's Hope, the Peace Moberly Tract and the Proposed Peace Boudreau Protected area are also covered by no registration reserve, Portions of the preliminary impact lines on the north bank are not protected by any reserve, however, no mineral claims appear to have been made. Other than reserves held by the MOTI, BC Hydro is not aware of any tenures issued to 3rd parties for the purposes of aggregate production on Crown land that overlap with the Project Activity Zone and preliminary impact lines.
	TRANSPORTATION			
	TRANSPORTATION			
EAC 35	The EAC Holder must develop a Traffic Management Plan to appropriately manage Project-related traffic in and around work sites during construction in a manner that protects wildlife, maximizes worker and public safety, and manages effects on productivity.	Ongoing	In Compliance	This requirement is addressed in the final Construction Safety Management Plan (CSMP), Section 5.4 Traffic Management Plan. Site-specific Traffic Management Plans and Safety Management Plans are required from contractors, and approved by MOTI. These plans include measures such as coordinating Project Scheduling, Traffic Control Plans, addressing posted speeds, lane widths, hazardous zones, lane closures, public notification, etc. to protect wildlife, maximize safety and manage effects on productivity.
EAC 35	The Traffic Management Plan must be developed by a QEP.	Completed	In Compliance	The Traffic Management Plan is described in Section 5.4 of the CSMP. Section 6.0 of the CSMP lists the QPs who prepared the plan.
EAC 35	The Traffic Management Plan must include at least the following: • Maximize the use of existing access corridors.	Ongoing	In Compliance	The project is maximizing the use of existing access corridors as much as possible. This is currently being done in areas along the Transmission line where existing Right- Of-Way access exists for maintenance and for clearing in the Eastern Reservoir.
EAC 35	 Equip Project vehicles travelling on Project access roads with VHF/UHF communication radios. 	Ongoing	In Compliance	All Project vehicles travelling on Project access roads have VHF/UHF communication radios.
EAC 35	 Control and/or restrict access where required, and as discussed with MOTI. 	Ongoing	In Compliance	

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 35	 Identify access roads to be decommissioned after Project use. 	Ongoing	In Compliance	Contractor Traffic Management Plans will identify access roads to be decomr has included temporary access for clearing, dam site construction, and Hwy \dot{z}
EAC 35	· Public safety measures.	Ongoing	In Compliance	Public safety measures are addressed in Contractor Traffic Management Plar Plans, which are reviewed and approved by MOTI. Measures include having I Management Plans, Traffic Control Plans, public signage and notification, etc
EAC 35	 Post speed limits on all construction access roads. 	Ongoing	In Compliance	Speed limits are posted throughout the dam site area as well as on all public where construction is taking place. These speed limits are reflective of const zones.
EAC 35	. Work schedules, subject to safety considerations, to minimize delays and nuisance to the public caused by the realignment of Highway 29, particularly during peak visitor periods.	Ongoing	In Compliance	All works on public roadways are subject to Traffic Management Guidelines a MOTI. This includes measures such as maximum delay and work stoppage.
EAC 35	 Inclusion of Traffic Control Plans, Public Information Plans, Incident Plans, and Implementation Plans. 	Ongoing	In Compliance	These topics are included in site-specific Contractor Traffic Management Plar
EAC 35	The Traffic Management Plan must also establish measures for identifying and mitigating effects on local transportation infrastructure resulting from Project activities.	Ongoing	In Compliance	The Traffic Management Plans include a pavement management program. MOTI conducts pavement condition monitoring surveys in the region once ex travelling in one direction on main roads. BC Hydro has increased the require both directions on main roads every two years for all project effected roads. 240 Rd, 269 Rd, 271 Rd, Jackfish Lake Rd, Hwy 97, and Hwy 29.
EAC 35	 The Traffic Management Plan must also include at least the following: Identification of all road modifications, realignments, and improvements on Highway 29 North, Highway 29 South, Jackfish Lake Road, and North Bank Minor Roads that are required to ensure access is maintained and service levels meet the appropriate MOTI standards. 	Completed	In Compliance	All road modifications and improvements on the listed roads require approva MOTI has reviewed and approved design standards for 271 Rd, Cache Creek : 29, etc.
EAC 35	 Construction of a paved brake-check before the start of the 10% grade on Canyon Drive west of Hudson's Hope and make it a mandatory requirement for Project-related trucks to stop and check vehicle brakes. 	Completed	In Compliance	Construction of a paved brake-check was completed in September 2015.
EAC 35	 In consultation with MOTI, identify any additional measures that may be required for public safety (signage, signals, illumination, monitoring etc.) 	Ongoing	In Compliance	BC Hydro worked with MOTI to identify any additional required measures tha required for public safety. Additional measures may be identified in the future feedback from MOTI.

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The carpool and commuter program is described in Appendix C of the CSMP, Appendix C – Commuter and Carpool Plan and is being implemented as planned. Preferred carpool parking	In Compliance	Ongoing	The EAC Holder must develop and implement a carpool and commuter program as part of the Traffic Management Plan.	EAC 36
Site-specific Traffic Management Plans and Safety Management Plans are required from contractors, and approved by MOTI. These plans include measures such as coordinating Project Scheduling, Traffic Control Plans, addressing posted speeds, lane widths, hazardous zones, lane closures, and public notification, etc. to protect wildlife, maximize safety and manage effects on productivity. Revision 2 to the CSMP was issued in March 2017. Revision 2 of the CSMP contains updates to Section 5.2.12 Traffic Monitoring and Appendix C, section 2.1 and 2.4.	In Compliance	Ongoing	The EAC Holder must develop, implement and adhere to the final Traffic Management Plan, and any amendments, to the satisfaction of EAO.	EAC 35
The Draft Traffic Management Plan is described in Section 5.4 of the CSMP. The final CSMP was submitted to the required recipients on June 5, 2015.	In Compliance	Completed	The EAC Holder must file the final Traffic Management Plan with EAO, MOTI, Peace River Regional District, City of Fort St. John, District of Hudson's Hope, Chetwynd and Saulteau, West Moberly, Halfway River, Doig River, Blueberry River and Prophet River First Nations, and McLeod Lake Indian Band 30 days prior to the commencement of construction.	EAC 35
The Draft Traffic Management Plan is described in Section 5.4 of the CSMP. The draft CSMP was submitted to the required recipients on October 17, 2014.	In Compliance	Completed	The EAC Holder must provide this draft Traffic Management Plan to MOTI, Peace River Regional District, City of Fort St. John, District of Hudson's Hope, District of Chetwynd and Saulteau, West Moberly, Halfway River, Doig River, Blueberry River and Prophet River First Nations, and McLeod Lake Indian Band for review 90 days prior to the commencement of construction.	EAC 35
BMPs are written into contracts and being followed for all works on public roadways.	In Compliance	Ongoing	 Follow best management practices as outlined in Traffic Management Guidelines for Work on Roadways (BC Ministry of Transportation 2001 and as amended from time to time). 	EAC 35
Description	Compliance Status	Implementation Status	EAC Condition	No.

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is designated in the main site parking lot.

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EAC 37	EAC 37	EAC 37	EAC 36		EAC 36	No.
 The Transportation Monitoring and Follow-up Plan must include at least the following: On an annual basis during construction and during each year when Project traffic will be using each identified intersection, traffic counts and monitoring of traffic operations at the following intersections: Beattie Drive in Hudson's Hope Clarke Avenue in Hudson's Hope Highway 29 and Canyon Drive in Hudson's Hope Highway 97 / Highway 29 in Chetwynd Highway 97 at Old Fort Road in Fort St. John Highway 97 at 100th Street in Fort St. John Highway 97 at 85th Avenue in Fort St. John 	The Transportation Monitoring and Follow-up Plan must be developed by a QEP.	The EAC Holder must develop a Transportation Monitoring and Follow-up Plan to ensure measures to mitigate Project effects on local transportation infrastructure are effective or need to be adjusted to adequately mitigate the effects.	The EAC Holder must consult with the affected local communities, including Aboriginal communities in the development of a carpool and commuter program.		The EAC Holder will provide a shuttle service for workers between Chetwynd and the Site C dam site if warranted by demand or restrictions on access for private vehicles to the dam site.	EAC Condition
Ongoing	Completed	Completed	Completed		Ongoing	Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance		In Compliance	Compliance Status
Intersection monitoring was carried out annually in Year 3 of construction with quarterly monitoring of the dam site entrances. The Traffic and Pavement Monitoring report for the third year of construction was submitted to regulatory agencies and local governments on January 22, 2019. The next annual monitoring data collection will occur in April - May 2019. January 22, 2019. The next annual monitoring data collection will occur in April - May 2019.	The Transportation Monitoring and Follow-up Plan is described in Sections 5.4.10, Section 5.4.12, and Appendix B of the CSMP. Section 6.0 of the CSMP lists the QPs who prepared the plan. Appendix B Traffic Monitoring and Mitigation Plan - Fort St. John and North Bank Area Roads was developed in consultation with the City of Fort St. John staff.	The requirements of Condition 37 are addressed in Sections 5.4.10, Section 5.4.12, and Appendix B of the CSMP.	The draft and final CSMPs were submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014 and June 5, 2015, respectively.	A requirement for a shuttle service if warranted by demand or restrictions for workers between Chetwynd and the Site C dam site was placed in the GSS and MCW contracts. The Contractors will monitor demand from their workforce. There are no restrictions on access for private vehicles to the dam site gates.	Potential carpool coordination websites for works were posted on the public Site C website in the fall of 2015. Please see: http://hw/activities/sustainable_transportation/Pages/default.aspx.	Description

Appendix G

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No.	EAC 37	EAC 37	EAC 37	EAC 37	EAC 37	EAC 37	EAC 37
EAC Condition	 Annual monitoring during construction of traffic operations on local roads to determine if road restrictions for Project-related traffic should be implemented, in accordance with appropriate MOTI standards. 	As part of the Transportation Monitoring and Follow-up Plan, the EAC Holder must implement the following 90 days prior to commencement of operations: Illumination of continuous lightning along Highway 97 through Taylor, from Birch Avenue west to 100th Street access at McMahon Drive, and intersection lightning at Highway 97 and Pine Avenue, 103rd Avenue, and Cherry Avenue	 Installation of changeable message signs on Highway 97 on the south Taylor Hill and on the hill north of Taylor, to be operated as part of the MOTI network that will provide drivers with advanced notification of road conditions, including notification of fog conditions. 	 Installation of a highway webcam in Taylor to monitor fog conditions, to be operated as part of the MOTI network. The location will be determined in consultation with Taylor and MOTI. 	The Transportation Monitoring and Follow-up Plan reporting must occur at least annually during the monitoring and follow- up program period, beginning 180 days after the commencement of construction.	The EAC Holder must provide the draft Transportation Monitoring and Follow-up Plan to MOTI, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups for review within 90 days after the commencement of construction.	The EAC Holder must file the final Transportation Monitoring and Follow-up Plan with EAO, MOTI, Peace River Regional District, City of Fort St. John, District of Hudson's Hope, District of Chetwynd and Aboriginal Groups within 150 days after the commencement of construction.
Implementation Status	Ongoing	Completed	Completed	Completed	Ongoing	Completed	Completed
Compliance Status	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description	Intersection monitoring was carried out annually in Year 3 of construction with quarterly monitoring of the dam site entrances. The Traffic and Pavement Monitoring report for the third year of construction was submitted to regulatory agencies and local governments on January 22, 2019. The next annual monitoring data collection will occur in April - May 2019.	Continuous lighting was installed in 2015 and is operating in Taylor along Highway 97in accordance with this requirement.	Changeable message signs were installed in 2015 and are operating on Highway 97 in accordance with this requirement.	The webcam was installed in 2017 as part of MOTI's network and can be accessed on DriveBC.	BC Hydro submitted the Year 3 Traffic and Pavement Monitoring report on January 22, 2019.	The draft Transportation Monitoring and Follow-up Plan, as part of the CSMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014.	The final CSMP was submitted to regulatory agencies, governments, and Indigenous groups on June 5, 2015.

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No.	EAC 37 The EAC Transpo amendn	EAC 38 The EAC describe effects c operatic	
EAC Condition	Holder must develop, implement and adhere to the final rtation Monitoring and Follow-up Plan, and any rents, to the satisfaction of EAO.	Holder must develop a Public Safety Management Plan to how it will implement measures to avoid or manage the of the Project on public safety during construction and ns.	lic Safety Management Plan must be developed by a QEP.
Implementation Status	Ongoing	Completed	Completed
Compliance Status	In Compliance	In Compliance	In Compliance
Description	BC Hydro submitted the CSMP on June 5, 2015, the most recent revision was submitted on March 22, 2017. The CSMP includes all of the measures in the Transportation Monitoring and Follow-up Plan in section 5.4.10, section 5.4.12, and Appendix B Traffic Monitoring and Mitigation Plan - Fort St. John and North Bank Area Roads. The Traffic and Pavement Monitoring report for the second year of construction was submitted regulators and local communities on January 22, 2019.	Section 5.3 of the CSMP describes the Public Safety Management Plan (Public Safety Management Plan) as well as planning for future aspects of the project. The Public Safety Management Plan, developed by a QEP, is described in Section 5.3 of the CSMP. The draft and final CSMPs were submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014 and June 5, 2015, respectively. A status update on Condition 37 requirements is provided below. Public Safety Management Plans are key deliverables by all Primes and major contactors at Site C and must be approved before the contractor can mobilize to site.	The Public Safety Management Plan is described in Section 5.3 of the CSMP. Section

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EAC 38

The Public Safety Management Plan must include at least the

Ongoing

In Compliance

the Project.

public.

perimeter with activity access control, security patrols and signage to inform members of the

mark the boundaries of the active construction area. The work site maintains a security north and south banks of the Peace River, upstream and downstream of the dam site, to requirements for river navigation. Public safety signs and beacons have been installed on the In river work zone hazards are well marked for navigation purposes and meet the

The PSMP describes measures to inform public on safety issues during the construction of

Description

Information about safety is shared publicly using a variety of methods

Implementation Status

Compliance Status

EAC Condition

following:

construction and operation of the Site C reservoir.

navigational hazards, access restrictions and closures during the

Increase public awareness of safety hazards, including

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				The bi-weekly construction bulletin provides information about planned work and safety information for boaters. 26 bulletins were provided in 2018.
				The quarterly Aboriginal Group construction notification also contains this information. Four letters were provided in 2018.
				As per the PSMP, Contractor Public Safety Management Plans are provided to Indigenous groups and to local and regional governments.
				The operations PSMP will be developed prior to reservoir filling.
EAC 38	 Establish boater communication protocol including communication of navigational hazards during construction and operations. 	Ongoing	In compliance	Information about safety is shared publicly using a variety of methods, including the bi-weekly construction bulletin and the quarterly construction notification letter which is sent to Indigenous groups, local governments and posted online.
				Public safety signs and beacons have been installed on the banks of the Peace River to mark the boundaries of the active construction area. Further, BC Hydro will facilitate the

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EAC 38

and notifications, relating to overhead structures such as towers and

Develop standard navigation mitigations for signals, markings

Ongoing

In Compliance

compliance with Navigation Protection Act approvals.

Standard navigation mitigations for signals, markings and notifications is being undertaken in

distribution of contractor's public safety management plans as and when needed.

conductors crossing navigable waters.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 38	 Manage public water-based access during construction and for the first 5 years of operation. 	Ongoing	In Compliance	The Peace River will not be closed to the public until river diversion. In river work zone hazards are well marked for navigation purposes and meet the requirements for river navigation. Public safety signs and beacons have been installed on the north and south banks of the Peace River, upstream and downstream of the dam site, to mark the boundaries of the active construction area. The work site maintains a security perimeter with activity access control, security patrols and signage to inform members of the public.
EAC 38	The EAC Holder must provide this draft Public Safety Management Plan to MOTI, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Saulteau, West Moberly, Halfway River, Doig River, Blueberry River and Prophet River First Nations, and McLeod Lake Indian Band for review 90 days prior to the commencement of construction and operations.	Completed	In Compliance	The draft CSMP (Section 5.3 Public Safety Management Plan) was submitted to regulatory agencies, governments and Indigenous groups on October 7, 2014.
EAC 38	The EAC Holder must file the final Public Safety Management Plan with the MOTI, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Saulteau, West Moberly, Halfway River, Doig River, Blueberry River and Prophet River First Nations, and McLeod Lake Indian Band 30 days prior to the commencement of construction and operations.	Completed	In Compliance	The final CSMP (Section 5.3 Public Safety Management Plan) was submitted to regulatory agencies, governments and Indigenous groups on June 5, 2015.

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EAC 40	EAC 40	EAC 39		EAC 38	No.
The Outdoor Recreation Mitigation Plan must be developed by a QEP.	The EAC Holder must finalize and implement the Outdoor Recreation Mitigation Plan to mitigate changes in recreational opportunities and loss of existing recreational areas resulting from the Project.	The EAC Holder must provide information to the Province of Alberta, during construction and operations, to assist in their communications with anglers in Alberta regarding changes in downstream fishing opportunities due to construction activities and longer-term changes in fish community composition.	OUTDOOR RECREATION AND TOURISM	The EAC Holder must develop, implement and adhere to the final Public Safety Management Plan, and any amendments, to the satisfaction of EAO.	EAC Condition
Completed	Ongoing	Initial Planning		Ongoing	Implementation Status
In Compliance	In Compliance	Future Requirement		In Compliance	Compliance Status
Section 5.0 of the Outdoor Recreation Management Plan lists the QPs who prepared the plan.	BC Hydro submitted the draft Outdoor Recreation Mitigation Plan on July 27, 2016 and submitted the final Outdoor Recreation Mitigation Plan on January 27, 2017 with regulatory agencies, governments and Indigenous group. The Plan describes the timing for when different measures will occur. The timing of specific measures is referenced below.	BC Hydro acknowledges and understands this condition. BC Hydro will provide information regarding changes in downstream fishing opportunities on to the Province of Alberta on an annual basis, commencing when information from the FAHMFP becomes available.		 The PSMP is described in Section 5.3 of the CSMP. The PSMP describes the requirements for BC Hydro and its contractors in managing public safety. The PSMP applies to all work sites and all activities associated with construction of the Project. Ongoing implementation of the PSMP includes: blocking trails where public can access the site; appropriate signage in the river channel along the property perimeter and in other key places; appropriate information on Public Safety Management Plan included in site orientations; additional emergency measures related to downstream inundation response; security enforcement of trespass and access control protocols; managing tour groups and visitor access to mitigate safety concerns; managing work practices so public safety is contemplated in all components of the project. River navigation hazards are in place in addition to river channel signs and construction zone beacons. The Peace River bridge is well marked in stream work is identified by warning signs and river safety boat patrols are ongoing. Site C Communications takes steps to keep key public stakeholders informed about construction activity and to provide applicable warnings about work that may impact public safety, including noise abatement, dust abatement and traffic management planning. 	Description

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EAC	EAC.	EAC	EAC	EAC	EAC	EAC.	N
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Fund the development of a BC Peace River/Site C Reservoir la vavigation and Recreation Opportunities Plan	Outline an approach to governance and allocation of funds rom the Community Recreation Site Fund	Provide approximately \$200,000 for a Community Recreation (itte Fund of which \$50,000 is for recreational sites on the south bank o support development of new shoreline recreation areas within the 'eace River and its tributaries to the Alberta border.	Provide approximately \$150,000 to the District of Hudson Hope or the enhancement of Alwin Holland Park, or other community horeline recreation areas.	Establish at least one public viewpoint at the Site C dam site.	Establish three new boat launch/day use sites, complete with arking, picnic areas and toilets, at Cache Creek, Lynx Creek and ludson's Hope Shoreline, and accessible via Highway 29.	The Outdoor Recreation Mitigation Plan must include at least the ollowing to: Provide technical information to support outdoor recreation providers in adapting to new shoreline conditions.	EAC Condition
nitial Planning	Ongoing	Ongoing	Completed	Completed	Ongoing	Ongoing	Implementation Status
Future Requirement	In Compliance	In Compliance	In Compliance	In Compliance	in Compliance	In Compliance	Compliance Status
BC Hydro acknowledges and understands this condition. The Outdoor Recreation Mitigation Plan describes the plan in section 2.2.4. A BC Peace River / Site C Reservoir Navigation and Recreation Opportunities Plan will be developed to mitigate potential effects on over the long term on outdoor recreation and tourism infrastructure, as well as access to water-based navigation. The planning process and the plan development will be funded by BC Hydro and initiated within one year after reservoir filling.	Section 2.2.3 of the final Outdoor Recreation Mitigation Plan describes the strategy and implementation plan for the recreation fund. BC Hydro consulted with local governments on the implementation of the fund in in 2018. Implementation of the fund will commence in 2019.	Section 2.2.3 of the final Outdoor Recreation Mitigation Plan describes the strategy and implementation plan for the recreation fund. BC Hydro consulted with local governments on the implementation of the fund in in 2018. Implementation of the fund will commence in 2019.	Section 2.2.2 of the final Outdoor Recreation Mitigation Plan includes information about the payment which was made to Hudson's Hope in 2017.	Section 2.2.2 of the final Outdoor Recreation Mitigation Plan includes information about the viewpoint on the north bank. The viewpoint opened to the public in August 2017.	Section 2.2.2 of the final Outdoor Recreation Mitigation Plan includes information about the boat launches. The design of three new boat launch and day use sites is ongoing. Road access for boaters and recreation site users from Highway 29 for each of the boat launches is currently in design phase, in coordination with Highway 29 work.	Section 2.2.1 of the final Outdoor Recreation Mitigation Plan includes information about the provision of technical information and communications strategies that will be used.	Description

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EAC 42			EAC 41	EAC 41	EAC 40	EAC 40	EAC 40	No.
The EAC Holder must manage increased demands resulting from the influx of the Project workforce on community health care and social services by implementing mitigation measures detailed in a Healthcare Services Plan.	Community Infrastructure and Services	COMMUNITY	Where it is both physically and economically feasible, the costs to relocate facilities will be included in the agreements.	The EAC Holder must make reasonable efforts to enter into agreements with the owners of the campground at Cache Creek and the hunting camp near the Site C dam site to compensate for any effects to those facilities, prior to potential effects on operation of these facilities.	The EAC Holder must develop, implement and adhere to the final Outdoor Recreation Mitigation Plan, and any amendments, to the satisfaction of EAO.	The EAC Holder must file the final Outdoor Recreation Mitigation Plan with EAO, FLNR, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Saulteau, West Moberly, Halfway River, Doig River, Blueberry River and Prophet River First Nations, and McLeod Lake Indian Band within 18 months after the commencement of construction.	The EAC Holder must provide this draft Outdoor Recreation Mitigation Plan to FLNR, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Saulteau, West Moberly, Halfway River, Doig River, Blueberry River and Prophet River First Nations, and McLeod Lake Indian Band for review within 12 months after the commencement of construction.	EAC Condition
Ongoing			Initial Planning	Ongoing	Ongoing	Completed	Completed	Implementation Status
In Compliance			Future Requirement	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
The final Health Care Services Plan was submitted on June 5, 2015. Implementation of the measures in the Plan are underway.			BC Hydro acknowledges and understands this condition.	BC Hydro has entered into an agreement with the owner of the campground at Cache Creek. This agreement transferred the land to BC Hydro in return for compensation. Further discussions regarding the effects of the project on the campground facility are ongoing. BC Hydro has entered into an agreement with the operator of the hunt camp near Site C. This agreement compensated the operator for the effects on the facility and the cost to replace and/or relocate the physical infrastructure. It is not known if the operator has reinstated the hunt camp at an alternative location.	Implementation of the measures as described in the final Outdoor Recreation Mitigation Plan is underway.	BC Hydro submitted the final Outdoor Recreation Mitigation Plan on January 27, 2017 to regulatory agencies, governments and Indigenous groups.	BC Hydro submitted the draft Outdoor Recreation Mitigation Plan on July 27, 2016 to regulatory agencies, governments and Indigenous groups.	Description

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No.	EAC 42	EAC 42	EAC 42	EAC 42	EAC 42	EAC 42
EAC Condition	The Healthcare Services Plan must include at least the following: Implement on-site health care comprised of physician and nursing services to manage non-urgent health issues for the workforce residing in the construction camps.	· Establish a process for coordination of program delivery with the Northern Health Authority (NHA).	 Establish a process for providing new resident workers and their families with local information about health, education and social services. 	The EAC Holder must provide this draft Healthcare Services Plan to NHA, Peace River Regional District, City of Fort St. John and District of Hudson's Hope for review a minimum of 90 days prior to the commencement of construction.	The EAC Holder must file the final Healthcare Services Plan with the NHA, Peace River Regional District, City of Fort St. John and the District of Hudson's Hope a minimum of 30 days prior to the commencement of construction.	The EAC Holder must develop, implement and adhere to the final Healthcare Services Plan, and any amendments, to the satisfaction of EAO.
Implementation Status	Ongoing	Completed	Completed	Completed	Completed	Ongoing
Compliance Status	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance
Description	Section 6.1 of the final Health Care Services Plan describes the on-site health care. The on-site Project Health Clinic opened on March 1, 2016 staffed with a nurse practitioner and advanced care paramedic. BC Hydro provides quarterly data reports to Northern Health on the Project Health Clinic's activities.	Project Health Clinic staff have been in contact with Northern Health Authority (NHA) contacts provided by Northern Health to coordinate programs delivered through the clinic. BC Hydro provides a quarterly report to Northern Health on use of the Project Health Clinic. BC Hydro and Health Clinic staff also hosted a tour and meeting with Northern Health staff, members of the local Division of Family Practice, WorkSafe BC and BC Ambulance on October 30, 2017.	Links to information about health, education and social services for each community in the Peace were posted on the public Site C website in fall 2015 to share with new residents and potential new residents. This information is reviewed and updated as needed.	The draft Health Care Services Plan was submitted to NHA and governments on October 17, 2014.	The final Health Care Services Plan was submitted to NHA and governments on June 5, 2015.	The final Health Care Services Plan was submitted on June 5, 2015. Implementation of the measures in the Plan are underway. The Project Health Clinic opened on March 1, 2016. BC Hydro held a Joint Health Care Services meeting on November 1, 2018 with Northern Health, WorkSafe BC and physicians from the local Division of Family Practice.

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No. EAC 43	EAC 43		EAC 43	
EAC Condition The EAC Holder must develop an Emergency Services Plan that	 The EAC Holder must develop an Emergency Services Plan that includes at least the following to describe how the EAC Holder will implement measures to: Contract for provision of emergency services (fire services and medical transport) 		 Communicate Project emergency management plans to all emergency service providers, and provide updates as plans are amended 	
Implementation Status Ongoing	Ongoing		Ongoing	
Compliance Status	In Compliance		In Compliance	
Description The final Emergency Services Plan was submitted to local emergency services providers, and	The final Emergency Services Plan was submitted to local emergency services providers, and governments on June 5, 2015. Fire and emergency services continue to attend site when called via 9-1-1 from the Worker Accommodation site. PRHP maintains a brigade for construction purposes. BC Hydro's Fire Marshall has been involved in this planning and has spoken fully into the requirement which prime at site have planned for. The medical clinic at site continues to provide immediate EMT response to for serious incidents while BC Ambulance service is dispatched. This supplements the first aid requirements already in place per WSBC standards.	Medical transport from Site C can presently occur via site supplied transport or BC Ambulance transport. Additional resources have been allocated for emergency response by the local Fort St John Fire Department who will respond to emergencies at the ATCO Two Rivers accommodations and the AFDE worksites on the right bank.	The Emergency Action Plan continues to develop at Site C, as construction advances and all contractors are required to plan and prepare emergency responses in accordance with the Site C plan.	Ongoing emergency planning continues to include the PRRD, the City of FSJ, police, fire services, BC Ambulance and other stakeholders, especially as this concerns inundation response planning. As coffer dam development continues in advance of river diversion in 2020, additional planning, preparations exercises and response mechanisms will be defined, coordinated and tested by contractors in conjunction with BC Hydro requirements.

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The draft Emergency Services Plan was submitted to local emergency services providers, and governments on October 17, 2014.	In Compliance	Completed	The EAC Holder must provide this draft Emergency Services Plan to the appropriate local emergency service providers including the Peace River Regional District, City of Fort St. John, District of Hudson's Hope and District of Taylor for review a minimum of 90 days prior to the commencement of construction.	EAC 43 T P H H
without concerns expressed and is planned to continue in 2019.				
BC Ambulance, RCMP, Conservation Officers and other provincial bodies occurred in 2018				
provide information and respond to questions and concerns. Interactions with fire services,				
BC Hydro continues to liaise with emergency services in the region on a regular basis to			Wildfire Management Branch.	<
			Conservation Officer Service, Search and Rescue Associations, BC	0
meetings and inspections were all carried out without incident.			those services relating to: firefighting, policing, ambulance services,	t
emergency service vehicles and accommodating emergency response personnel for routine			need for emergency services during construction and are defined as	n
not encounter any problems with access. Protocols in place planned to deal with escorting			For this condition, these emergency services refer only to Project	Т
as they relate to effective security and safety. Emergency services traveling to site in 2018 did			construction and communicate to emergency service providers	c
BC Hydro continues to develop and mature both access requirements and access restrictions	In Compliance	Ongoing	 Develop site access protocols to enable safe site access during 	EAC 43

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EAC Condition

Implementation Status

Compliance Status

Description

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EAC 44

potential increased need resulting from the influx of the Project The EAC Holder must assist School Districts 59 and 60 to adjust to

Ongoing

In Compliance

BC Hydro provided this information on the Project workforce to School Districts 59 and 60 on

July 27, 2018. BC Hydro will provide updated information in July 2019.

about anticipated changes in the resident population and potential workforce by providing annual information throughout construction

new school enrolment.

EAC 43

construction.

EAO.

Emergency Services Plan, and any amendments, to the satisfaction of The EAC Holder must develop, implement and adhere to the final

Ongoing

In Compliance

been integrated into all safety management planning for contractors at site. Building on BC Hydro submitted an Emergency Action Plan with full sign-off in August 2016. The plan has

baseline requirements for exercises and ongoing planning.

meetings occurred in 2018 to ensure alignment with prime contractors and to confirm previous work and success around emergency management at Site C, additional coordination EAC 43

The EAC Holder must file the final Emergency Services Plan with EAO,

Completed

In Compliance

governments on June 5, 2015.

The final Emergency Services Plan was submitted to local emergency services providers, and

District, City of Fort St. John, District of Hudson's Hope and District of

Taylor a minimum of 30 days prior to the commencement of

local emergency service providers including the Peace River Regional

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 45	The EAC Holder must assist the Northern Lights College to adjust to potential increased need resulting from the influx of the Project workforce by providing information annually during construction to identify the number of worker hires.	Ongoing	In Compliance	Site C Contractors are contractually required to report on their work force monthly. B has provided this information in "The Summary of the Site C Workforce - Annual repo (Total worker, Temporary Foreign Workers and Difficult to Hire Positions)" that was p to the Northern Lights College and School District 59 and 60 on July 27th, 2018. The n report will be issued in July 2019.
EAC 46	The EAC Holder must develop a Waste Management Plan.	Completed	In Compliance	The Waste Management Plan is described in Section 4.16 of the CEMP for the Project
EAC 46	The Waste Management Plan must be developed by a QEP.	Completed	In Compliance	The Waste Management Plan is described in Section 4.16 of the CEMP. Section 6.0 of CEMP lists the QPs who prepared the plan.
EAC 46	The Waste Management Plan must include at least the following: Identify waste management strategies to manage effects on landfills in the region.	Ongoing	In Compliance	Section 4.16 of the CEMP requires that Contractor EPPs address this requirement. BC audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 46	 Develop methods for disposal of project-related waste. 	Ongoing	In Compliance	Section 4.16 of the CEMP requires that Contractor EPPs address this requirement. BC audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 46	Ensure capacity of local landfills to meet disposal requirements of the Project construction activities	Ongoing	In Compliance	BC Hydro has been in communications with local landfills about operations. Landfill operators have not to date expressed concerns about waste streams from the Project negatively affecting landfill capacity.
EAC 46	 Establish resources and funding arrangements to address any potential shortfall in existing landfill capacity. 	Ongoing	In Compliance	Operators of the Regional District Landfill have not expressed concern over landfill cap: resulting from increased waste flows from the Site C Project.
EAC 46	 Identify other waste management options through consultation with the Peace River Regional District/municipal agencies responsible for management of solid waste in the area. 	Ongoing	In Compliance	All contractors onsite manage a waste stream that is segregated as per the available w programs in the area. BC Hydro consulted with Peace River Regional District in 2018 an not identify any additional waste management practices that BC Hydro needs to pursu
EAC 46	The EAC Holder must provide the Waste Management Plan to the MOE, Peace River Regional District, City of Fort St. John and the District of Hudson's Hope for review a minimum of 90 days prior to the commencement of construction activities.	Completed	In Compliance	The Waste Management Plan is described in Section 4.16 of the CEMP for the Projec Draft CEMP was submitted to regulatory agencies, governments, and Indigenous grou October 17, 2014

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				Appendix G
No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 46	The EAC Holder must file the final Waste Management Plan with the EAO, MOE, Peace River Regional District, City of Fort St. John and the District of Hudson's Hope a minimum of 30 days prior to the commencement of construction activities.	Completed	In Compliance	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).
EAC 46	The EAC Holder must develop, implement and adhere to the final Waste Management Plan, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	Section 4.16 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.
EAC 47	The EAC Holder must mitigate actual effects on the functionality of local water and sewage systems by implementing measures detailed in a Local Infrastructure Mitigation Plan.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition. BC Hydro established mitigation and/or monitoring programs with the District of Hudson's Hope, City of Fort St. John and the District of Taylor for their water and sewage systems as appropriate, in their community agreements. BC Hydro is working with the PRRD to establish a similar agreement.
				BC Hydro will submit the draft Local Infrastructure Mitigation Plan to governments and Indigenous groups, a minimum of 360 days prior to reservoir filling. BC Hydro will submit the final Local Infrastructure Mitigation Plan to the EAO, governments and Indigenous groups, a minimum of 30 days prior to reservoir filling.
EAC 47	The Local Infrastructure Mitigation Plan must include at least the following: A strategy for ongoing communication with local municipalities. Specific mitigation measures (system relocation, replacement, monitoring) that may be required to ensure the functionality of existing municipal water and sewer systems.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition
EAC 47	 Identification of resources and funding arrangements associated with specific mitigation measures that may be required to ensure functionality of existing municipal water and sewer systems. 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition
EAC 47	The EAC Holder must provide this draft Local Infrastructure Mitigation Plan to the Peace River Regional District, City of Fort St. John, District of Hudson's Hope, District of Taylor, and Aboriginal Groups for review a minimum of 360 days prior to reservoir filling.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition

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The Housing Plan and Housing Monitoring and Follow-up Program Rev. 2 was submitted December 2016. The Housing Plan Rental Apartments Monitoring Report - 2018 was submitted to the City and BC Housing on January 22, 2019. The First Nations Net Migratiu report for 2018 will be submitted in May 2019. BC Hydro meets with the City of Fort St. J several times a year to discuss any topics of interest to the City as well as implementation conditions.	In Compliance	Ongoing	The EAC Holder must ensure that measures implemented under the Housing Plan are effective in mitigating increased demands for housing in the City of Fort St. John by developing and implementing a Housing Monitoring and Follow-up Program for the construction phase.	EAC 49
The Housing Plan and Housing Monitoring and Follow-up Program Rev. 2 was submit December 2016. The Housing Plan Rental Apartments Monitoring Report - 2018 was submitted to the City and BC Housing on January 22, 2019. The First Nations Net Mig report for 2018 will be submitted in May 2019.	In Compliance	Ongoing	The EAC Holder must develop, implement and adhere to the final Housing Plan, and any amendments, to the satisfaction of EAO.	EAC 48
The final Housing Plan and Housing Monitoring and Follow-Up Program, was subm the EAO, the City of Fort St. John and Indigenous groups on June 5, 2015. Revision : final plan was submitted on December 12, 2016.	In Compliance	Completed	The EAC Holder must file the final Housing Plan with the EAO, the City of Fort St. John and Aboriginal Groups a minimum of 30 days prior to the construction of housing.	EAC 48
The draft Housing Plan and Housing Monitoring and Follow-Up Program, was submit the City of Fort St. John and Indigenous groups on April 7, 2015.	In Compliance	Completed	The EAC Holder must provide this draft Housing Plan to the City of Fort St. John, and Aboriginal Groups for review a minimum of 90 days prior to the construction of housing.	EAC 48
The Housing Plan and Housing Monitoring and Follow-up Program Rev. 2 describes h monitoring net migration to reserves is completed in section 7.2. The report for 2017 submitted in May 2018. The report for 2018 will be submitted in May 2019.	In Compliance	Ongoing	 Monitor net migration to reserves as a result of the Project. 	EAC 48
To date, BC Hydro has provided the following funding for emergency and transitiona housing programs in Fort St. John: \$25,000 contribution to Skye's Place in Septembe to support transitional housing; \$25,000 contribution to Meaope Transition House in September 2015 to support transitional housing; and \$200,000 contribution to Salva Army in November 2016 to support emergency housing.	In Compliance	Completed	 Provide approximately \$250,000 to emergency or transitional housing providers in the City of Fort St. John. 	EAC 48
Section 5.4 of the Housing Plan and Housing Monitoring and Follow-up Program dese the plan to build the long-stay RV accommodations. The RV spaces at Peace Island Pa operated by the District of Taylor have been completed. Taylor opened the spaces to public in early summer 2018.	In Compliance	Completed	 Expand RV accommodation by building 20 new temporary long-stay RV accommodations. 	EAC 48
Description	Compliance Status	Implementation Status	EAC Condition	No.

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ring to ensure measures to mitigat ed to be adjusted to adequately m Holder must develop an approach tal vacancy rate and price as publis for the Fort St. John area and mus f market changes that may require	ing to ensure meas ad to be adjusted to Holder must develo for the Fort St. John f market changes th f market stranges th r will review the mo nd discuss if additio ons.	r will review r will review discuss if a ons. City of Fort con the Fort for the Fort for the Fort the Fort ons.	r will Hold Hold Hold Hold Hold Hold Hold Ho
t define the natu additional	n area and must define the natu nat may require additional onitoring results with the City of nal mitigation is required and	St. John area and must define the natu nges that may require additional the monitoring results with the City of additional mitigation is required and ided semi-annually during construction St. John, beginning 180 days following struction.	he Fort St. John area and must define the natu rket changes that may require additional review the monitoring results with the City of scuss if additional mitigation is required and of Fort St. John, beginning 180 days following t of construction. Is to frack net migration to reserves attributai n rental market conditions in the City of Fort S if additional mitigation is needed.
s with the City of Or		ly during construction to Or ng 180 days following	ly during construction to or ng 180 days following or to reserves attributable rs in the City of Fort St. s needed.
	Ongoing	Dngoing	Dngoing Dngoing Dngoing
	In Compliance	In Compliance	In Compliance In Compliance
	The Housing Plan and Housing Monitoring and Follow-up Program Rev. 2 was submit December 2016. The Housing Plan Rental Apartments Monitoring Report - 2018 was submitted to the City and BC Housing on January 22, 2019. BC Hydro meets with the Fort St. John several times a year to discuss any topics of interest to the City as well a mplementation of conditions. The most recent meeting occurred on October 31, 20: First Nations Net Migration report for 2018 will be submitted in May 2019.	The Housing Plan and Housing Monitoring and Follow-up Program Rev. 2 was submitted December 2016. The Housing Plan Rental Apartments Monitoring Report - 2018 was submitted to the City and BC Housing on January 22, 2019. BC Hydro meets with the C Fort St. John several times a year to discuss any topics of interest to the City as well as implementation of conditions. The most recent meeting occurred on October 31, 2018 First Nations Net Migration report for 2018 will be submitted in May 2019. BC Hydro submitted the Housing Plan and Housing Monitoring and Follow-up Progra 2 on December 12, 2016 which reflects the change by CMHC from semi-annual repo- annual reporting. The monitoring was updated to reflect only fall monitoring but the threshold to consider mitigation was lowered from two reporting cycles to one to off change. BC Hydro discussed the change with the City prior to submitting the revised Pl	The Housing Plan and Housing Monitoring and Follow-up Program Rev. 2 was submitted December 2016. The Housing Plan Rental Apartments Monitoring Report - 2018 was submitted to the City and BC Housing on January 22, 2019. BC Hydro meets with the Cit Fort St. John several times a year to discuss any topics of interest to the City as well as mplementation of conditions. The most recent meeting occurred on October 31, 2018. First Nations Net Migration report for 2018 will be submitted in May 2019. BC Hydro submitted the Housing Plan and Housing Monitoring and Follow-up Progran 2 on December 12, 2016 which reflects the change by CMHC from semi-annual report annual reporting. The monitoring was updated to reflect only fall monitoring but the threshold to consider mitigation was lowered from two reporting cycles to one to off- change. BC Hydro discussed the change with the City prior to submitting the revised Pla change. BC Hydro discussed the change with the City prior to submitting the revised Pla submitted in May 2018. The report for 2018 will be submitted in May 2019. BC Hydro h requested Indigenous communities to provide information they would like included in t report for 2018.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 51	The EAC Holder must develop and implement a Business Participation Plan (Plan).	Ongoing	In Compliance	 The Site C Project continued to maintain an active business directory, with approximately 1,700 businesses registered. This business directory is shared with major contractors. including PRHP, ATCO and AFDE. BC Hydro also uses the business directory for internal requirements. Information about BC Hydro-issued public procurement opportunities are posted to BCBid, on the Site C website (where appropriate) and emailed to the Site C business directory. In this period, seven emails were sent to the business directory and information on major procurements are provided to local and regional governments and local and provincial business association stakeholders. Other activities include: The Site C procurement forecast, including regularly- updated major procurement/contract fact sheets, is available on the Site C contractors. BC Hydro is an active member of several local and regional Chamber organizations (e.g. Fort St. John, Chetwynd), attending meetings and providing presutations as appropriate. This satisfies the requirement to build relationships and increase awareness in the region. As part of ongoing community relations, BC Hydro will continue to meet with local economic development offices and business organizations to provide up-to-date information on business opportunities with the Site C project. Site C's major contractors have also led several procurements through their own internal systems and maintain active vendor's lists. BC Hydro provides information to businesses

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 51	The Plan must include at least the following: Increase awareness in the business community about Project procurement opportunities.	Ongoing	In Compliance	The Site C Project continued to maintain an active business directory, with approximately 1,700 businesses registered. This business directory is shared with major contractors, including PRHP, ATCO and AFDE. BC Hydro also uses the business directory for internal requirements.
				Information about BC Hydro-issued public procurement opportunities are posted to BCBid, on the Site C website (where appropriate) and emailed to the Site C business directory. In this period, seven emails were sent to the business directory and information on major procurements are provided to local and regional governments and local and provincial business association stakeholders.
				Other activities include: The Site C procurement forecast, including regularly- updated major procurement/contract fact sheets, is available on the Site C website. BC Hydro responded to enquiries related to business opportunities in this period, providing information and linking businesses to relevant opportunities with BC Hydro and the Site C contractors. BC Hydro is an active member of several local and regional Chamber organizations (e.g. Fort St. John, Chetwynd), attending meetings and providing presentations as appropriate. This satisfies the requirement to build relationships and increase awareness in the region.
				As part of ongoing community relations, BC Hydro will continue to meet with local economic development offices and business organizations to provide up-to-date information on business opportunities with the Site C project. Site C's major contractors have also led several procurements through their own internal systems and maintain active vendor's lists. BC Hydro provides information to businesses

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The final Labour and Training Plan was submitted to regulatory agencies, governments, Indigenous groups, School Districts 59 and 60, and Northern Lights College on June 5, 2017. The Labour and Training Plan requires an annual report on the Project workforce be submitted to Training institutions on the North. "The Summary of the Site C Workforce - Annual report (Total worker, Temporary Foreign Workers and Difficult to Hire Positions)" was provided to the Northern Lights College and School District 59 and 60 on July 27th, 2018 The next report will be issued in July 2019.	In Compliance	Ongoing	The EAC Holder must develop and implement a Labour and Training Plan.	EAC 53
 BC Hydro worked with local governments and non-profit organizations active in the Peace region to establish the BC Hydro Peace Region Non-Profit Community Fund ("Fund"), now called the BC Hydro Generate Opportunities 'GO Fund". The Fund will support programs provided by non-profit organizations in target communities in the North and South Peace (Chetwynd, Hudson's Hope, Taylor, Fort St. John and PRRD) throughout Project construction. BC Hydro will provide an annual contribution of \$100,000 per year to the fund for eight years. BC Hydro established the Regional Decision-making Committee in June 2016. The GO Fund was launched jointly by BC Hydro, Northern Development Initiative Trust (NDIT) and the Committee on September 13, 2016. All information is available on website: www.northerndevelopment.bc.ca/funding-programs/capacity-building/bc-hydro-go-fund/. Applications will be accepted continuously with four intake reviews (November, February, May, and August). 	In Compliance	Ongoing	The EAC Holder must support the North and South Peace non- profit organizations by establishing a community non-profit fund and providing an annual contribution of \$100,000 per year to the fund during the construction phase. Organizations that support children and families will be eligible to apply for funding from the community non-profit fund.	EAC 52
As described in the Business Participation Plan (available on the Site C website), BC Hydro will publicly report on business participation activities on an annual basis. The 2017-2018 Annual Report for the Business Participation Plan was made available on the Site C website in July 2018. The 2018- 2019 annual report will be available on the Site C website in July 2019.	In Compliance	Ongoing	The EAC Holder must develop, implement and adhere to the Final Plan, and any amendments, to the satisfaction of EAO.	EAC 51
Description	Compliance Status	Implementation Status	EAC Condition	No.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 53	The Labour and Training Plan must include at least the following: Where labour requirements cannot be met through the local labour pool, develop a strategy for attracting new entrants to the local labour force.	ongoing	In Compliance	 BC Hydro has undertaken the following initiatives described in the Plan to date: Site C contractors continue to participate in regional jobs fairs. BC Hydro has contractually required Site C Contractors to report on their work force monthly, including reporting on categories of workers that are difficult to hire for the Peace Region labour pool. Developed and implemented the Indigenous Employment and Information Day. The session is an opportunity for networking between contractors and the training and employment representatives from regional Indigenous communities. Two sessions have been held in 2018 BC Hydro required Site C contractors to post Site C employment opportunities on the WorkBC and Employment Connections websites. BC Hydro has also facilitated contact between new Site C contractors and Employment Connections to ensure Site C Contractors continue to post Site C employment opportunities. Two session on the mumber and job category of foreign workers, management, and supervisors employed in Canada on Project related work. In September 2017, the Contractors Labour Committee is to support Indigenous training labour subcommittee. The purpose of the subcommittee is to support Indigenous training abour and employment on Site C through communication, consultation, coordination an cooperation among contractors on the Project

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 53	 Resources and funding arrangements with education providers to ensure required training and skill development programs are available. 	Ongoing	In Compliance	BC Hydro has undertaken the following initiatives described in t - continued to support trades and skilled training through the BC Training Bursary Awards program through Northern Lights Colle students had received bursaries, including 100 Indigenous stude from the bursary in programs such as electrical, welding, millwri and many others. The bursary ended in October 2018, with rem available. BC Hydro has worked with the Northern Lights Colleg bursary for additional year, and reserve the remaining bursary a with trades programs directly needed for project work. - maintained regular contact with relevant Ministry's to update a workforce requirements for the Project and provide workforce i
EAC 53	Participation in regional workforce training initiatives during construction	Ongoing	In Compliance	 BC Hydro has maintained on-going contact with training provide employment agencies in Northeast British Columbia and facilitat agencies and Site C contractors. BC Hydro has facilitated connections between PRHP, AFDE and I plan on job fair specifically focused on workers required for upco In August 2013, Northern Lights College Foundation started diand Skilled Training Bursary Awards. As of August 2018, 241 st including 100 Indigenous students who have benefitted from the as electrical, welding, millwright, cooking, social work, and many in October 2018, with remaining amounts still available. BC Hyd Northern Lights College Foundation to extend the bursary for ad the remaining bursary amounts for local workers with trades propect work.

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No.	EAC 53
EAC Condition	 Identification of apprenticeship opportunities during construction
Implementation Status	Ongoing
Compliance Status	In Compliance
Description Description	 BC Hydro has undertaken the following initiatives described in the Plan to date: Required Site C contractors to adhere to the provincial government's policy "Apprentices on Public Projects in British Columbia" which requires identification of apprentices being utilized on the Site C Project. BC Hydro requires Site C contractors contractually to comply with the provincial government policy which requires contractors to demonstrate they are engaged in apprenticeship training and use apprentices on the work site. BC Hydro will be ensuring compliance with the any updated policy as appropriate to applicable contracts for the term of their respective construction contract. BC Hydro has also included broad apprentice targets in the Main Civil Works (MCW) contract. In addition, both the Generating Station and Spillway (GSS) Civil contract and the Transmission lines and the substation contracts have apprentice targets included in them that were developed based on the request of government as outlined above to assist companies to aspire to a 25 per cent or greater target for apprentices reviewing workforce requirements and apprenticeship reporting to ensure targets and reporting requirements are met. This also includes determining what support is required for training workers for upcoming project required skills.

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EAC 54	EAC 53	EAC 53	EAC 53	EAC 53	No.
The EAC Holder must develop an Aboriginal Training and Inclusion Plan.	The EAC Holder must develop, implement and adhere to the final Labour and Training Plan, and any amendments, to the satisfaction of EAO.	The EAC Holder must file the final Labour and Training Plan with EAO, City of Fort St John, District of Taylor, District of Hudson Hope, Peace River Regional District, Aboriginal Groups, School Districts 59 and 60, and Northern Lights College a minimum of 30 days prior to the commencement of construction.	The EAC Holder must provide this draft Labour and Training Plan to the City of Fort St John, District of Taylor, District of Hudson Hope, Peace River Regional District, Aboriginal Groups, School Districts 59 and 60, and Northern Lights College for review a minimum of 90 days prior to the commencement of construction.	 Provision of additional day-care spaces in Fort St. John to increase spousal participation in the labour market. 	EAC Condition
Completed	Ongoing	Completed	Completed	Completed	Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
The Aboriginal Training and Inclusion Plan (June 2015) is available on the Project website at: https://www.sitecproject.com/sites/default/files/Aboriginal_Training_and_Inclusion _Plan.pdf	The Summary of the Site C Workforce - Annual report (Total worker, Temporary Foreign Workers and Difficult to Hire Positions) was provided to the Northern Lights College and School District 59 and 60 on July 27th, 2018. The next report will be issued in July 2019.	The final Labour and Training Plan was submitted to regulatory agencies, governments, Indigenous groups, School Districts 59 and 60, and Northern Lights College on June 5, 2017.	The draft Labour and Training Plan was submitted to regulatory agencies, governments, Indigenous groups, School Districts 59 and 60, and Northern Lights College on October 17, 2014.	Section 6.5 of the Labour and Training Plan submitted on June 5, 2015 describes the approach to providing additional day-care spaces in Fort St. John. In spring 2015, BC Hydro and School District 60 reached an agreement that will create 37 new childcare spaces in the new elementary school in Fort St. John. BC Hydro contributed \$1.8 million to School District 60 to build the new childcare centre as part of the new school. School District 60 selected the YMCA of Northern British Columbia as the operator in January 2018. The daycare opened on August 1, 2018.	Description

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 54	The Aboriginal Training and Inclusion Plan must include at least the following:	Ongoing	In Compliance	BC Hydro continues to post Site C Project job opportunities on the Site C Project, WorkBC and Employment Connections websites. These sites and the hyperlinks are provided as
	 Description of a protocol and plan for the communication of employment opportunities to Aboriginal groups. 			standing information in the bi-weekly information updates sent out by email to Indigenous groups. During this reporting period, employment of Indigenous people working for Site C Construction and Non-Construction Contractors ranged from approximately 80-220 per month.
				BC Hydro's Indigenous Employment and Business Development Program Specialist in Fort S John continued to actively work with Indigenous communities to highlight the opportunitie

EAC 54 Pe		en · · · · · · · · · · · · · · · · · · ·
Inclusion of evaluation criteria for hiring and training Aboriginal (ersons in contractor procurement packages.		ne Addright Fraining and inclusion Fran must include at least the Description of a protocol and plan for the communication of mployment opportunities to Aboriginal groups.
Dngoing		
in Compliance E		
BC Hydro contractors have continued to train and employ Indigenous carpenter apprentices on the Project. Where applicable to their role, the following safety training has been provided to over 50 Indigenous workers on the Site C Project: Fire Suppression Training; Power System Safety Protection (PSSP); Risk Tolerance; H2S (Hydrogen Sulfide) Awareness; First Aid; and Bear Aware.	both on Site C as well as with BC Hydro broadly. Results of these initiatives are described in the Aboriginal Training and Inclusion Plan Annual Report, submitted to the EAO and made available to Indigenous groups through the Project website. Indigenous groups are notified of annual reports through the bi-weekly Site C Information Update emails. The 2017-2018 ATIP Annual Report, describing activities from Iuly 1, 2017 to March 31, 2018 was submitted to the EAO on October 24, 2018. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019.	and Employment Connections websites. These sites and the hyperlinks are provided as standing information in the bi-weekly information updates sent out by email to Indigenous groups. During this reporting period, employment of Indigenous people working for Site C Construction and Non-Construction Contractors ranged from approximately 80-220 per month. BC Hydro's Indigenous Employment and Business Development Program Specialist in Fort St.

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	No.	EAC 54	EAC 54
	EAC Condition	 Strategies for capacity building, education, and training associated with Aboriginal participation in the labour market, including construction, trades, and other indirect and induced sectors for Aboriginal workers, as these jobs are likely to be longer lived than those related strictly to construction. 	. Resources and funding arrangements to support training, industry, and Aboriginal partnership opportunities in the region. Provide \$30,000 to the to the Minerva Foundation for three years to support Treaty 8 First Nation women in northeast BC wishing to participate in the Minerva Foundation's Combining Our Strength Initiative (\$10,000 provided to date.).
	Implementation Status	Ongoing	Complete
	Compliance Status	In Compliance	In Compliance
Appendix G	Description	 BC Hydro has implemented capacity building initiatives that have supported essential skills training, pre-trades and trades training, or increased business capacity in Indigenous businesses. Examples include Indigenous involvement in Site C field programs; Moberly Lake Academic Program; Youth Hires Program; Site C Tours; Career Energizers with BC Hydro; Northern Lights College Essential Skills for Trades; Driver Training; Construction Safety with PRHP; and Electro-Fishing Training course. BC Hydro is currently developing a Site C Pre-Carpentry training to consider proposals from Indigenous groups and training organizations for potential capacity building, education and training opportunities throughout the construction phase of the Project. 	As of 2017, BC Hydro has fulfilled its commitment of providing \$30,000 in funding to Minerva Foundation to support Treaty 8 First Nation women in northeast BC wishing to participate in the Minerva Foundation's Combining Our Strength Initiative. This funding was provided over three years from 2014 to 2017.

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No.	EAC 54	EAC 54
EAC Condition	This is in addition to funding provided to date to Northem Lights College Foundation (\$1 million over five years), Northern Development Opportunities Program (\$175,000), Northern Opportunities School District Counsellor (\$184,000), NENAS NEATT Program (\$100,000) and Oho Education (\$16,600). Program (\$100,000) and Oho Education (\$16,600).	 Aboriginal Business Participation Strategy to maximize opportunities for Aboriginal businesses, incorporating at least the following: Obtaining information from Aboriginal suppliers in the LAA, and from other Aboriginal groups with whom BC Hydro is engaged about the Project, about their business capacity and capabilities to provide goods and services for the Project
Implementation Status	Ongoing	Ongoing
Compliance Status	In Compliance	In Compliance
Description	In 2012, BC Hydro provided \$1 million in funding to the Northern Lights College Foundation (NLCF) for the BC Hydro Trades & Skilled Training Award Bursary. This was to be distributed over a five-year period, ending in August 2018. The purpose of the bursary was to support the development of skilled workers in northeast B.C. and assist students who may not otherwise have access to post-secondary education. Fifty per cent of the funding for bursaries is dedicated to Indigenous students. As of the last intake of August 2018, 241 students received bursaries, including 100 Indigenous students.	BC Hydro supports the advancement of economic opportunities for Indigenous groups, and is working with Indigenous businesses with respect to contracting opportunities on the Project. In addition, BC Hydro's contractors are required to make efforts to provide opportunities for subcontracting, employment and training for Indigenous businesses and individuals, and to report on Indigenous inclusion in the performance of their work. Indigenous businesses have been awarded work on the Site C Project in the following areas: vegetation clearing; site preparation, roads and bridges; grass seed supply; wetland mitigation; safety buoys; project health clinic; substation work; environmental monitoring; fish habitat enhancement; civil construction; erosion and sediment control; quarry development and rip rap production.

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No.	EAC 54	EAC 54	EAC 54	EAC 54	EAC 54		EAC 55
EAC Condition	 Direct engagement with the local Aboriginal business community, including sponsoring and participating in Aboriginal business events and conferences. 	o Implementation of BC Hydro's Aboriginal Contract and Procurement Policy.	The EAC Holder must provide this draft Aboriginal Training and Inclusion Plan to Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.	The EAC Holder must file the final Aboriginal Training and Inclusion Plan with EAO and Aboriginal Groups a minimum of 30 days prior to construction.	The EAC Holder must develop, implement and adhere to the final Aboriginal Training and Inclusion Plan, and any amendments, to the satisfaction of EAO.	HUMAN HEALTH	The EAC Holder must manage increased demands on community recreational programs and services resulting from the influx of the Project workforce by implementing mitigation measures detailed in a Recreation Program for residents of the work camp, in consultation with the City of Fort St. John.
Implementation Status	Ongoing	Ongoing	Completed	Completed	Ongoing		Ongoing
Compliance Status	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance		In Compliance
Description	BC Hydro continues to engage the local Aboriginal Business community through the following initiatives: - Site C Business Directory - Business Networking Sessions and Job Fairs - Procurement Process Support	BC Hydro's procurement and Indigenous Relations staff are available to discuss procurement processes and ways to stay informed about upcoming procurements. BC Hydro works closely with Indigenous communities and businesses to understand their capacity and interest with respect to the Project and identification of potential contracting opportunities.	The draft Aboriginal Training and Inclusion Plan was submitted to Indigenous groups on October 17, 2014.	The final Aboriginal Training and Inclusion Plan was submitted to EAO and Indigenous groups on June 5, 2015	Results of initiatives conducted under Aboriginal Training and Inclusion Plan (ATIP) are described in annual reports submitted to the EAO and made available to Indigenous groups through the Project website. Indigenous groups are notified of annual reports through the bi-weekly Site C Information Update emails. The 2017- 2018 ATIP Annual Report, describing activities from July 1, 2017 to March 31, 2018 was submitted to the EAO on October 24, 2018. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. BC Hydro will update the ATIP as required based on new information, and will continue to implement initiatives described in the plan throughout construction.		BC Hydro signed a Community Measures Agreement with the City of Fort St. John on April 22, 2016 which addressed mitigation for camp resident use of City recreational services.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 55	If the recreational services required by residents of the camp extend beyond that provided through in-house (EAC Holder) facilities and programming, the EAC Holder must identify, through consultation with the City of Fort St. John, additional facility and/or programming needs and must provide the resources required to meet those needs.	Ongoing	In Compliance	BC Hydro signed a Community Measures Agreement with the City of 22, 2016 which addressed mitigation for camp resident use of City re
EAC 55	The EAC Holder must develop a draft Recreation Program for review by the City of Fort St. John and the Peace River Regional District a minimum of 90 days prior to the commencement of camp operations.	Completed	In Compliance	The draft Recreation Program was submitted to City of Fort St. Jo 17, 2014.
EAC 55	The EAC Holder must file the final Recreation Program with EAO, City of Fort St. John and Peace River Regional District a minimum of 30 days prior to the commencement of camp operations.	Completed	In Compliance	The final Recreation Program was submitted to EAO, City of Fort S 5, 2015.
EAC 55	The EAC Holder must develop, implement and adhere to the final Recreation Program, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	BC Hydro has made payments to the City in accordance with the (Agreement for Year 1-4 of the Project.

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	iny functionality problems such as poor water quality or low yield ult from the Project, the EAC Holder must work with the well 'ner(s) to provide an alternate source of potable water.	nitoring must be done twice a year for 10 years, beginning nually from the outset of construction.	e EAC Holder must ensure that wells affected by changes to oundwater levels within 1 km of the reservoir or Peace River nsumption by monitoring potentially affected wells, with the proval of potentially affected well owners, for significant long-term .Il quality issues.	EAC Condition
	Initial Planning	Ongoing	Ongoing	Implementation Status
	Future Requirement	In Compliance	In Compliance	Compliance Status
	BC Hydro acknowledges and understands this condition. If testing finds issues with water quality or yield caused as a result of the project, BC Hydro will work with the well owner(s) to provide an alternate source of potable water.	Monitoring will continue for a period of 10 years from the date of the initial voluntary sampling event in October 2016.	BC Hydro commenced monitoring of groundwater in June 2015 at representative water sampling locations selected based on historical well drill logs and spatial proximity to water wells within 1 km of the reservoir. This program was implemented as an alternative to monitoring private wells for which BC Hydro cannot control access, operation, maintenance, or possible contamination. For those willing to participate in the monitoring program, BC Hydro has requested information on wells, and if used for drinking water, requested approval to complete well water testing. An initial field program was conducted in fall 2016, during which time 10 wells were sampled at eight residential properties for baseline water quality analysis. An additional monitoring event was undertaken in spring 2017, during which time 5 wells were sampled for baseline water quality analysis. A renewed effort was made by BC Hydro in summer 2017 to contact owners of registered and non-registered wells. Monitoring in fall 2017 included a total of 16 wells, and expanded the program to include well yield testing where feasible. Monitoring in 2018 was conducted in spring (12 wells sampled and questionnaires completed) and fall (5 wells sampled, 23 questionnaires completed). Well owners whom BC Hydro was unable to successfully contact to schedule monitoring in advance of planned field programs, or who requested to join the voluntary program after the planned event, are considered for inclusion in future monitoring events. Implementation of twice per year monitoring will include contact with drinking water well owners with a brief questionnaire on well operations and any potential changes in water quality. Water quality and well yield testing will be completed on an as- needed basis in private drinking water wells, if potential changes or concerns are identified.	Description

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EAC 57	EAC 57	EAC 57	EAC 57	EAC 57	EAC 57	EAC 57	No.
The EAC Holder must file the final Air Quality Management Plan and Smoke Management Plan with EAO, MOE, City of Fort St. John, District of Hudson's Hope, Peace River Regional District, District of Taylor, District of Chetwynd and Aboriginal Groups a minimum of 30 days prior to the commencement of construction activitiles.	The EAC Holder must provide these draft Air Quality Management Plan and Smoke Management Plan to MOE, City of Fort St. John, District of Hudson's Hope, Peace River Regional District, District of Taylor, District of Hudson's Hope, District of Chetwynd and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction activities.	The EAC Holder must monitor air quality associated with shoreline protection works at Hudson's Hope during the construction period and for the first two years of operations.	 Procedures to provide MOE with data collected during monitoring so that they can notify sensitive populations if air quality thresholds are exceeded. 	 Measures to retain vegetative barriers, or install temporary barriers, where practical. 	 Control Project-related smoke by following the most current BC Ministry of Environment Open Burning Smoke Control Regulation. 	 Measures to manage Project effects on air quality associated with concrete production at concrete batch plants. 	EAC Condition
Completed	Completed	Initial Planning	Completed	Ongoing	Ongoing	Ongoing	Implementation Status
In Compliance	In Compliance	Future Requirement	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).	The Smoke Management Plan and Air Quality Monitoring Program are described in Section 4.1 and Appendix A and B, respectively, of the CEMP. The Draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014	BC Hydro acknowledges and understands this condition. Shoreline protection works at Hudson's Hope are planned to commence in 2020 – 2022. Air quality monitoring plans will be implemented during construction and for the first 2 years of reservoir operations.	A MOU agreement was established between BC Hydro and the MOE regarding the housing and publishing of Site C air quality monitoring data on January 7, 2016.	Section 4.1 of the CEMP requires Contractors to retain vegetative barriers, or install temporary barriers, where practicable. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.1 and Appendix A of the CEMP refer to the requirement to control Project- related smoke in accordance with the BC Ministry of Environment's Open Burning Smoke Control Regulation. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Section 4.1 of the CEMP requires Contractors to prepare EPPs that include measures to manage emissions and dust from all project activities. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Description

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Callity Management Plan, and any interdments, to the satisfaction of EAO. Construction Completed plants In Compliance In addity Compliance addity Construction Is even plants RAC 38 The EAC Holder must develop a Noise and Vibration Management Plan, sati and plants Completed In Compliance The Noise and Vibration Management Plan to figure Project-related noise and vibration effects on human Completed In Compliance The Noise and Vibration Management Plan to figure Project-related noise and vibration effects on human Future Requirement Extruction to each onvietiges and understands fils com noise level monitor noise levels associated with construction Future Requirement Extruction compliance The Noise and Vibration Management Plan to residents in vicinity of Project Project The Site C project team is implementing the Construction construction Communication Plan for residents in vicinity of Project In compliance The Site C project team is implementing the Construction subtrace with the requirement Plan to residents in vicinity of Project Project nem is implementing the Construction subtrace with all subtrace construction contraction Plan to residents in vicinity of Project EAC 53 Implement contraction Plan for residents in vicinity of Project Project new site construction vicinity Plan te regional Communication Plan to residents in vicinity of Project EAC 53 Retain or reect acoustic barriers, fencing, and vegetative Orgoing In compliance </td <td>EAC 57</td> <td>The EAC Holder must develop, implement and adhere to the final Air</td> <td>Ongoing</td> <td>In Compliance</td> <td>Appendix A of the CEMP requires that Contractor EPPs a</td>	EAC 57	The EAC Holder must develop, implement and adhere to the final Air	Ongoing	In Compliance	Appendix A of the CEMP requires that Contractor EPPs a
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Act SB Endomination on ite levels associated with construction of Hudson's Hope Shoreline Protection. Orgoing In compliance Act SB Schoreline protection vortication of construction program and construction Communication Plan for residents in vicinity of Project Orgoing In compliance Aboréginal Group Communication Plan for sesidents in vicinity of Project Schoreline protection Construction Communication Plan for residents in vicinity of Project Orgoing In compliance The 2017-2016 Annual Report for the Construction Stee C website on July 27, 2018. The 2018-2019 An Implementation exercise include: Regional Communication plants to ensure groups are provided with advance notification and stee C website on July 27, 2018. The 2018-2019 An Implementation exercise include: Regional Communication plants to ensure groups be weekly construction updates. First Nature 2018-2019 An Implementation exercise include: Regional Communication plants to ensure schore as appropriate. Acc SB Retain or erect acoustic barriers, fencing, and vegetative screens as appropriate. Orgoing In Compliance The CLMP Section 4.11 describes the retention or Vegetative screens as appropriate sa a mitigation to verify environmental audits during construction to verify	EAC 58	The Noise and Vibration Management Plan must include at least the following:	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this conditi
EAC SS Implement notification of construction program and Construction Communication Plan for residents in vicinity of Project In compliance In compliance The Site C project team is implementing the Const Aborginal Group Communication Plan for residents in vicinity of Project activities The 2017-2016 Annual Report for the construction about the survey The 2017-2016 Annual Report for the Construction about the advance notification ab The 2017-2016 Annual Report for the Construction about the construction about the construction about the project website on July 27, 2018. The 2018-2019 A Implementation events include: Regional Communication Notification Leaders, First Natio State holder construction Notification Leaders, First Natio Stateholder construction Notification Leaders, Stateholder construction Notification Leaders, First Natio Stateholder construction Notification Leaders, Stateholder construction Notification Leaders an intigation in Your construction Notification Leaders an int		 Program to monitor noise levels associated with construction of Hudson's Hope Shoreline Protection. 			Shoreline protection works at Hudson's Hope are plan noise level monitoring will be undertaken during cons
EAC 58 Retain or erect acoustic barriers, fencing, and vegetative screens as appropriate. Ongoing In Compliance Hor Compliance screens as appropriate. In Compliance Hor CEMP Section 4.11 describes the retention or vegetative screens as appropriate as a mitigation to verify environmental audits during construction to verify	EAC 58	 Implement notification of construction program and Construction Communication Plan for residents in vicinity of Project activities 	Ongoing	In compliance	The Site C project team is implementing the Construc Aboriginal Group Communication Plans to ensure that groups are provided with advance notification about
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EAC 58 Retain or erect acoustic barriers, fencing, and vegetative Ongoing In Compliance The CEMP Section 4.11 describes the retention or vegetative screens as appropriate. In Compliance In Compliance With this requirement by environmental audits during construction to verify					Implementation events include: Regional Community drops, bi-weekly construction updates, First Nations Stakeholder Construction Notification Letter, Constru Project website, news releases about key project mil
EAC 58 Retain or erect acoustic barriers, fencing, and vegetative Ongoing In Compliance The CEMP Section 4.11 describes the retention or vegetative screens as appropriate as a mitigation u screens as appropriate. Hydro audits compliance with this requirement by environmental audits during construction to verify					responses to public enquiries, advertising (i.e., transn
	EAC 58	 Retain or erect acoustic barriers, fencing, and vegetative screens as appropriate. 	Ongoing	In Compliance	The CEMP Section 4.11 describes the retention or e vegetative screens as appropriate as a mitigation m Hydro audits compliance with this requirement by r environmental audits during construction to verify i

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EAC 58 T	EAC 58 to	EAC 58 ·	EAC 58 ·	EAC 58	EAC 58 b si	EAC 58 ·	No.
he EAC Holder must develop, implement and adhere to the final oise and Vibration Management Plan, and any amendments, to the	Manage Project construction noise to provide quiet enjoyment o residents, even if it means temporary relocation of residents at ne EAC Holder's expense.	Design a work and noise management schedule that allows an ninterrupted eight hour sleep schedule	Construct perimeter fencing and retain or plant tree screens at 5th Avenue Industrial Lands	Monitor noise at 85th Avenue Industrial Lands	Mitigate night-time noise (e.g. perimeter berms and acoustic arriers, portable enclosures or barriers to the conveyor hopper, and lent backup alarms)	Develop and implement noise monitoring and adaptive nanagement as required.	EAC Condition
Ongoing	Ongoing	Completed	Ongoing	Ongoing	Ongoing	Ongoing	Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
Section 4.11 of the CEMP requires that Contractor EPPs address this requirement. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting	The CEMP Section 4.11 describes noise mitigation measures specific to 85th Avenue Industrial Lands. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation and by conducting noise monitoring during construction activities that commenced in mid-2018.	The Noise Management Plan included within Worker Accommodation design and operations contract is aligned with the CEMP Section 4.11.	The CEMP Section 4.11 describes noise mitigation measures specific to 85th Avenue Industrial Lands. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	The CEMP Section 4.11 describes the implementation of a noise monitoring program at 85th Avenue Industrial Lands. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	The CEMP Section 4.11 describes the scheduling of construction activity near homes to reduce periods of disturbance, and the control of construction traffic and deliveries on local roads during night-time hours (22:00-07:00). BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	The CEMP Section 4.11 describes the implementation of a noise monitoring program to measure noise levels at sensitive locations near the 85th Avenue Industrial Lands, Highway 29 re-alignment, and Hudson's Hope berm. BC Hydro audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	Description

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EAC 60	EAC 60		EAC 59	EAC 58	EAC 58	No.
The Methylmercury Monitoring Plan must include: Methods for collecting monitoring information must include: Involving Aboriginal Groups and the FNHA in the design, implementation, management and interpretation and communication of results;	The EAC Holder must, in collaboration with the First Nations Health Authority (FNHA), NHA and Aboriginal Groups, develop a Methylmercury Monitoring Plan.	Methylmercury	The EAC Holder must outline measures including relocation of affected home-owners, as deemed appropriate in consultation with affected home-owners, to address serious levels of noise or changes in air quality during construction of the Project. The measures would be included in the appropriate plans.	The EAC Holder must file the final Noise and Vibration Management Plan with EAO, FLNR, District of Hudson's Hope, City of Fort St. John, Peace River Regional District and District of Chetwynd a minimum of 30 days prior to the commencement of construction activities.	The EAC Holder must provide this draft Noise and Vibration Management Plan to FLNR, District of Hudson's Hope, City of Fort St. John, Peace River Regional District and District of Chetwynd for review a minimum of 90 days prior to the commencement of construction activities.	EAC Condition
Initial Planning	Initial Planning		Ongoing	Completed	Completed	Implementation Status
Future Requirement	Future Requirement		In Compliance	In Compliance	In Compliance	Compliance Status
BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition. BC Hydro has commenced preparation of a draft Methylmercury Monitoring Plan to share with the FNHA, Northern Health Authority (NHA) and Indigenous groups. BC Hydro will submit this Plan to EAO, FNHA and NHA, a minimum 90 days prior to reservoir filling.		Implementation of the Noise and Vibration and Air Quality Management Plans, including review of EPPs, inspections of mitigation measures, and monitoring, is ongoing. A noise and air quality complaint response process has been developed and is being implemented.	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. The CEMP continues to be updated as required, with the most recent version, Revision 4, dated July 26, 2016, provided to regulators, government agencies, Indigenous groups and the public via the Site C Clean Energy Project website at: https://www.sitecproject.com/document-library/environmental-management.	The Noise and Vibration Management Plan is described in Section 4.11 of the CEMP. The Draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014	Description

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EAC 60	EAC 60	EAC 60	EAC 60	EAC 60	EAC 60	No.
 an annual update on the status, results, and trends of methylmercury concentrations in fish and the presence of human health risks associated with the consumption of fish from the affected waterbodies. 	a detailed communications strategy developed in consultation with relevant Aboriginal groups and government departments and agencies including consumption advisories or other health related bulletin or information, as may be necessary; and	Measures to enable people to limit exposure to methylmercury to avoid risk to human health such as:	Requirements for monitoring the trend and evolution of methylmercury concentrations in fish. Monitoring requirements must include the following: proposed geographic extent; proposed monitoring parameters; proposed monitoring locations; and proposed monitoring timelines and frequency.	 Use of baseline methylmercury levels in representative fish species consumed by Aboriginal Groups and non-aboriginal harvesters. 	 Use of information regarding consumption of fish by Aboriginal Groups known to consume fish in the methylmercury monitoring study if available, and non-aboriginal harvesters including: species and size of fish caught for consumption; o location where fish are caught for consumption; o consumption of fish by age group and gender; fish meal sizes by age group and gender; o fish meal frequency; parts of fish consumed; offish preparation methods; and other relevant consumption information (e.g. events where consumption is higher over a short period of time such as a camping event); and 	EAC Condition
Initial Planning	Initial Planning	Initial Planning	Initial Planning	Initial Planning	In itial Planning	Implementation Status
Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Compliance Status
BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	Description

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No.	EAC 60	EAC 60	EAC 60	EAC 60	EAC 60		EAC 61	EAC 61
EAC Condition	Baseline information must be established prior to any project impacts using a minimum of two years of data and operations phase monitoring will occur each year for the first ten years of operations and every 5 years after until such time as methylmercury levels in fish populations have stabilized.	The EAC Holder must report on the results to EAO, FNHA and NHA in accordance with the monitoring schedule.	The EAC Holder must provide this draft Methylmercury Monitoring Plan to FNHA and NHA for review a minimum of 90 days prior to the commencement of reservoir filling.	The EAC Holder must file the final Methylmercury Monitoring Plan with EAO, FNHA and NHA a minimum of 30 days prior to the commencement of reservoir filling.	The EAC Holder must develop, implement and adhere to the final Methylmercury Monitoring Plan, and any amendments, to the satisfaction of EAO.	HERITAGE RESOURCES	 The EAC Holder must develop and implement measures to manage Project effects on visual resources by undertaking the following throughout construction: Address how to landscape the shoreline protection area in Hudson's Hope to maintain or enhance natural views in collaboration with the District of Hudson's Hope 	Set objectives and requirements for exterior designs for Project structures, and landscaping to blend in with the character of the surrounding environment except in accordance with safety
Implementation Status	Initial Planning	Initial Planning	Initial Planning	Initial Planning	Initial Planning		Ongoing	Ongoing
Compliance Status	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement		In Compliance	In Compliance
Description	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.		BC Hydro has completed public consultation on the Hudson's Hope shoreline protection area. BC Hydro will collaborate with the District of Hudson's Hope regarding measures to maintain or enhance visual resources. BC Hydro signed a Partnering Relationship Agreement with the District of Hudson's Hope in January 2017 which addresses how the District and BC Hydro will work together on the measures in their community. BC Hydro has discussed plantings along the shoreline protection works with the District.	BC Hydro has included requirement for building designs to blend in with surrounding in architectural contract terms for Project Structures, where feasible.

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				Appendix G
No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 61	 Set objectives and requirements for establishing and building workforce accommodation camps on previously disturbed areas or areas generally hidden from key viewpoints. 	Completed	In Compliance	The Site C workforce accommodation camp has been sited on a previously disturbed area and is, in general, hidden from key viewpoints.
EAC 61	The EAC Holder must undertake the measures to the satisfaction of	Ongoing	In Compliance	The implementation of the measures is underway in accordance with this condition.
	EAU.			
	Physical Heritage and Cultural Heritage			
EAC 62	The EAC Holder must protect and preserve heritage resources by	Ongoing	In Compliance	The Heritage Resources Management Plan (HRMP) is available on the Project website at:
	implementing measures as detailed in a Heritage Resources Management Plan.			https://www.sitecproject.com/document-library/environmental- management. Following instruction from the EAO, the HRMP was updated to Revision 3 and submitted to regulators on November 19, 2018.
				Revisions include: providing definitions of "confirmed heritage resources" and "reported but unconfirmed heritage resources"; setting out roles and responsibilities for implementation of the plan; providing a process for reporting, identifying and inspecting location of unconfirmed heritage resources; describing a process confirming the protection status of archaeological and historical sites, including burials; clarifying the circumstances in which avoidance will be considered as an option for mitigating impacts to heritage resources, and providing further description of management options for burial sites protected under the <i>Heritage Conservation Act;</i> and, further defining the heritage monitoring and follow-up program. Annual reports for field work completed in 2018 under these permits and for paleontological recources will be submitted to regulatory agapties by March 31, 2010
EAC 62	The Heritage Resources Management Plan must be developed by a QEP.	Completed	In Compliance	Section 10.0 of the HRMP lists the QEPs who prepared the plan.
EAC 62	The Heritage Resources Management Plan must specify a process for the engagement of Aboriginal Groups in planning and follow-up/monitoring activities related to heritage resources as the Project proceeds.	Ongoing	In Compliance	 This is addressed in the final HRMP. Implementation of this requirement has included: the opportunity for Indigenous groups to comment on Section 14 heritage reports and Section 14 and 12 permit amendments in accordance with the Heritage Conservation Act where the Indigenous groups is listed in the permit, Offers to present heritage work results to Indigenous groups and, providing archaeology crew field assistant employment opportunities for Indigenous people.

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EAC 62	EAC 62	EAC 62	EAC 62	EAC 62	EAC 62	No.
The Heritage Resources Monitoring and Follow-Up Program must include at least the following: • Monitor reservoir erosion during occurrences of exposure to assess the impacts on existing or newly identified protected archaeological sites and other heritage resources	The Archaeology Impact Management Program must be developed by a QEP qualified to hold Section 14 Heritage Inspection and Investigation Permits.	The field and reporting portions of each program will be of a scope, duration and frequency prescribed by the BC Heritage Conservation Act permits.	The Heritage Resources Management Plan must include Archaeological Impact Management and Heritage Resources Monitoring and Follow-Up Programs. Monitoring and Follow-Up Programs.	The EAC Holder must provide the draft Heritage Resources Management Plan to Archaeology Branch of FLNR and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.	In particular, the Plan must incorporate a process for continued collaboration with Aboriginal Groups on ground-truthing for the identification of any burial sites that the Project may disturb.	EAC Condition
Initial Planning	Completed	Ongoing	Ongoing	Completed	Ongoing	Implementation Status
Future Requirement	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
BC Hydro acknowledges and understands this condition.	Section 10.0 of the HRMP lists the QEPs who prepared the plan.	Annual reports for field work completed in 2018 under these permits, and for paleontological resources, will be submitted to regulatory agencies on March 31, 2019.	Section 6 of the HRMP describes Heritage Resources Impact Management. Management measures implemented to date have included: -inclusion of heritage requirements in contractor EPPs, as applicable to the scope of work covered by the EPP, -undertaking archaeological work for the Heritage Resources Impact Assessment in accordance with the terms and conditions of Heritage Conservation Act Section 14 (Heritage Inspection) permits, and -undertaking any land-altering work in accordance with Section 12 Heritage Conservation Act (Site alteration) permit.	The draft HRMP was submitted to the Archaeology Branch of FLNR, and Indigenous groups on October 17, 2014.	This is addressed in the final HRMP Implementation of this requirement has included: -in accordance with the Heritage Conservation Act, Indigenous groups that may be affected by a permitting decision and who are listed in the permit, are provided a review period of between 15 and 30 days and an opportunity for comment, and -providing archaeology crew field assistant employment opportunities for Indigenous people. - BC Hydro continues to work with First Nations to implement appropriate burial management solutions.	Description

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 62	 Implement mitigation measures, systematic data recovery or emergency salvage operations in accordance with the Heritage Resources Management Plan. 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 62	. Conduct the monitoring of shoreline erosion downstream (for approximately 2 km) as part of chance-find procedures to determine if physical heritage resources are affected by the Project. The EAC Holder must undertake this monitoring for any spills from the Project reservoir for a period of two years following the commencement of reservoir filling and commissioning.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 62	 Establish a reporting structure for reporting to Aboriginal Groups and the Archaeology Branch beginning 180 days following the commencement of operations. 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 62	The EAC Holder must file the final Heritage Resources Management Plan with EAO, Archaeology Branch and Aboriginal Groups a minimum of 30 days prior to commencement of construction.	Completed	In Compliance	The final HRMP was submitted to EAO, the Archaeology Branch of FLNR, and Indigenc groups on June 5, 2015. Revision 3 of the final HRMP was submitted to EAO, the Archaeological Branch of FLNR, and Indigenous groups on November 19, 2018.
EAC 62	The EAC Holder must develop, implement and adhere to the final Heritage Resources Management Plan, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	Annual reports for field work completed in 2018 under these permits and for paleonto resources will be submitted to regulatory agencies by March 31, 2019.

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EACE 13 The AC Holder must must be developed in factors on utilination of the set of the developed in a must be compared in the grant messare compared in the must be and the set of the developed in a must be provided in a mu	No. EAC Condition	Implementation Status	Compliance Status	Description
The 2017 2013 CRWP Annual Report, describing activities for 2028 res submitted to the E-X0 on August 32, 2018. The 2010 describe activities from April 1, 2018 to Nethark 31, 2018. The indigenous groups in November 2018. The revision induces definition of "cultural resources", setting out roles and results and structure of the Cultural and Heritage Resources. Commit developing mitigations proves for indigenous groups, including ground-truthing activities and the indigenous groups in November 2018. The revision indigenous developing mitigations resources for exited and the revision developing mitigations resources for exited and the revision inducing workares. Intigation, and compliance verification inducing workares in the plant from collaboration with history first Nutural resources and inducing social and Heritage Resources. Commit methods and the revision groups, indicating ground-truthing activities and the inducing workare in mitigation groups in the plant from collaboration with history first Nutural resources and affects of the Highway 29 realignment on cultural and herita Fals (nerr the confluence of Cache Ceek and the Peace Riv Transportation and the relations in 3 secret plants in the algement at Cache Creek. BC Hydro constitutes to creatly with indigenous groups in langement and cached the fractional activity zone prior to constitute to norsel with indigenous groups and prior the indigenous groups in ground truthing of traditional activity zone prior to constitute. In Cache Creek. BC Hydro constitutes to creatly with indigenous groups in the ground truthing of traditional activity zone prior to constitute on the Resident Socie (cultural in existence). BC Hydro constitutes to creatly with indigenous groups region support integerous groups in ground truthing of traditional activity zone prior to constitute with the grouprior taproprior derivity acting to engage with these	AC 63 The EAC Holder must manage adverse Project effects on cultural resources by implementing mitigation measures detailed in a Cultural Resources Mitigation Plan.	Ongoing	In Compliance	BC Hydro is engaging Indigenous groups on the development a mitigation measures respecting the potential effects of the Proje heritage. Results of initiatives conducted under Cultural Resourc are described in annual reports submitted to the EAO and made groups through the Project website. Indigenous groups are notif through the bi-weekly Site C Information Update emails.
BC Hydro has updated the CRWP based on feedback from the Indigenous groups in November 2018. The revisions included definition of "cultural read-texture of the Cultural and Heringze Resources Commind exeloping inglators measures for cultural and Heringze Resources Commind exeloping inglators measures for cultural and Heringze Resources Commind exeloping inglators measures for cultural and Heringze Resources Commind exeloping inglators measures for cultural and Heringze Resources Commind exeloping and the Cultural and Heringze Resources Commind exeloping and the cultural and heringze Resources Commind exeloping and the cultural and hering a transgement optic including avoidance, mitigation, and compliance welfileation or compliant from Vest Noberty First Nations and Torobet KW effects of the Environmental Assessment Office initiated comparisit from Vest Noberty First Nations and Proper Kinst Nations in groups in ground truthing traditional activity are profer to construction. Bet Hydro Nations in Provide With Indigenous groups in ground truthing through Consultation and Capacity Finding additional funding to sould for near the project Continue to concern within or ear the project Continue tate of concern within or ear the project Continue to avoid or mitigate impacts.				The 2017-2018 CRMP Annual Report, describing activities from 2018 was submitted to the EAO on August 24, 2018. The 2018 describe activities from April 1, 2018 to March 31, 2019.
and structure of the Cultural and Heritage Resources Comits developing mitigations measures for cultural resources in coli indgenous groups, including ground-truthing activities and t mitigation plans, and identifying potential management optic including avoidance, mitigation and compliance verification is continue to implement initiative described in the plan throup collaboration with individual indigenous groups, including gro preparation of site specific mitigation plans. In April 2017, the Environmentral Assessment Office initiated compliant for west Moberly First Nations and Prophet Riv effects of the Highway. 29 realignment on cultural and the reace Riv Transportation and Infrastructure are currently working with totters on the cadesign of the Highway. 29 realignment at Cad- consultation on the alternative noute aptrons in 2018, suppo Making Process, to select a route while seeking to avoid or burial sites and sared places at Cade Creek. BC Hydro construction. BC Hydro has provided fu ground truthing through Consultation and Capacity funding additional funding to Olog Niker First Nation. Hafthway Niker F First Nations for specific cultural investigations. Some Indige identified cultural sites of concern within to rear the project continuing to engage with these groups around maphing of i potential measures to avoid or mitigate impacts.				BC Hydro has updated the CRMP based on feedback from the E Indigenous groups in November 2018. The revisions included, a definition of "cultural resources", setting out roles and responsi the plan, establishing a process for review and revision of the p
In April 2017, the Environmental Assessment Office initiated complaint from West Moberly First Nations and Prophet Rive effects of the Highway 29 realignment on cultural and herita Flats (near the confluence of Cache Creek and the Peace Rive Transportation and Infrastructure are currently working with others on the redesign of the Highway 29 realignment at Ca- consultation on the alternative route options in 2018, suppor Making Process, to select a route while seeking to avoid or rn burial sites and sacred places at Cache Creek. BC Hydro continues to consult with Indigenous groups regan support Indigenous groups in ground truthing of traditional activity zone prior to construction. BC Hydro has provided fi ground truthing through Consultation, Hafkway River F First Nations for specific cultural investigations. Some Indige identified cultural sites of concern within or near the project continuing to engage with these groups around mapping of potential measures to avoid or mitigate impacts.				and structure of the Cultural and Heritage Resources Committe developing mitigations measures for cultural resources in collat Indigenous groups, including ground-truthing activities and the mitigation plans, and identifying potential management option: including avoidance, mitigation, and compliance verification as continue to implement initiatives described in the plan through collaboration with individual Indigenous groups, including grou preparation of site specific mitigation plans.
Flats (near the confluence of Cache Creek and the Peace Riv Transportation and Infrastructure are are currently working with others on the redesign of the Highway 29 realignment at Cache ocnsultation on the alternative route options in 2018, support Making Process, to select a route while seeking to avoid or n burial sites and sacred places at Cache Creek. BC Hydro continues to consult with Indigenous groups regan support Indigenous ground truthing of traditional 1 activity zone prior to construction. BC Hydro has provided in ground truthing through Consultation and Capacity Funding additional funding to Doig River Fist Nation. BC Hydro has provided in the groups around mapping of notential measures to avoid or mitigate impacts.				In April 2017, the Environmental Assessment Office initiated a complaint from West Moberly First Nations and Prophet River effects of the Highway 29 realignment on cultural and heritage
BC Hydro continues to consult with Indigenous groups regan support Indigenous groups in ground truthing of traditional activity zone prior to construction. BC Hydro has provided fu ground truthing through Consultation and Capacity Funding additional funding to Doig River First Nations, Halfway River F First Nations for specific cultural investigations. Some Indige identified cultural sites of concern within or near the project continuing to engage with these groups around mapping of t potential measures to avoid or mitigate impacts.				Transportation and Infrastructure are currently working with Ir others on the redesign of the Highway 29 realignment at Cache consultation on the alternative route options in 2018, supporte Making Process, to select a route while seeking to avoid or red burial sites and sacred places at Cache Creek.
additional funding to Doig River First Nation, Haltway River F First Nations for specific cultural investigations. Some Indige identified cultural sites of concern within or near the project continuing to engage with these groups around mapping of f potential measures to avoid or mitigate impacts.				BC Hydro continues to consult with Indigenous groups regardin support Indigenous groups in ground truthing of traditional lan activity zone prior to construction. BC Hydro has provided func ground truthing through Consultation and Capacity Funding Ag
				First Nations for specific cultural investigations. Some Indigeno identified cultural sites of concern within or near the project ar continuing to engage with these groups around mapping of the potential measures to avoid or mitigate impacts.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 63	The Cultural Resources Mitigation Plan must be developed in collaboration with a Cultural and Heritage Resources Committee (Committee) established by the EAC Holder that includes Aboriginal Groups. Groups.	Ongoing	In Compliance	 The 2017-2018 Cultural Resources Mitigation Plan Annual Report, describing activities from July 1, 2017 to March 31, 2018 was submitted to the EAO on August 24, 2018. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019. BC Hydro will update the CRMP as required based on new information, and will continue to implement initiatives described in the plan throughout construction. The 2018 Revision of the CRMP (rev. 3) includes clarification of the role and structure of the Cultural and Heritage Resource Committee. The CRMP includes formation of a Cultural and Heritage Resource Committee. BC Hydro has continued to invite all 13 Indigenous groups named in the EAC and FDS, and representatives from 10 of the Indigenous groups have participated actively in the Committee (Doig River, Blueberry River, Hafway River, Dene Tha', Duncan's, Horse Lake First Nations, McLeod Lake Indian Band, Saulteau First Nations, Métis Nation BC, and Kelly Lake Métis Settlement Society). The Committee is continued to work collaboratively on cultural resources including trails, sites, and stories, and discussing and developing an approach to Indigenous cultural awareness and orientation of the workforce. Initiatives underway include signage shelters at the Site C north bank viewpoint and traveling museum exhibit that could travel to Indigenous communities and would ultimately reside in the Fort St John Museum. The Committee is currently working on other projects within their regional sub-groups that will identify measures to commemorate site, identify and name key cultural awareness and orientation of the workforce.

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No.				
	EAC Condition	Implementation Status	Compliance Status	Description
EAC 63 The Cult the follo · Ide and stor · Co · Cu · Su	<ur> tural Resources Mitigation Plan must include consideration of or wing elements and/or others that may be recommended by imittee: entification and naming of key cultural sites cumenting historical use of the area, including trails, sites, ies. ies. immemoration of sites lost to inundation. Itural awareness and orientation of workforce. Itural awareness and orientation of workforce. Itural awareness through financial or in-kind support. pport for cultural camps through financial or in-kind support. </ur>	Ongoing	In Compliance	The Cultural Resource and Heritage Committee has continued to work collaboratively on cultural resources mitigation initiatives, such as identifying measures to commemorate sites that will be lost to inundation, identification and naming of key cultural sites, documenting historical use of the area, including trails, sites, and stories, and discussing and developing an approach to Indigenous cultural awareness and orientation of the workforce. Initiatives underway include Indigenous interpretive signage at the Site C north bank public viewpoint and a potential traveling museum exhibit that could travel to Indigenous communities and to ultimately reside in the Fort St John Museum. In early 2017, in an effort to make Committee meetings more effective, BC Hydro secured a facilitator in April 2017. This facilitator has helped facilitate six meetings during this reporting period, and advanced discussions around measures to improve upon Committee meetings. In April, 2018, in an effort to move matters forward expeditiously, the Committee agreed to meet in three regional sub-groups in addition to meeting as a whole. The intent of the regional sub-group structure is for the smaller groups to work on projects together.
EAC 63 The EAC	Holder must provide the draft Cultural Resources Mitigation	Completed	In Compliance	The draft Cultural Resources Mitigation Plan was submitted to Indigenous groups on October
Commen	the Committee for review a minimum 90 days prior to the committee for review.	Completer		т пе илан силинан кезицісез імпидацин глан маз зимпінцей то плиідетіюць діочірь он основет 17, 2014.
EAC 63 The EAC with EAC commer	Holder must file the final Cultural Resources Mitigation Plan of O and the Committee a minimum of 30 days prior to the nement of construction.	Completed	In Compliance	The final Cultural Resources Mitigation Plan was submitted to Indigenous groups on June 5, 2015. Revision 3 of the final CRMP was submitted to EAO and the Committee November 19, 2018.
EAC 63 The EAC Cultural satisfact	: Holder must develop, implement and adhere to the final Resources Mitigation Plan, and any amendments, to the ion of EAO.	Ongoing	In Compliance	Results of initiatives conducted under Cultural Resources Mitigation Plan are described in annual reports submitted to the EAO and made available to Indigenous groups through the Project website. Indigenous groups are notified of annual reports through the bi-weekly Site C Information Update emails.
				The 2017-2018 Cultural Resources Management Plan Annual Report, describing activities from July 1, 2017 to March 31, 2018 was submitted to the EAO on August 24 2018. The 2018-2019 Annual Report will describe activities from April 1, 2018 to March 31, 2019.
EAC 64 The EAC facilities operatio funding	Holder must provide a total of \$100,000 to local accredited in close proximity to the Project, prior to the start of ons, to curate and display the recovered resources and the is not to be used for buildings to house them.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition. BC Hydro will fund local accredited facilities in close proximity to the Project, prior to the start of operations, to curate and display the recovered resources and the funding is not to be used for buildings to house them. The allocation of the funding is planned for Year 5 of

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 64	These funds must be provided only to facilities that agree to work with interested Aboriginal Groups on the display and curation of	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
	those artefacts.			BC Hydro will fund local accredited facilities in close proximity to the Project, pric start of operations, to curate and display the recovered resources and the fundin be used for buildings to house them. The allocation of the funding is planned for Construction.
	ENVIRONMENTAL PROTECTION AND MANAGEMENT			
	Greenhouse Gas Emissions			
EAC 65	The EAC Holder must monitor the levels of Greenhouse Gas (GHG) emissions resulting from the Project as detailed in a Greenhouse	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
	Gases Monitoring and Follow-Up Program to confirm predictions of the GHG model.			BC Hydro will submit a draft and final Greenhouse Gases Monitoring and Follow to regulatory agencies and Environment Canada within 90 day, and 150 days, re after the commencement of operations.
EAC 65	The Program must include at least the following: · Protocols for monitoring GHG emissions from Site C reservoir for the first 10 years of operations.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 65	 Protocols for monitoring and reporting GHG emissions during operation and maintenance activities. 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 65	 A reporting structure for reporting results at least annually during the monitoring and follow-up program period, beginning 180 days following commencement of operations, to MOE and Environment Canada. 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 65	The EAC Holder must develop, implement and adhere to the final Greenhouse Gases Monitoring and Follow-Up Program, and any amendments, to the satisfaction of EAO.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 65	The EAC Holder must provide this draft Greenhouse Gases Monitoring and Follow-Up Program to MOE and Environment Canada for review within 90 days after the commencement of operations.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 65	The EAC Holder must file the final Greenhouse Gases Monitoring and Follow-Up Program with EAO, MOE and Environment Canada within 150 days after the commencement of operations.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
	ENVIRONMENTAL MANAGEMENT PLANS, FOLLOW-UP AND			

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 66	The EAC Holder must clearly document its roles and responsibilities for monitoring and reporting employee and contractor performance and compliance with the EAC and its conditions in an Environmental Oversight Program.	Completed	In Compliance	Environmental Management Roles and Responsibilities are described in Section 2.0 of the CEMP.
EAC 66	The Environmental Oversight Program must include requirements for investigating and reporting non-compliance with the EAC and any management plans, ensuring corrective actions are implemented, and requirements for reviewing and updating the Construction Environmental Management Plans and Operations Environmental Management Plans to ensure that they remain relevant and current.	Ongoing	In Compliance	The BC Hydro environmental team onsite inspects and audits against the various environmental documentation and commitments. Contractors and BC Hydro keep a non-compliance report tracking program and share the information to ensure the identified items are acted upon. Some generic items have been identified; moving forward BC Hydro will ensure Non-compliance Reports are specific, actionable with accountable individuals assigned and a due date which is timely but able to be met. If BC Hydro or the IEM identify a non-compliance, contractors are required to investigate, document and rectify the non-compliance, keeping BC Hydro involvement to an inspection, audit, and oversight role. In 2018 BC Hydro inspectors checked for compliance with individual contractor EPP commitments 25,720 times.
EAC 66	The EAC Holder must submit the draft Environmental Oversight Program to EAO 90 days prior to commencing construction.	Completed	In Compliance	The draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014.
EAC 66	The EAC Holder must submit the final Environmental Oversight Program to EAO 30 days prior to commencing construction.	Completed	In Compliance	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).
EAC 66	The EAC Holder must develop, implement and adhere to the final Environmental Oversight Program, and any amendments, to the satisfaction of EAO.			The BC Hydro environmental team onsite inspects and audits against the various environmental documentation and commitments. Contractors and BC Hydro keep a non-compliance report tracking program and share the information to ensure the identified items are acted upon. Some generic items have been identified; moving forward BC Hydro will ensure Non-compliance Reports are specific, actionable with accountable individuals assigned and a due date which is timely but able to be met. If BC Hydro or the IEM identify a non-compliance, contractors are required to investigate, document and rectify the non-compliance, keeping BC Hydro involvement to an inspection, audit, and oversight role. In 2018 BC Hydro inspectors checked for compliance with individual contractor EPP commitments 25,720 times.
EAC 67	The EAC Holder must appoint an IEM acceptable to EAO, at least three months prior to construction.	Completed	In Compliance	BC Hydro retained Environmental Dynamics Inc. as the Independent Environmental Monitor for the Project on January 13, 2015. EAO approved this on May 7, 2015.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 67	The IEM will be responsible for monitoring the course of construction of the Project as directed by EAO.	Ongoing	In Compliance	BC Hydro retained Environmental Dynamics Inc. as the Independent Environmental Monitor for the Project on January 13, 2015. EAO approved this on May 7, 2015. EDI provides a weekly environmental monitoring report to BC Hydro and regulators.
EAC 67	The IEM must audit any incident reports as well as EAC Holder responses to the EAC Holder's Environmental Monitor's findings and recommendations (Reports) must be filed with FLNR and EAO within 30 days of request.	Ongoing	In Compliance	BC Hydro retained Environmental Dynamics Inc. as the Independent Environmental Monitor for the Project on January 13, 2015. EAO approved this on May 7, 2015. EDI provides a weekly environmental monitoring report to BC Hydro and regulators.
EAC 67	These Reports must be developed and reported to the satisfaction of EAO.	Ongoing	In Compliance	BC Hydro retained Environmental Dynamics Inc. as the Independent Environmental Monitor for the Project on January 13, 2015. EAO approved this on May 7, 2015. EDI provides a weekly environmental monitoring report to BC Hydro and regulators.
EAC 68	The EAC Holder must manage worker and public safety throughout the construction phase by implementing measures detailed in a Construction Safety Management Plan that complies with all applicable requirements of statutes, permits, approvals, and authorizations as outlined in Section 35 of the EIS. authorizations as outlined in Section 35 of the EIS.	Ongoing	In Compliance	 BC Hydro is auditing the implementation of measures in the CSMP by: reviewing Safety Management Plans / Public Safety Management Plans submitted by the contractors, holding regular meetings with the contractors to discuss safety performance and exploring opportunities for improvement, and conducting safety audits during construction to verify that requirements of the Plan are being considered and implemented as required. BC Hydro has also required that the main Prime contractors retain independent third party auditors to conduct safety audits on an annual basis. BC Hydro has obtained a third party auditor to ensure compliance to Prime Contractor requirements.
EAC 68	The Construction Safety Management Plan must be developed by a QEP.	Completed	In Compliance	Section 6.0 of the CSMP lists the QPs who prepared the plan.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 68	The Construction Safety Management Plan must include the following component plans: · Fire Hazard and Abatement Plan;	Ongoing	In Compliance	The Fire Hazard and Abatement plan is described in Section 5.2 of the CSMP. Fire abatement practices are part of everyday work. The BC Hydro Fire Marshall has been actively engaged in fire management planning and fire code review in each phase of construction and site services. The Fire Marshall and/or her representative has been acti engaged in Fire audit work at Site C. Fire Marshall recommendations have formed the ba of corrective action plans to the satisfaction of the Fire Marshall. Fire systems tests have ongoing at the worker accommodation camp since it opened.
EAC 68	· Public Safety Management Plan;	Ongoing	In Compliance	Section 5.3 of the CSMP describes the Public Safety Management Plan as well as plannir future aspects of the project. The Public Safety Management Plan, developed by a QEP, described in Section 5.3 of the CSMP. The draft and final CSMPs were submitted to regu agencies, governments, and Indigenous groups on October 17, 2014 and June 5, 2015 respectively. A status update on Condition 37 requirements is provided below. See com for EAC condition 38. BC Hydro has obtained the services of a third party contractor to a with implementation and monitoring of Public Safety Management Plans as river divers and other activities draw closer.
EAC 68	 Traffic Management Plan; and 	Ongoing	In Compliance	The Traffic Management Plan is contained in Section 5.4 of the CSMP. The Traffic Management Plan applies to the dam site, other work sites that will be influe by Project-related traffic including, but not limited to, public roads in the Peace River R District, Wuthrich Quarry, West Pine Quarry, Highway 29, Hudson's Hope Shoreline Protection, Petroleum Development Roads, Project Access Roads, Jackfish Lane Road, Highway 97 and the transport of extraordinary loads.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 68	 Description of worker qualifications and training requirements pertaining to the Construction Safety Management Plan; 	Ongoing	In Compliance	CSMP requires that workers are appropriately qualified. The audit cycle ensures that this takes place, and WorkSafe BC also audits for compliance with worker qualifications. Requirements for safety training, orientation, training and tailboard meetings are also discussed in Section 3 of the CSMP.
				BC Hydro and Work Safe BC also audit for compliance with worker qualifications.
EAC 68	 Description of reporting requirements; and 	Ongoing	In Compliance	 BC Hydro is auditing the implementation of measures in the CSMP by: reviewing Safety Management Plans /Public Safety Management Plans submitted by the contractors, holding regular meetings with the contractors to discuss safety, performance and exploring opportunities for improvement, and conducting safety audits during construction to verify that requirements of the Plan are being considered and implemented as required. BC Hydro has also required that the Prime contractors retain independent third party auditors to conduct safety audits on an annual basis. The draft and final CSMPs were submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014 and June 5, 2015, respectively. Reporting requirements are being met by: BC Hydro's Incident Management System reporting requirements on upcoming work to WorkSafe BC, and various weekly reports on safety including statistics, monthly business reviews on safety, reviews of incidents and investigations.
EAC 68	 Process for revising and updating the Construction Safety Management Plan. 			The CSMP is updated as needed and if conditions on site change.
EAC 68	The EAC Holder must provide the draft Construction Safety Management Plan to regulatory agencies, Peace River Regional District, City of Fort St. John and the District of Hudson's Hope and Aboriginal Groups for review 90 days prior to commencement of construction.	Completed	In Compliance	The draft CSMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014.
EAC 68	The EAC Holder must file the final Construction Safety Management Plan with EAO, regulatory agencies, Peace River Regional District, City of Fort St. John and District of Hudson's Hope and Aboriginal Groups 30 days prior to commencement of construction.	Completed	In Compliance	The final CSMP was submitted to regulatory agencies, governments, and Indigenous groups on June 5, 2015. Revision 2 of the CSMP was issued March 22, 2017 and contains updates to Section 5.4.12 Traffic Monitoring and Appendix C.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 68	The EAC Holder must develop, implement and adhere to the final Construction Safety Management Plan, and any amendments, to the satisfaction of EAO.	Ongoing	In Compliance	BC Hydro is auditing the implementation of measures in the CSMP by: - reviewing Safety Management Plans /Public Safety Management Plans submitted by the contractors, - holding regular meetings with the contractors to discuss safety performance and explore opportunities for improvement, and - conducting safety audits during construction to verify that requirements of the Plan are being considered and implemented as required. BC Hydro has also required that the MCW contractor retain independent third party auditors to conduct safety audits on an annual basis.
EAC 69	The EAC Holder must manage effective environmental protection and management throughout the construction phase by implementing measures detailed in a Construction Environmental Management Plan (CEMP).	Ongoing	In Compliance	The draft and final CEMPs were submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014 and June 5, 2015, respectively. Revision 2 of the CEMP was submitted to these same recipients on February 4, 2016. Revision 3 of the CEMP was submitted to the Comptroller of Water Rights on March 31, 2016 as part of discussions related to early leaves to Commence Construction for the Project. Revision 4 of the CEMP was issued on July 26, 2016 and it included a number of minor edits and significant additional requirements related to Erosion and Sediment Control and water quality management.
				BC Hydro is auditing those measures of the CEMP by: - reviewing EPPs submitted by the contractors, - conducting environmental inspections during construction to verify that requirements of the Plan are being considered and implemented as required, and responding to issues identified by IEM in its weekly inspection reports.
				Two Orders were issued by EAO during the reporting period regarding water and sediment control. The first Order was issued on May 14, 2018 for failure to adhere to implement measures to control runoff water and sediment following clearing of Portage Mountain Quarry. The second Order was issued on September 21, 2018 for failure to implement measures to control runoff water and sediment transport prior to commencing operations ir Area 30 as specified by the Area 30 (Operations) Environmental Protection Plan. Corrective actions were immediately taken for each of these Orders to bring the sites into compliance.
EAC 69	The CEMP must be developed by a QEP.	Completed	In Compliance	Section 6.0 of the CEMP lists the QPs who prepared the plan.

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EAC 69 · Noise EAC 69 · Smok EAC 69 · Soil N	EAC 69 · Noise EAC 69 · Smot EAC 69 · Soil I	EAC 69 · Noise EAC 69 · Smol	EAC 69 · Noise	EAC 69 · Noise	EAC 69 · Noise				EAC 69 · Ice M	EAC 69 · Herit	EAC 69 · Hazai	EAC 69 · Grou	EAC 69 · Fuel i	EAC 69 · Fishe	EAC 69 · Erosi	EAC 69 · Conti	EAC 69 · Blasti	EAC 69 · Air Q	EAC 69 THE CEMP Acid I	EAC 69 The CEMP be avoided	No.
Aanagement, Site Restoration, and Revegetation Plan;	Janagement, Site Restoration, and Revegetation Plan;			«e Management Plan;		and Vibration Management Plan;			lanagement Plan;	age Resources Management Plan;	rdous Waste Management Plan;	ndwater Protection Plan;	Handling and Storage Management Plan;	ries and Aquatic Habitat Management Plan;	on Prevention and Sediment Control Plan;	aminated Sites Management Plan;	ing Management Plan;	uality Management Plan;	must include the rollowing: Rock Drainage and Metal Leachate Management Plan;	must provide details on how potential adverse effects will , mitigated, or compensated.	EAC Condition
-		Completed	Course lateral	Completed		Completed			Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	completed	Completed	Implementation Status
		in compliance	1- C	In Compliance		In Compliance			In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	in compliance	In Compliance	Compliance Status
	Plan	ADDEDDIVE H OT THE CENTRE CONTAINS THE SOIL MIANAGEMENT. SITE RESTORATION, AND REVEGETATION		Appendix A of the CEMP contains the Smoke Management Plan		Noise and Vibration Management is described in Section 4.11 of the CEMP.	construction.	develop and implement a Head Pond Ice Monitoring Plan for the Stage 2 diversion stage of	Ice Management is described in Section 4.10 of the CEMP. BC Hydro will retain a QP to	Heritage Resource Management is described in Section 4.9 of the CEMP.	Hazardous Wastes Management is described in Section 4.8 of the CEMP.	Groundwater Protection is described in Section 4.7 of the CEMP.	Fuel Handling and Storage Management is described in Section 4.6 of the CEMP.	The Fisheries and Aquatic Habitat Management Plan is described in Section 4.5 of the CEMP.	Erosion Prevention and Sediment Control Management is described in Section 4.4 of the CEMP.	Contaminated Sites Management is described in Section 4.3 of the CEMP.	Blasting Management is described in Section 4.2 of the CEMP	Appendix B of the CEMP contains the Air Quality Monitoring Program.	Appendix E of the CEMP contains the Acid Rock Urainage and Metai Leachate Management Plan.	The CEMP provides details on how potential adverse effects will be avoided, mitigated, or compensated.	Description

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EAC 69	EAC 69	EAC 69	EAC 69		No.
The CEMP is to be prepared by BC Hydro.	 Process for revising and updating the CEMP. 	· Wildlife Management Plan.	 Waste Management Plan; and 		EAC Condition
Completed	Ongoing	Completed	Completed		Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance		Compliance Status
The process for revising and updating the CEMP is described in Section 2.6 of the CEMP.	The process for revising and updating the CEMP is described in Section 2.6 of the CEMP.	The Wildlife Management Plan is described in Sections 3.0 and 4.17 of the CEMP and Section 8.6.2 of the VWMMP.	The Waste Management Plan is described in Section 4.16 of the CEMP.	audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs. The IWMAMP includes herbicide and mechanical based invasive plant management in the dam site area, and the expansion of the vehicle cleanliness program, including the use of vehicle and equipment inspection forms. Rev 6 of the IWMAMP was completed and rolled out to most contractors for the project. To date, contractors the Project area, regular vehicle inspections and cleaning through hand pulling, on-going inventories of invasive plant locations, extensive plant removal through hand pulling, or-going inventories are clean and free of dirt and invasive plants when transitioning between sites and into the Project area. RC Hydro implemented an invasive species Management Contractor that completed a control program across the dam site and off dam site areas along Highway 29 work areas in mid to late 2018. In mid to late 2018 BC Hydro commenced construction of a permanent vehicle weed wash station near Gate B on the dam site. Civil site preparation and drainage was completed by the end of 2018 but the onset of winter conditions precluded concrete placement and the finalization of the facility. Construction will resume in spring 2019.	Description

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EAC 70	EAC 69	EAC 69	EAC 69	EAC 69	No.
The EAC Holder must manage Project effects through construction and operations by implementing measures detailed in mitigation and monitoring plans.	The EAC Holder must develop, implement and adhere to the CEMP, and any amendments, to the satisfaction of EAO.	The EAC Holder must file the CEMP with EAO, regulatory agencies, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups 30 days prior to the commencement of construction.	The EAC Holder must provide the draft CEMP to regulatory agencies, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.	 Detailed Environmental Protection Plans will be developed which must include the following: Clear statement of objectives; Description of potential Project effects and safety hazards, through consideration of baseline conditions and sensitive receptors; Clean documentation of applicable legislative requirements that must be adhered to, as well as BC Hydro policies, guidelines and other best management practices that will be followed; Clear documentation of measures to be implemented and actions to be taken to mitigate or compensate potential effects; Description of worker qualifications and training requirements pertaining to each of the plans associated with the Constructive Environmental Management Plan; and Description of Monitoring and Reporting Requirements. 	EAC Condition
Ongoing	Ongoing	Completed	Completed	Ongoing	Implementation Status
In Compliance	In Compliance	In Compliance	In Compliance	In Compliance	Compliance Status
BC is implementing mitigation measures as outlined in mitigation and monitoring plans developed to date, as required by the EAC.	BC Hydro audits compliance with the CEMP by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.	The final (Revision 1) of the CEMP was provided to regulatory agencies, governments and Indigenous groups on June 5, 2015. Revision 2 of the CEMP was issued in February 2016 and Revision 4 in July 2016 (Revision 3 was not formally published).	The draft CEMP was submitted to regulatory agencies, governments, and Indigenous groups on October 17, 2014	Environmental Protection Plan requirements are detailed in Section 2.4 of the CEMP. BC Hydro audits compliance with this requirement by reviewing contractor EPPs.	Description

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EAC 71	EAC 70	No.
The EAC Holder must manage environmental protection and management by implementing measures in the following Development Plans: · Del Rio Pit Development Plan;	 Each mitigation and monitoring plan in addition to plan specific conditions in this document must include the following: Plan objectives; Plan scope; Mitigation plan details (including details of any sub-components), including a summary of potential Project effects and baseline conditions relevant to the plan and any sub-components, a schedule and a spatial description of the plan area; Monitoring plan details, where monitoring is required, including parameters to be monitored or measured, a schedule (including frequency and duration), a spatial description of monitoring plan area or sampling locations; and Description of plan reporting requirements. 	EAC Condition
Ongoing	Ongoing	Implementation Status
In Compliance	In Compliance	Compliance Status
The draft and final Development Plans for Del Rio Pit were submitted to regulatory agencies, governments and Indigenous groups on April 7, 2015 and June 5, 2015, respectively. The plan sets out the plan purpose, scope, details, safety and environmental management, and site reclamation strategy (as appropriate). To date, no activities have taken place at Del Rio Pit.	 Final mitigation plans have been submitted to the EAO in accordance with the requirements of the EAC. These plans address the content requirements set out by the EAC. Plans submitted to date are as follows: Aboriginal Plant Use Mitigation Plan Aboriginal Training and Inclusion Plan Apricultural Monitoring and Follow-up Program Agricultural Monitoring and Follow-up Program Construction Environmental Management Plan (Rev 2) Cultural Resources Mitigation Plan Energency Services Plan Fisheries and Aquatic Habitat Management Plan Heritage Resources Plan Heritage Resources Management Plan Heritage Resources Management Plan Heritage Resources Plan Vegetation Plan Vegetation Witigation Plan Vegetation Witigation Plan Vegetation Witigation and Monitoring Plan West Pine Quarry Development Plan, and Wuthrich Quarry Development Plan 	Description

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No.	EAC 71	EAC 72		EAC 72	EAC 72	EAC 72	EAC 72
EAC Condition	The EAC Holder must develop, implement and adhere to the Final Development Plans, and any amendments, to the satisfaction of EAO.	The EAC Holder must manage effective communications for the Project by implementing measures in communication plans and a business participation plan.		The following communication and participation plans are to be developed and implemented: Business Participation Plan;	Construction Communication Plan; and	First Nations Communication Plan.	Each plan in addition to plan specific conditions identified in this document will include: Clear Statement of Objectives; Audiences;
Implementation Status	Ongoing	Ongoing		Ongoing	Ongoing	Ongoing	Ongoing
Compliance Status	In Compliance	In Compliance		In Compliance	In Compliance	In Compliance	In Compliance
Description	Works at West Pine Quarry and Wuthrich Quarry are conducted in accordance with the Final Development Plans (located here: https://www.sitecproject.com/document library/environmental-management) . These are the only active quarries to date. The 2018 Annual Summary Reports for West Pine Quarry, and Wuthrich Quarry will be submitted to regulatory agencies and Indigenous groups by March 31, 2019.	BC Hydro is meeting this condition (see also Condition 58). The Site C project team is implementing the Construction Communication Plan and Aboriginal Group Communication Plans to ensure that residents, stakeholders and Indigenous groups are provided with advance notification about construction. The Site C project team is implementing the Business Participation Plan to keep businesses informed and updated on the opportunities associated with the construction of the Project.	Examples of implementation measure include: mail drops and letters, construction updates and bulletins, presentations, Indigenous construction notification letters and updates to the project website. Other tactics also being used to provide construction- related and business opportunity information include Council Presentations, Regional Community Liaison Committees, presentations to stakeholders, government relations and property owner liaison.	The response to Condition 58 and the response to Condition 72 describe compliance with the Business Participation Plan.	See response to Condition 27 (Aboriginal construction communications) and Condition 72.	Condition 27 describes compliance with the Aboriginal Group Communications Plan.	Condition 27 describes compliance with the Aboriginal Group Communications Plan.

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Ine EAC Holder must provide this draft Operations Safety Anangement Plan, including all component plans, to regulatory gencies, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups for review a minimum of 90 lays prior to the commencement of operations.	Process for revising and updating the Operations Safety Aanagement Plan.	Description of reporting requirements; and	Description of worker qualifications and training requirements International training to the Plan(s);	Clear documentation of compliance and effectiveness nonitoring to be undertaken;	Clear documentation of all applicable legislative requirements In hat must be adhered to, as well as BC Hydro policies, guidelines and ther best management practices that will be followed;	Description of potential Project effects and safety hazards, In hrough consideration of baseline conditions and sensitive receptors;	ach component plan must include the following: Clear Statement of Objectives;	Worker Safety and Health Management Plan.	The Operations Safety Management Plan must include the following omponent plans: Public Safety Management Plan (including the Reservoir horeline Monitoring and Management Plan); and	he Operations Safety Management Plan must be developed by a [])EP.	Ihe EAC Holder must manage worker and public safety throughout In he operations phase by implementing measures detailed in an perations Safety Management Plan that complies with all pplicable requirements of statutes, permits, approvals, and uthorizations as outlined in Section 35 of the EIS.	EAC Condition
nitial Planning	nitial Planning	nitial Planning	nitial Planning	nitial Planning	nitial Planning	nitial Planning	nitial Planning	nitial Planning	nitial Planning	Initial Planning	initial Planning	Implementation Status
Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Future Requirement	Compliance Status
BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition.	BC Hydro acknowledges and understands this condition. BC Hydro will submit a draft Operations Safety Management Plan, developed by a QEP, to regulatory agencies, governments and Indigenous groups, a minimum of 90 days and 30 days, respectively, prior to the commencement of operations.	Description

Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18) January 2019 to December 2019

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lges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	 Description of reporting requirements; and 	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	 Clear documentation of compliance and effectiveness monitoring to be undertaken; 	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	 Clear documentation of all applicable legislative requirements that must be adhered to, as well as BC Hydro policies, guidelines and other best management practices that will be followed; 	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	In itial Planning	 Description of potential Project effects, through consideration of baseline conditions and sensitive receptors; 	EAC 74
ges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	Each plan must include the following: · A Clear Statement of Objectives;	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	· Water Management Plan.	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	 Waste Management Plan (including Materials Management); and 	EAC 74
ges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	 Vegetation and Invasive Plant Management; 	EAC 74
lges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	 Ice Management Plan; 	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	The OEMP must include the following plans: · Hazardous Waste Management Plan;	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	The OEMP must be developed by a QEP.	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	The EAC Holder must manage to ensure effective environmental protection and management throughout the operations phase by implementing measures detailed in an Operations Environmental Management Plan (OEMP).	EAC 74
Iges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	The EAC Holder must develop, implement and adhere to the final Operations Safety Management Plan, and any amendments, to the satisfaction of EAO.	EAC 73
lges and understands this condition.	BC Hydro acknowled	Future Requirement	Initial Planning	The EAC Holder must file the final Operations Safety Management Plan, including component plans with EAO, regulatory agencies, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups a minimum of 30 days prior to the commencement of operations.	EAC 73
Description		Compliance Status	Implementation Status	EAC Condition	No.

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No.	EAC Condition	Implementation Status	Compliance Status	Description
EAC 74	 Process for revising and updating the Plan. 	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 74	The EAC Holder must provide this draft OEMP, including all plans, to regulatory agencies, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups for review a minimum of 90 days prior to the commencement of operations.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 74	The EAC Holder must file the final OEMP, with regulatory agencies, Peace River Regional District, City of Fort St. John, District of Hudson's Hope and Aboriginal Groups a minimum of 30 days prior to the commencement of operations.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 74	The EAC Holder must develop, implement and adhere to the final OEMP, and any amendments, to the satisfaction of EAO.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 75	The EAC Holder must provide its on-site project employees, contractors and sub-contractors, prior to those employees, contractors and sub-contractors starting work, with briefings on and copies of Schedule B (Table of Conditions) of the EAC and all Environmental and Safety Management Plans identified in Schedule B that are relevant to their works.	Ongoing	In Compliance	Prior to the start of field activities, Field Crew Supervisors, QEPs and attend an environmental overview and training workshop, where th Environmental and Safety Management Plans identified in Schedule works.
	DAM SAFETY			
EAC 76	The EAC Holder must conduct an assessment of the impacts of a multiple cascading dam breach, in accordance with the Canadian Dam Association Guidelines and BC Hydro's Dam Safety Program,	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 76	and share the results of that study with the Government of Alberta, FLNR and the authorities of the towns that would be affected, prior to the commencement of operations.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
EAC 77	The EAC Holder must consult with the Government of Alberta and emergency management officials in Alberta, and FLNR on communication and contingency plans to address the potential occurrences of a multiple cascading dam breach, prior to the commencement of operations.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.
	WEST PINE HAUL ROUTE TRAFFIC MANAGEMENT PLAN			

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					Appendix G	ب
_	No.	EAC Condition	Implementation Status	Compliance Status	Description	
EA	,C 78	b) Provide a copy of the consultation report, required under paragraph 4 of this condition, to the EAO, the Affected Communities, MOTI, or all three parties, within 15 days of the Holder receiving a written request from the EAO, an Affected Community, or MOTI.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.	
EA	,C 78	The Plan, and any amendments thereto, must be implemented to the satisfaction of the EAO throughout the duration of use of the West Pine Haul Route for the purposes of transporting materials from the West Pine Quarry to Highway 29 realignment segments, Shoreline Protection sites in Hudson's Hope, and areas of the reservoir requiring protection during reservoir filling.	Initial Planning	Future Requirement	BC Hydro acknowledges and understands this condition.	

Annual Progress Report No. 4 (Combined with Quarterly Progress Report No. 18) January 2019 to December 2019



Site C Clean Energy Project

Annual Progress Report No. 4

(Combined with Quarterly Progress Report No. 18)

Appendix H

Summary of Individual Contracts Exceeding \$10 Million

PUBLIC



Site C Clean Energy Project

Annual Progress Report No. 4

(Combined with Quarterly Progress Report No. 18)

Appendix I

Project Progression

PUBLIC



Site C Clean Energy Project

Annual Progress Report No. 4

(Combined with Quarterly Progress Report No. 18)

Appendix J

Detailed Project Expenditure

PUBLIC

Indigenous communities are keenly aware of the danger such activities pose to their connections to land and ancestors. As former Chief Gerry Hunter of Halfway River First Nation, a Dunne-za community, explains, "I cannot take my grandchildren to show them where their roots are. The dams destroyed my great-great-grandfather's resting place" (p. 100). In some cases, Cox's attention to Indigenous perspectives is through interviewing participants herself, and in other sections, it stems from her deep research into reports, news stories, and public history sites. She also makes clear the diversity of opinions among Treaty 8 First Nations.

In great detail, Cox interrogates the close relationship between the BC government, which had already approved the project and its Crown corporation, BC Hydro, which had sent its permit requests to the province. The author also shares the results of a 2017 report of the BC Utilities Commission, which found that the project was over-budget, behind schedule, and that energy demand had been overestimated. With compassion and frustration, Cox documents the lawsuits and eviction notices launched against citizens, and the ways in which capitalist security firms positioned land defenders as criminals. Importantly, this is not simply a story of big government with megaproject dreams. Instead, readers will appreciate Cox's emphasis on the stories of residents passionately fighting for their homes and territory. Ken and Arlene Boon, a couple with multigenerational ties to the area, and to whom the book is dedicated, were generous with their time and experience, thereby giving the author an intimate view of their struggle to keep their farm.

Importantly, Cox also examines the partnerships between First Nations leaders and activists and their settler neighbors in protecting the valley. Indeed, the Chief of West Moberly First Nations, Roland Willson (Dunne-za), turns an old cliché on its head as he describes the annual Paddle for the Peace, in which people canoe a portion of the Peace River in solidarity, as "the cowboys and the Indians, working together" (p. 21). Furthermore, an inclusive call was issued over social media for "all those who want to protect the Peace River Valley, come to Rocky Mountain Fort" (p. 35). They also worked together in other ways, as communitybased grassroots activists and concerned residents wanting to protect the territory also raised \$22,000 to set up the camp and send materials, which the author herself visited in winter. Through documenting these partnerships, Cox demonstrates the importance of coordinated community efforts to protect the land.

The battle for the Peace is not over. As this story continues to unfold beyond the scope of the book, I am eager to see how First Nations and settler residents fare in their ongoing fight. This book is important reading for scholars, activists, and policy-makers interested in environmental justice and community mobilization. In short, Cox's work will appeal to a wide range of readers; her prose is accessible, passionate, and privileges the words and perspectives of those determined to protect their homes and homeland.

ORCID iD

Lianne C. Leddy (b) https://orcid.org/0000-0002-4824-7745

Author Biography

Lianne C. Leddy (Anishinaabe kwe) is a member of the Serpent River First Nation, located on the north shore of Lake Huron. She is an associate professor of Indigenous Studies at Wilfrid Laurier University and researches historical questions related to gender and land in Indigenous contexts. Leddy's work has appeared in *Oral History Forum*, the *Canadian Historical Review*, *Herizons*, and several edited collections.

Exposing the True Costs of a "Clean" Energy Megaproject in the Peace River Valley

NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 0(0) 1–2 © The Author(s) 2020 Article reuse guidelines: sagepub.com/journals-permissions DOI: 10.1177/1048291120947691 journals.sagepub.com/home/new



Sarah Cox. (2018). Breaching the peace: The Site C dam and a valley's stand against big hydro. Vancouver, BC: On Point Press. 295 pp. \$24.95 (pbk). ISBN: 9780774890267

Reviewed by: Lianne C. Leddy (), Wilfrid Laurier University, Waterloo, ON, Canada

In the foreword to *Breaching the Peace*, Alex Neve, the Secretary-General of Amnesty International Canada, describes the significance of the book's title. "It reminds us," he writes, "that 'peace' ultimately must be grounded in rights, reconciliation, and our environment" (p. xii). In this important book, Sarah Cox demonstrates how local communities have worked together to protect their homes against a controversial megaproject.

Sarah Cox brings together interviews, extensive reports and news coverage, as well as on-the-ground visits to the Site C area, located in Treaty 8 territory, to tell the story of the decade-long fight by residents of the Peace River Valley against the British Columbia government's hydroelectric dam construction. The most expensive public project in the province's history, the Site C dam was touted by the Liberal government as an urgent enterprise "to literally keep the lights on" (p. 23). After coming to power in the 2017 provincial election, the New Democratic Party, which had previously opposed the project, blamed the previous government, claiming that the project could not be canceled because construction was "past the point of no return" and too much money had already been spent (p. 253). What will be of interest to many readers is how Cox places hydroelectricity, which has rebranded from high modernism to "clean" energy, in its local context, passionately interrogating the human and ecological cost of such a large-scale project. Indeed, the book primarily demonstrates that this long-awaited project is not, in fact, green. Rather, it is yet another chapter in more than half a century of destruction of an entire valley, threatening the very people who call it their home.

The book itself is organized thematically, with chapters detailing such topics as Treaty 8 land defenders, local farmers protecting their property, the ecosystem supported by the Peace River that is in danger, and the history of hydroelectric damming in the province. Cox does not shy away from criticizing past and present governments, while at the same time sensitively describing the struggles of local residents and First Nations activists.

As an Indigenous woman and scholar, I deeply appreciated that Cox described the importance of territory not just in terms of home ownership (although that forms much of her analysis), but also because of what the land supports: soil, plants, animals, and birds, natural elements to which she dedicates an entire chapter. Cox is also attentive to the importance of territory for First Nations gatherings and ceremonies, and, where possible, allowing Indigenous voices to speak for themselves as they describe their fears about the current project, particularly in light of their past experiences with hydroelectricity. BC Hydro was aware that "Site C would destroy forty-two sites of cultural and spiritual significance" and more than twenty-four transportation routes that are important to First Nations (p. 94). The destruction would have grave consequences for their ability to pick medicines, conduct ceremonies, and for their very survival as Indigenous people. As Malcolm Apsassin, a member of Blueberry River First Nations, powerfully asserts,

Site C would ruin our hunting, our trapping. We will just go down the drain. We will have no place to trap. I am still young, and I have a long ways to go, and I've got my family to raise, and if that dam comes up, it will just ruin our life. (p. 95)

This is no exaggeration, and it is rooted in past experience: in 2016, the BC government quietly apologized for the impacts of the Bennett Dam, which was built in the 1960s without First Nations consultation.

UNITED STATES INTERNATIONAL TRADE COMMISSION Investigation No. 332-574

COMMENTS OF COMMONS BC

Commons BC is an organization based in British Columbia, Canada. Its mission includes fighting for responsible policy based on evidence, data and the public interest with a special focus on the Site C dam, forestry fracking and gas. It has been involved in researching B.C. Hydro Corporation's Site C dam in the Peace River Valley of British Columbia, the westernmost province in Canada.

On July 29, 2020, the United States International Trade Commission (ITC) held a hearing In the Matter of Renewable Electricity: Potential Economic Effects of Increased Commitments in Massachusetts: Investigation No: 332-574.

Commons BC respectfully submits these comments to address the regulatory process in Canada and costs and subsidies associated with the hydropower industry.

1. REGULATORY OVERSIGHT OF THE CANADIAN HYDROPOWER INDUSTRY

Ambassador Giffen made the following statement on behalf of the Canadian Electricity Association during the July 29, 2020 Hearing:

There are public regulators just like we have in the United States and, in some cases, more rigorous than we have in the United States that deal with all of these issues. And I don't mean to suggest that the people who are objecting to the dams are wrong. I'm just saying all of those complaints and concerns and thoughts are heard by the regulators in Canada and balanced judgments, in my mind, are made. And, typically, what the United States Government does is show respect for those kinds of decisions 1 that are made by respected regulators in countries where we have the kinds of agreements we have.

Transcript, Page 210, 211, Lines 18-25 and Page 211, Lines 2-3.

Commons BC provides the following responses to this statement.

It is true that Canadian provinces have public regulators mandated to oversee policies and large projects. However, it is also true that those regulators can be circumvented in ways which make them irrelevant or ineffective.

For example, the British Columbia government passed legislation (Clean Energy Act (2010), which exempted eleven major proposed public energy-related projects from oversight by the BC

Utilities Commission (BCUC). The BCUC would ordinarily have conducted public hearings into the need for, impacts of, and recommended response to these proposed projects. The exemptions included the most expensive public project ever undertaken in British Columbia, the Site C Dam and associated infrastructure, initially budgeted at \$6.6 billion and now, three years into construction, already at \$10.7 billion and projected to increase substantially again.

In addition to blanket legislation, as described above, regulatory processes are sometimes held under restrictive terms of reference which prevent relevant information from being considered. Site C again offers an example: a change in government led to a "mini BCUC hearing." The terms of reference excluded examination of the notoriously unstable geology in the area of the dam's location. Now, three years into construction, problems with the foundation upon which the powerhouse, spillway and south end of the dam itself, have been reported – a 'discovery' which should have been explored and accounted for prior to the decision to proceed.

A third issue with recent Canadian regulatory processes is a trend toward not requiring testimony and cross-examination under oath, leading to the hearing outcomes being regarded with less credibility than previous processes, where full procedural safeguards were in place.

There are presently three large hydro-dams under construction in Canada. The above examples are drawn from BC's Site C. Examination of the other two dams (Keeyask in Manitoba, in central Canada) and Muskrat Falls in Newfoundland & Labrador the eastern-most Canadian province) have very similar situations.

The CD Howe Institute, a highly respected "small c" conservative think-tank, issued a report in January 2019, comparing the three dams mentioned above. The report concluded that, "*To avoid uneconomic projects in the future, the report also recommends strengthening institutional independence - in particular, by ensuring independent regulatory review for mega-projects...*"

Link to BC Clean Energy Act (2010):

https://www.bclaws.ca/civix/document/id/consol24/consol24/00_10022_01 See Section 7 for projects exempted from BC Utilities Commission oversight.

Link to CD Howe Institute Report:

https://www.cdhowe.org/sites/default/files/attachments/research_papers/mixed/Commentary_52_8.pdf

The above illustrates how Canadian governments can and do over-ride their own legislation to proceed with projects without due diligence. See below for the effect of overriding established procedures. Although the above relates to legislation in British Columbia, the western-most province of Canada, we can point to similar exemptions that occurred in the central province of Manitoba (Keeyask Dam and related transmission lines) and the most eastern province, Newfoundland & Labrador (Muskrat Falls Dam and related infrastructure).

This is of critical important to the U.S. International Trade Commission. It should not assume that Canadian hydropower has been subject to comprehensive scrutiny.

2. COSTS AND SUBSIDIES OF CANADIAN HYDRO POWER INDUSTRY

Since being resurrected in the early 2000's, cost estimates for Site C have risen from \$6.6 Billion to \$10.7 Billion in 2017, which the British Columbia government assured rate-payers was a guaranteed price. However, reports issued on July 31 of this year include a list of cost over-runs in several construction departments which will far exceed the \$10.7 Billion. Worse, the reports identified stability issues in the geological foundations on the right bank of the Peace River, where the powerhouse, spillway and the south end of the dam itself is to be located. The reports did not include a remediation strategy, nor a revised budget for the project, other than to confirm that remediation would be expensive.

Link to July 31, 2020 BC Hydro Progress Reports Outlining Cost Overruns and Foundation Concerns:

https://www.bcuc.com/Documents/Proceedings/2020/DOC 58849 2020-07-31-BCH-SiteC-Progress-Report-19-PUBLIC.pdf

Prior to the July 31 reports, various experts have pegged the cost of Site C power at around \$120 per megawatt hour. No-one has ventured an estimate since the above reports, because of the lack of information regarding the cost to mitigate the weak foundation on the right bank. But the trends are clear: the cost of electricity from mega-dams are increasing dramatically; the cost of renewables are decreasing dramatically.

Independent energy experts appear agreed that new mega-dams will not pay for themselves. Either they will sit idle as stranded assets, or their product will be subsidized by their ratepayers or the taxpayers at large. We already see that in British Columbia: last year the BC government took over just under \$1 billion of BC Hydro debt and rolled into the BC provincial government debt.

The International Trade Commission may wish to examine the real cost of electricity being considered for import.

Thank you for the opportunity to participate in the ITC hearing.

Respectfully submitted:

Lindsay Brown Commons BC commonsbc.ca

NORTH AMERICAN MEGADAM RESISTANCE ALLIANCE

August 14, 2020

Ms. Lisa R. Barton Secretary to the Commission U.S. International Trade Commission 500 E. Street, SW, Room 112 Washington, DC 20436 Via Electronic Docket

Re: Investigation No. 332-574

Dear Secretary Barton:

On behalf of the North American Megadam Resistance Alliance (NAMRA), and in accordance with the scheduling notice, 85 Fed. Reg. 35330 (June 9, 2020) NAMRA respectfully submits the following:

- 1. Cover Letter
- 2. Final Statement of North American Megadam Resistance Alliance, August 14, 2020
- 3. NAMRA Errata Sheet for Transcript of July 29, 2020 ITC Hearing

PART I

Exhibit 1: Petition to United States Governors and New York City Mayor from Canadian communities impacted by hydropower development and signatures from Indigenous community members and allies

Exhibit 2: *Penobscot Tribe Comments* on U.S. Army Corps of Engineers Review of NECEC Hydropower Transmission Corridor

Exhibit 3: *Innu Nation Comments* with Supporting Documents on NECEC Hydropower Transmission Corridor

Exhibit 4: Letter to the Editor, The Altamont Enterprise, August 12, 2020: *CHPE electricity would not be safe, clean or renewable*

PART II

Exhibit 5: Brief of Alliance Romaine *In Opposition to the Romaine River Hydro-Electric Mega Project*

Exhibit 6: *Comments of Indigenous Elder Jim Learning, Labrador, on NECEC Hydropower Transmission Corridor*, Maine Public Utilities Commission

Exhibit 7: Shocking Revelations at Hydro-Quebec: The Environmental and Legal Consequences of the Quebec

Exhibit 8: Media: *United Nations calls for methylmercury mitigation at Muskrat Falls*, 2019

Exhibit 9: Media: *Broken Promises, Nunatsiavut president, premier clash over Muskrat Falls water levels*, 2019

Exhibit 10: Dammed If You Do: How Sunk Costs Are Dragging Canadian Electricity Ratepayers Underwater

Exhibit 11: Scientific Paper: Mapping the world's free-flowing rivers

PART III

Exhibit 12: Opinion, Vancouver Sun, July 2020: *Site C dam has a huge problem - and it's not COVID-19* by Vaughn Palmer

Exhibit 13: Report: August 13, 2020: *A Big Fracking Mess: As Site C dam construction bogs down in geotechnical problems, thousands of earthquakes triggered by fracking operations occur nearby*

Exhibit 14: July 29, 2020: Statement from BC Hydro on Site C annual and quarterly report filing with the BC Utilities Commission

Exhibit 15: July 29, 2020: British Columbia Utilities Commission, British Columbia Hydro and Power Authority, Site C Clean Energy Project, *Public Annual Report No. 4 and Quarterly Progress Report No. 18, and Quarterly Progress Report No. 19*

Exhibit 16: August 14, 2020 Comments of Commons B.C.

Exhibit 17: 2018 *Exposing the True Costs of a "Clean" Energy Megaproject in the Peace River valley* by Lianne C. Leddy

Exhibit 18: 2020 Commons British Columbia Comments

Very truly yours,

Margaret E. Sheehan, Esq. Coordinator NAMRA coordinator.namra@gmail.com Lyme, NH 03768 USA



UNITED STATES INTERNATIONAL TRADE COMMISSION Investigation No. 332-574

Final Statement of North American Megadam Resistance Alliance (NAMRA)

We have ten years to prevent irreversible damage from climate change. In the words of U.N. General Assembly President Garces of Ecuador "we are the last generation that can prevent irreparable damage to our planet" and must act for future generations guided by principles of climate justice. Continued Canadian hydropower development perpetuates colonialism and injustice forcing Indigenous and local communities to suffer the negative impacts of energy production that does not deliver the benefits promised.

"Rivers are essential sources of environmental health, economic wealth and human wellbeing" and river connectivity extends in four dimensions: longitudinally, laterally, vertically and temporally.¹ The Canadian Government's myopic view is that rivers are merely "hydroelectricity capacity" with "only" 40 percent developed, an additional four gigawatts currently under construction and with 60% remaining available to be exploited for profits and disguised as clean energy. Canada's hydropower energy policy is a death knell for rivers, communities and the planet. It is a shameful example of what 21st century renewable energy is not. Canadian hydropower does not deliver promised economic benefits to its own citizens as the financially disastrous Site C, Keeyask and Muskrat Falls demonstrate and in fact harms communities.

Canadian's regulatory review process for hydropower development is a sham. Projects are routinely exempted from review. When review does occur, it fails to meet basic standards for accountability as documented at Site C and Muskrat Falls. U.S. regulators do not undertake their own independent review of the impacts of this hydropower production allowing projects to be segmented, thereby escaping scrutiny under U.S. environmental protection laws. U.S. hydropower energy policy is outdated and at odds with climate science and international principles of equity and justice.

NAMRA urges the ITC to review all aspects of impacts of Canadian hydroelectricity imports and recommend:

¹ Grill, et al. *Mapping the world's free flowing rivers*, Nature. Vol. 569, May 9, 2019.

- 1. Bilateral renegotiation of the 2018 side letter to the USMCA/CUSMA on energy matters to replace the current flawed definition "renewable energy"² on hydropower;
- 2. A carbon accounting of greenhouse gas emissions of existing and proposed Canadian hydropower imports;
- 3. A directive to end all greenwashing of existing and proposed Canadian hydroelectricity imports;
- 4. A bilateral truth and reconciliation process to redress past and present harms to Indigenous people caused by Canada's hydropower development and the U.S. consumption of that hydropower; and
- 5. A recommendation that Massachusetts incorporate principles of climate justice, equity and inclusion into its energy policy for Canadian hydroelectricity imports.

Submitted by:

North American Megadam Resistance Alliance

Margaret E. Sheehan .

Margaret E. Sheehan, Esq. Coordinator NAMRA coordinator.namra@gmail.com

August 14, 2020

² The side letter says "renewable energy" "[m]eans energy derived from natural processes that are replenished at a higher rate than they are consumed. They are virtually inexhaustible. Renewable energy resources include …**hydro**…" [emphasis supplied]

UNITED STATES INTERNATNIONAL TRADE COMMISSION Investigation No. 332-574

Renewable Electricity: Potential Economic Effects of Increased Commitments in Massachusetts

Hearing Wednesday July 29, 2020 By Teleconference before the Commissioners of the United States International Trade Commission

NORTH AMERICAN MEGADAM RESISTANCE ALLIANCE

TRANSCRIPT ERRATA PAGE

I, Margaret E. Sheehan, appearing on behalf of North American Megadam Resistance Alliance in the above-referenced matter, make the following corrections to my testimony as set forth in the Transcript:

Page 134, Line 19: Change "53" to "63"

Page 135, Line 6: Change "electrical" to "electricity" and "53" to "63"; Line 18 change "George" to "Judge"

Page 136, Line 20: Change "stream" to "cover"

Page 137, Lines 17-18: Change "counts for virtual" to "Counsellor Weichel"

Page 144, Line 4: Change "main" to "Maine"

Page 154, Line 23: Change "Romaine" to "Eastmain"

Page 202, Line 8: Change "air life" to "alewife"

Page 209, Line 2: Change "clean and clean" to "clean and green"

Signed under the penalties and perjury this 13th day of August 2020.

Margaret E. Sheekar

Margaret E. Sheehan

UNITED STATES INTERNATIONAL TRADE COMMISSION INVESTIGATION NO. 332-574

August 14, 2020 Submittal of Senator Mary Jane McCallum

Exhibit 1: August 14, 2020 Senator Mary Jane McCallum USITC Post Hearing Brief

Exhibit 2: 2009 Michael G Young Environmental Racism and First Nations: A Call for Socially Just Public Policy Development

Exhibit 3: January 24, 2019 The Tyee: Andrew Nikiforuk Megadams Not Clean or Green, Says Expert

The Honourable Mary Jane McCallum Senator – Manitoba



L'honorable Mary Jane McCallum Sénatrice – Manitoba

Senate | Sénat CANADA

August 14, 2020

<u>USITC Post Hearing Brief – Senator Mary Jane McCallum</u>

The Honourable Mary Jane McCallum, Senator from the Manitoba region, Canada, submits this post-hearing brief alongside Tataskweyak Cree Nation – aka Split Lake – of Northern Manitoba. The issues raised in this brief, as well as those submitted by Tataskewyak Cree Nation, are in direct relation to the issues raised at the July 29, 2020 hearing before the Commissioners of the United States International Trade Commission (USITC) on the subject of *Renewable Electricity: Potential Economic Effects of Increased Commitments in Massachusetts*.

One of the purposes of this submission is to convey the past and present lived experiences of the First Nations on their lands, territories and environment in Canada and to focus on the extension of racism as it applies to the environment and the lands of First Nations in Canada. This racism manifests itself both socially and economically, especially as it relates to First Nations in Canada. To understand the ongoing environmental racism committed against First Nations by the combined efforts of the provincial and federal governments alongside the resource extraction companies – including mega dam hydro projects – one needs to understand that this racism involves the ongoing struggles of the decolonization of First Nations. The governments and the resource extraction companies have engineered laws, policies and regulations to continue to keep First Nations marginalized, voiceless, and powerless in their own country and on their own land. "The remote nature of many First Nations communities joined with the special jurisdictional issue associated with them, has led to a lack of clear responsibilities for the health of these communities," (Senate of Canada, 2007).

In order for the unabashed truth to come out, my office has decided to submit, through our briefing, firsthand information of the ongoing struggle of a First Nations community that lives with a hydro mega dam on their land, and how little progress has been made over decades of struggle and despite an abundance of environmental degradation. This community is Tataskweyak Cree Nation (aka Split Lake), in Northern Manitoba. Looking at this one community gives a template of the strife and struggle that rings true for countless First Nations across Canada. The balance of the submission represents my knowledge as an Indigenous woman who was raised on the land, taken from my land-based living to be sent to residential school, but who has since continued to return to my communities to understand the ongoing power imbalance and cycle of oppression which Hydro is implementing through their brazen interaction with community.

All Canadians have the right to safe air, water, and land. Yet for First Nations, Inuit and Metis,

as well as non-Indigenous Peoples living around mega dam projects, their rivers have become (in the case of Manitoba Hydro) and may become (in the case of Site C Dam) a dangerous source of drinking water, natural foods, and toxic pollution. Mega dam hydro projects in Manitoba braids environmental and geographical racism, examples of which include mercury contamination, flourishing algae, and the changing of nature's pathways, such as the reversal of the flow of a river. (*See briefing by Tataskweyak Cree Nation Councillor Robert Spence on the location of increasing water pollution as you move from Winnipeg to Selkirk to Gimli to Thompson and Gillam*).

It seems that this contamination is allowed to continue because other Canadians do not have to see and live in this degradation, being removed by geography. First Nations want a safe environment and equal rights, including environmental justice, just like other Canadians who live in urban and southern areas. They are asking for your help to achieve this by probing the impacts that hydro projects truly have on the surrounding communities and ensuring you act responsibly rather than further perpetuating a vicious cycle which results in the degradation of Indigenous lives and lands.

While other countries are moving away from mega dams, why have Canadian governments, both federally and provincially, chosen to continue supporting the building of these mega dams and why would countries, like the United States, then buy this type of ill-gotten Hydro product from Canada? As stated by Professor David Schindler:

"When you add the emissions from building and producing materials for a dam, as well as the emissions from clearing forests and moving earth, the greenhouse gas production from hydro is expected to be about the same as from burning natural gas."

Schindler continues:

"dam construction and the resulting flooding produces significant volumes of greenhouse gas emissions. Canadian dams have strangled river systems, flooded forests, blocked fish movement, increased methylmercury pollution, unsettled entire communities and repeatedly violated treaty rights."

Schindler then asks:

"How can those impacts be regarded as green or clean... Mega dams have other impacts that have not been fully studied so have can it claim to use science-based research?"

Hydro development results in fragmented water sheds as industry builds roads and transmissions lines. In turn, the fragmentation destroys wildlife habitat and opens the surrounding area to hunters and fishermen who are not entitled to Treaty benefits. The changing of water levels due to hydro dams' activities and their construction continues to shatter the ecosystem and the lives of First Nations. Site C Dam (British Columbia), Muskrat Falls (Newfoundland and Labrador), and the numerous Manitoba hydro mega dams illustrate that colonial attitudes remain today; they have not disappeared as relics of an uninformed past. They are as acute now as they ever were. The right of Indigenous Peoples in Canada to free, prior and informed consent is neither being practiced nor upheld.

Manitoba Hydro and Site C Dam, as well as the Premiers of those provinces, are aware that by conscious design they have and continue to support the degradation of Indigenous lives and

lands by permitting the building of these mega dam projects. Are these environmental injustices a legacy of racist practices experienced by First Nations people? During COVID-19 these two sites continued to operate with high levels of workers who were unable to socially distance despite the fact that they had active cases of the virus on site – all of this despite the requests from the surrounding Chiefs and First Nations organizations to limit their numbers. The provincial government responded by saying it was an essential service – which it was not. As the dam is still under construction, it was/is not actively outputting consumable electricity. Meanwhile, Manitoba Hydro has 4 other operational dams in the same geographical area. One of them (Grand Rapids) is not always active but rather is only used when reserve power is needed. As their only course of protection during the ongoing COVID-19 pandemic, the only meaningful action that First Nations communities. These lockdowns and the safety precautions which they represent were put in jeopardy by the persistent and continued flow of workers – most from out of province and some from outside of the country – into the construction sites that are located on or adjacent to their communities.

Environmental racism not only affects physical health but it also affects civil, political and economic rights; self-determination; and power. The insidious nature of environmental racism is a major contributor to the ongoing cultural and spiritual genocide of Indigenous Peoples.

Directly related to hydro dams and their activity, water contamination is getting worse in Manitoba. Water conditions on First Nation's reserves in Canada, like Split Lake and South Indian Lake, are a product of environmental and geographic racism.

Despite the continued violations against the environment and human life/health from the risks associated with mega dams, it must not be forgotten that First Nations maintain the right to equality of protection and should have an opportunity to obtain a remedy. Although this is not ideal in that it is a reactive approach, it is better than sitting idle. So far, their voices have been ignored to the point that their only viable option has been litigation.

Rather than the aforementioned reactive approach, what the First Nations need is a proactive What they need is regulations which prohibit unjust environmental actions approach. beforehand and without coercion. First Nations should not be obligated to wait until the damage is done before they can try to obtain some degree of remediation. It has become all too common that Hydro only "negotiates" with Indigenous Peoples once the adverse impacts of their actions/projects make themselves explicitly known. By the time the impacts are seen the environmental, health and genetic damage has progressed into dangerous levels. This is not investment in the north. We can no longer think about the adverse impacts of mega dams as an issue whereby Hydro gives as little as possible to the affected communities to help them cope with the permanent adverse impacts they must then live with. Rather, Hydro must simultaneously address the underlying injustices and work to eradicate the poverty, exclusion and inequality it has created. This also includes Hydro development's contributions to climate change; the overt and covert racism and discrimination in both their practice and policy; sexual violence; and oppression. Hydro's story is not one of civilized behavior.

Hydro cannot plead ignorance – Hydro sees firsthand the damage it has wrought; they have the much-needed dose of reality that parliamentarians often fail to see. Seeing firsthand the experiences of those suffering from the intentional effects of large-scale water/environmental pollution and its effect on hunger, nutrition, and safety has not humbled them. In fact, it is abundantly clear it has had the opposite impact as this travesty continues to occur to this day.

In Manitoba, the mega dam project in the 1960's diverted water to provide cheap power for city dwellers as well as U.S. customers. Today in the town of Gillam where these mega dams are located, one of the elders advised me that she paid \$800.00 per month for her hydro bill. The workers were paying \$40.00 per month. Is that not a clear indictor of the economic, social, geographic and environmental racism and discrimination that are all at play?

These overt damages continue today, but other, more discrete, lethal damages are also ongoing. The presence and effect of hydro mega dams continues to destroy and prevent First Nations children from the fulfillment of their dreams – dreams other children are allowed due to their location; their environment. Children who are raised in an environment created from adverse impacts have a limited view of what safety entails to other Canadians – they live in an abnormal environment engineered by Hydro. What does their future look like? Is it brimming with hope like other Canadians? No. And with the high suicide rates in First Nations communities across Canada, it seems that the message these youth are leaving us are also not being heard. These children, too, have rights as defined by the *UN Convention on the Rights of the Child*. These include the right to protections against discrimination, abuse and neglect – mentally or physically; as well as the right to a safe environment, clean water and nutritious food. It seems obvious that, together, the different levels of Canadian government and the resource extractive companies are working in a way that contravene the rights of the children as well as those of the adults.

How, then, can the connections between Hydro and First Nations communities be researched and addressed – these points of entry into the lives and lands of communities?

In the past, First Nations had a purpose in life – life with the land – who was their teacher; their provider; their connection to spirit, safety, dignity, and self-determination. Now, Hydro acts as if First Nations do not exist, they merely occupy valuable space which Hydro sees as needed for more destruction to provide cheaper power for others who are largely far away from the immediate destruction and the environmental fallout that comes with it. The basis of Hydro's power and authority over First Nations' lands and, thus, lives is troubling to me. The foundation of First Nations' rights in Canada are their Treaties, which were signed by the Crown and are discharged/upheld through protections ensured and governed by the federal government. As such, it is unclear to me how Hydro has been granted ownership over swaths of Indigenous lands and territories. The legality of these actions at their very foundation seems dubious - how did Hydro come to be in such an authoritative position over Indigenous Peoples and their lands, and who is responsible for ensuring Hydro respects the Treaties which govern First Nations Peoples if not the federal government themselves? Despite this and by continuing to assert their power and authority over these Indigenous lands, Hydro continues to be culpable in practicing cultural extinction while simultaneously undermining the governance structures of the First Nations communities – ones which are codified by their Treaty rights.

The fight surrounding First Nations due to environmental and geographic racism in Canada has been waged for many years. So much remains at stake for the First Nations across Canada but also the non-Indigenous land owners. These people come from communities least responsible for their predicament of water loss and land dispossession yet they are the most affected. Their plight is ignored. This fight is one that is fundamentally about human rights and securing justice for those suffering from resource extractive measures. In this specific situation, the community I am referring to is the Tataskweyak Cree Nation in Northern Manitoba. As previously indicated, their briefings and highly relevant documentation accompany my submission.
The First Nations live in one of the most water rich countries in the world yet they largely have no clean water to drink. The government has given them bottled water for now but no other communication has occurred. They have only polluted water now on their lands due to Hydro's activities, which has resulted in the literal physical damage and death to humans and animals who live on the water. (**See attached images, submitted by Tataskweyak Cree Nation**). How do they live without water? How can Canada continue to walk away from its original peoples, favoring economic benefit instead?

First Nations lands are being destroyed; the animals are being exterminated. First Nations are left seeking the basic necessities of food, water, and shelter from their own resource rich country. What will their world, and yours, look like in 20 years? Will you be happy being subsidized by the poorest people in this country called Canada?

This man-made phenomenon continues to impact the people of Split Lake. Split Lake Cree Nation and other surrounding communities live in an already-vulnerable geographic location – vulnerable because of the ready supply of water available, ripe for manipulation. Yet they are unable to be as resilient as they can be. The changing water levels, produced by the mega dams in their area – namely Keeyask and Missy Falls – have wiped out large areas and livelihoods with very little compensation. These rising and falling water levels have, and continue to, slowly and steadily cause: greater food shortages of traditional, natural and healthier food sources (moose, fish, fowl,); pollution; and poverty – all of which compromise the people and their ability to develop and advance their traditional governance systems. Those who have not caused the problem but are left to live with it are carrying the biggest burden. Those who have caused the problem and get to largely walk away from it have the ability to benefit from it.

The effects of the increased mercury; pollution; algae; driftwood; and the death of plants as medicines, continues to flow into these communities' living areas at a faster rate than it can be removed. In fact, these adverse impacts cannot be removed. When will Hydro stop producing this filth?

I happen to be providing clinical dentistry in Tataskweyak Cree Nation (Split Lake) this week. Working with the many children who have come to see me makes this deeply personal.

People all over the world are pleading for water. This includes water loss due to climate change but also due to the less-than green, clean or ethical conduct of resource extraction by mega dam projects in Canada. From what I have seen firsthand, how can we possibly call the energy produced by hydro mega dams green, clean or most importantly ethical?

The US environmental justice movement has moved faster than Canadian efforts. In the article, *Environmental Racism and First Nations: A call for Socially Just Public Policy Development* by Christina Dhillon and Michael G. Young, it states:

"Introducing legislation and creating regulatory bodies, such as the US Environmental Protection Agency have institutionalized environmental justice within the American federal government system."

Canadian legislation that deals directly with the inequalities created by environmental racism is not effective because of inter-jurisdictional issues between the provincial, territorial and federal governments.

While Canada has a ways to go in ensuring environmental justice becomes a serious factor in the way our country conducts its business with the players in Industry, and especially Hydro, it is my sincere hope that you will uphold the spirit and intent of environmental justice and acknowledge the true impacts of mega dam projects here in Canada before you invest money and resources in exporting it for US consumption, thereby further exploiting many of Canada's most vulnerable people and communities.

Sincerely,

Mary Jane MicCallum

Senator Mary Jane McCallum Citizen of Barren Lands First Nation Treaty 10, Manitoba Region

Environmental Racism and First Nations: A Call for Socially Just Public Policy Development

Christina Dhillon	Michael G. Young
Royal Roads University	Royal Roads University

Despite recent growth in research involving environmental issues in Canada, interest in environmental racism remains scant. The deliberate siting of hazardous waste sites, landfills, incinerators, and polluting industries in communities inhabited by First Nations communities represent a social justice issue of considerable magnitude. Through example, identifies the need for changes in environmental policies. A review of current policies, legislation and proposals for reform are provided. It is suggested that education and awareness of environmental racism be promoted at the national level. Amendments to the Canadian Environmental Protection Act, the implementation of a regulatory body and the development of an Environmental Bill of Rights are also considered.

Introduction

A core tenet of social justice, and a societal expectation, holds that all Canadians have the right to safe air, water and soil. Yet, referring to First Nations people in North American, Mascarenhas observes "whether by conscious design or institutional neglect, Native-American communities face some of the worst environmental devastation in the nation (2007, p.570)." Sarnia, Ontario or Canada's 'Chemical Valley', is the most disconcerting example of environmental injustice. This area has been identified as Canada's largest concentration of petrochemical industries and associated water and air pollution (Chemical Valley, 2008). With approximately 10 tons of pollutants in the St. Clair River and an average of 100 spills a year, this river is a dangerous source of drinking water for Aamjiwnaang and Walpole Island First Nations (Mascarenhas, 2007). From mercury contamination in Grassy Narrows, to E.coli contamination on Kashechewan Reserve, many communities are beyond the saturation point for exposure to pollutants. The results - high incidences of birth defects, illness and disease - are devastating. Despite considerable evidence of environmental degradation, Canadian governments and citizens alike have, for the most part, failed to recognize this as an important policy problem. Indeed, environmental injustices of these magnitudes represent a legacy of racist practices experienced by First Nations peoples.

While the US environmental justice movement has developed at an exponential rate, Canadian efforts have been far less effective, resulting in uneven attention to and action regarding environmental justice (Draper & Mitchell, 2001). President Clinton's 1994 Executive Order 12898 required each Federal agency to achieve environmental justice as part of its mission (Draper and Mitchell, 2001). Introducing legislation and creating regulatory bodies, such as the US Environmental Protection Agency have institutionalized environmental justice within the American federal governance system. Canadian legislation that deals directly with the inequalities created by environmental injustice is for the most part non-existent. Draper and Mitchell affirm that "…in Canada, relatively little policy discussion explicitly linked to environmental justice has occurred...political and private sector leaders in Canada generally have not taken strong positions related to environmental justice issues" (2001, p. 96). Improvements and alterations to the dearth of current public policy regarding environmental justice for First Nations people is needed to ensure equal rights to a safe environment for all Canadians, regardless of race and/or economic status. Failure to commit to such change is tantamount to endorsing the continuance of racist practices, a far cry from the goal of a just society.

Given the breadth and scope of environmental justice definitions that have emerged in the US, it is important that Canada recognizes its own areas of concern and allows for a diversity of interpretations of environmental justice to evolve from its political and social contexts. While the terms environmental justice and environmental racism are related, they stem from slightly different literatures. Academics use the terms to refer to "geographic associations between pollution or waste sites and low-income or minority communities; however, researchers continue to disagree about whether the patterns they observe constitute evidence of inequity, injustice, or racism (Holifield, 2001, p.78)." The original goal of environmental justice, as defined in President Clinton's (1994) Executive Order 12829, was to ensure "all people, regardless of race, national origin or income, are protected from disproportionate impacts of environmental hazards" (Holifield, 2001, p.80). The concept now encompasses a diverse range of meanings as different individuals, advocacy groups and governments adapt it to fit their own geographic, historical and political contexts (Holifield, 2001). For example, in the US, while all federal environmental justice programs include provisions for both distributive and procedural justice, different departments have varying interpretations to suit their own needs. The Environmental Protection Agency's policies focus mainly on hazardous waste and pollution concerns, whereas the program of the U.S. Department of Housing and Urban Development addresses problems like lead-based paint in inner-city public housing projects (Holifield, 2001). Finally, environmental justice for the Federal Transit Administration means ensuring that minority and low-income communities benefit proportionally from transit projects (Holifield, 2001). As Szasz observes, "[i]ntegrated in demands for clean and healthy communities are larger assertions for the restructuring of the current relationship between economy and society" (in Mascarenhas, 2007 p. 574). Consequently, Taylor (2000) has posited that environmental justice is as much about civil rights, self-determination and power, as it is about the questions of health and environmental quality (in Mascarenhas, 2007).

Many examples provided in this essay can be classified as incidences of environmental injustice; however, given that First Nations communities are overrepresented in this regard, they can be classified as acts of environmental racism. Environmental racism can be defined as the deliberate or intentional siting of hazardous waste sites, landfills, incinerators, and polluting industries in communities inhabited by minorities and/or the poor (Collins-Chobanian & Wong, 2006). The concept of environmental racism is rights-based and asserts that communities subject to this kind of racism are frequently impoverished, excluded from dominant cultures and are denied full citizenship (Cook, 2006). Draper and Mitchell (2001) observe that this marginalized status leaves communities politically powerless and without representation in the policy-making process. Unfortunately, many First Nations communities know all too well the effects of their marginalized status.

This essay proposes a modest policy solution to confronting environmental injustice and racism in Canada. The suggestions are intended to influence public policy throughout the policy process from problem identification and agenda setting to policy formulation itself. First, specific examples of environmental racism in Canadian aboriginal communities are described. This is followed by an examination and critique of current environmental policy and legislation in Canada. Next, a strategic plan and policy solution to combat the effects of environmental racism is proposed including: increased education and awareness of the general public on the topic of environmental racism; amendments to the *Canadian Environment Protection Act* (1999); implementation of a regulatory body; and the introduction of a federal "Environmental Bill of Rights."

Examples of Environmental Racism and Injustice in Canada

Aboriginal Communities

Aboriginal communities within Canada have frequently been victims of environmental racism¹. The remote nature of many First Nation communities joined with the special jurisdictional issue associated with them, has led to a lack of clear responsibilities for the health of these communities (Senate of Canada, 2007). The following serve as exemplars of many instances of environmental injustice and environmental racism that occur in Aboriginal communities.

Sarnia, Ontario

Aamjiwanaang First Nation and residents of Sarnia face a serious environmental problem. There are approximately 850 band members residing on Aamjiwanaang Reserve, an area identified as the St. Clair River Area of Concern by the Canada-US Great Lakes International Joint Commission (Keith et al., 2005). The reserve is surrounded by one of Canada's largest concentrations of industry, including several large petrochemical, polymer and chemical industry plants (Keith et al., 2005).

Canada's National Pollutant Release Inventory (NPRI) is the central public registry that tracks the quantities of chemicals released into the environment each year. In 2005, the NPRI facilities in the Sarnia area released 5.7 million kilograms of "Toxic Air Pollutants" – pollutants which have been associated with reproductive and developmental disorders and cancer among humans (MacDonald & Rang, 2007). Quantities of emissions released in the Sarnia region are greater than any other community in Ontario and more than the entire provinces of Manitoba, New Brunswick and Saskatchewan (MacDonald & Rang, 2007). Yet, air pollution is just one aspect of the environmental problems affecting this community. The St. Clair River, a source of drinking water for Aamjiwanaang First Nation, also poses environmental danger. "Between 1974 and 1986, a total of 32 major spills and 300 minor spills have contributed to approximately 10 tons of pollutants in the St. Clair River" (Mascarenhas, 2007, p.567). On average 100 spills a year have been recorded since 1986 by Environment Canada (Mascarenhas, 2007). Furthermore, an abundance of agricultural runoff of pesticides and fertilizers enter the river every year (Mascarenhas, 2007).

Growing evidence suggests that the health of Aamjiwanaang First Nation and their local environment have been severely compromised (MacDonald & Rang, 2007). In 2006, a survey conducted by the Aamjiwnaang Environment Committee revealed that many residents had serious health implications related to air pollution. About 40 per cent of band members required an inhaler, and 17 per cent of adults and 22 per cent of children reported to have asthma (MacDonald & Rang, 2007). Furthermore, a concerning birth ratio of 2 girls to 1 boy is a clear indicator that something is wrong in Sarnia (Chemical Valley, 2008). A study conducted in 2005 confirms that the proportion of male live births of the Aamjiwnaang First Nation has been declining continuously from the 1990's to 2003 (Keith et al., 2005). Releases of chemicals have also interfered with the community's cultural life, affecting hunting, fishing, medicine gathering and ceremonial activities (MacDonald & Rang, 2007).

Members of Aamjiwaang First Nation have lost confidence in the abilities of their provincial, and federal governments to protect their community from environmental harm (MacDonald & Rang, 2007). This form of environmental degradation is one of selective victimization in which First Nations communities are deprived of critical resources and a healthy environment.

Grassy Narrows, Ontario

High levels of mercury contamination are typically found in Aboriginal communities near pulp mills or hydro developments (Assembly of First Nations, 2005). As early as 1970, mercury contamination from a Dryden paper mill was discovered in the English-Wabigoon River system (Indian and Northern Affairs Canada, n.d. hereafter referred to as INAC). "In a single stroke, the people of Grassy Narrows lost their two main sources of employment (guiding and commercial fishing), and their confidence in the safety of their food and water" (INAC, n.d.). Citizens of Grassy Narrows have faced relentless and on-going health problems as a result of consuming fish contaminated by pulp mill effluent (Assembly of First Nations, 2005). The Government of Canada has contributed more than \$9 million dollars in compensation to the First Nations affected by mercury contamination of the English-Wabigoon River; yet little can be done to remove the fact that a community has struggled with serious health and social problems for over 25 years (INAC, n.d.).

Environmental contamination has been a long-standing concern for First Nations people; in particular, more recent incidences of water contamination on First Nations' reserves indicate that environmental injustices may only be getting worse. In 2001, an assessment carried out by the Department of Indian Affairs and Northern Development (DIAND) and Health Canada revealed that almost three quarters of drinking water systems located on reserves posed significant risk (National Aboriginal Health Organization, 2002, hereafter referred to as NAHO). Additionally, in March 2007, DIAND released a progress report on First Nations drinking water indicating that the water systems of 97 First Nations communities are classified as high risk (NAHO, 2002). The following examples substantiate that water conditions on First Nation's reserves in Canada are a product of environmental racism.

Black Tickle, Labrador

In 2003, Maura Hanrahan's research, revealed unacceptable water conditions for the remote fly-in Metis community of Black Tickle, Labrador. The small community of 268 individuals has limited access to water through community wells in the summer and running brooks in the winter (NAHO, 2002). In addition, its 366 shallow ponds are vulnerable to contamination from animal waste (Hanrahan, 2003). The complete lack of sewage treatment, and limited capacity to adequately test drinking water, combine to turn Black Tickle into a "sick community"(NAHO, 2002).

Not surprisingly, the level of water Black Tickle residents use is much lower than that of Canadians in general; with the average person in Black Tickle using 112 litres of water daily, compared to the 326 litres used by the average Canadian (Hanrahan, 2003). The Terms of Union between the Dominions of Newfoundland and Canada in 1948 did not contain any reference to the islands or to Labrador's Indigenous people; the result is that funding of Indigenous programs and recognition of Indigenous rights has been minimal to non-existent (Hanrahan, 2003). Yet, unequal access to potable water is just one dimension of environmental injustice and racism experienced by Indigenous people in Canada. To be sure, homes in Black Tickle are among the hundreds in Indigenous Canada without running and/or safe water (Hanrahan, 2003). In the next example, appalling water conditions on Kashechewan Reserve in Ontario, illustrate how problems extend beyond water supplies to include First Nations housing, sewage and waste management, and exposure to toxins (Senate of Canada, 2007).

Kashechewan Reserve, Ontario

On 25 October 2005, the Minister of Aboriginal Affairs for the province of Ontario ordered the evacuation of nearly 1,000 residents of the Kashechewan reserve (Senate of Canada, 2007). The evacuation was in response to positive tests for Escherichia coli (E. coli) bacteria in the reserve's drinking water (Kashechewan, 2006). Kashechewan First Nation had been under a boil water advisory for 2 years and about 1,900 people on the reserve have for years battled skin infections and chronic illness blamed on the poor water quality (Senate of Canada, 2007). Bacteria levels in the water required that the community try to combat the *E. coli* by over-chlorinating the water. However, the chlorine in the water reached "shock" levels making matters worse as the high chlorine intensified skin irritations, causing burns (Kashechewan, 2006).

A major cause for contamination was the intake pipe for Kashechewan's water treatment plant had been installed downstream from a sewage lagoon (Senate of Canada, 2007). Furthermore, inadequate training and lack of on-going maintenance were cited as the main reasons for repeated contamination of the water supply. Simple improvements could have been implemented to prevent the large-scale health emergency that occurred, which now currently involves relocating an entire community at a great expense and with further negative social impact on the community (Senate of Canada, 2007).

Current Canadian Environmental Policy

Environment Canada

Environment Canada is the department within the federal government responsible for coordinating environmental policies and programs as well as promoting preservation of the natural environment and wildlife (Government of Canada, n.d.). In addition, responsibility for environmental management in Canada is a shared responsibility between the federal government and provincial/territorial governments. For example, in regards to waste management, the federal government regulates international and inter-provincial/territorial movements, while provincial/territorial governments regulate intra-provincial movements of hazardous waste and hazardous recyclable material (Environment Canada, n.d.). The provinces/territories are also responsible for establishing controls for licensing hazardous waste generators, carriers and treatment facilities within their jurisdiction (Environment Canada, n.d.).

Canadian Environmental Protection Act (CEPA)

Updated in 1999, Canada's current federal legislation dealing with environmental concerns is the Canadian Environmental Protection Act (1999). The goal of the Act is "to contribute to sustainable development through pollution prevention and to protect the environment, human life and health from the risks associated with toxic substances (CEPA, 1999)." While this legislation claims to protect human life from toxic hazards, equal opportunity to this protection from harm has not been mandated. In order to promote equality and prevent Aboriginal and other minority groups from being marginalized and targeted for environmentally unjust/racist practices, equality of protection must be explicitly written in statute. The following discussion identifies and critiques several provisions found within CEPA in terms of their applicability to environmental racism.

If a violation of CEPA has occurred, under sections 22 and 38 of the Act, the public can initiate an Environmental Protection Action if the Minister has failed to conduct an investigation and report within a reasonable time or if the Minister's response to the investigation was unreasonable (CEPA, 1999). Plaintiffs have an opportunity to obtain a remedy if a violation occurs, but this is very much a reactive approach (See Appendix A). A proactive approach would ensure that regulations should be implemented which prohibit unjust environmental actions before hand. Individuals would not be obligated to wait until the damage is done before they can try to obtain a remedy, for instance, the plaintiff may seek a declaratory order or an order requiring the defendant to refrain from conducting himself in a way which may constitute as an offence under CEPA (CEPA, 1999). Additionally, section 185(2) of CEPA provides that the Minister has authorization to decline permits if he/she believes that the waste or material will be managed inadequately (1999) (See Appendix B).

Although this safeguard is in place, it is also true that government decisions are widely impacted by economic considerations, and thus will rarely halt activities if they jeopardize economic growth. Other regulatory bodies, specifically targeting incidences of environmental injustice, need to be introduced to enforce provisions such as section 185(2).

Part 9 of CEPA discusses government operations pertaining to federal and Aboriginal lands. It attempts to close any gap between federal and provincial environmental jurisdictional requirements by ensuring that federal operations, and works and undertakings on federal lands, meet or exceed equivalent provincial provisions for emissions, effluents, waste handling and disposal, and environmental emergency or the accidental release in contravention of regulations of a substance into the environment (CEPA, 1999). It outlines a lengthy list of regulations, from respecting establishment of environmental management systems, to pollution prevention plans which the Minister may decide to recommend. However, before recommending to the Governor in Council a

regulation under this section, the Minister is required to consult with the government of a territory to determine if such regulations apply to that territory (See Appendix C).

In many cases, Aboriginal governments have not been consulted or warned about risks associated with developmental plans such as the construction of mines, mills, landfills and toxic waste disposal sites on Aboriginal lands. In the case of northern Saskatchewan's uranium mines, consultation and public hearings of the matter took place two years after the Rabbit Lake mine began operating (York, 1990). More recently, the development of Alberta Tar Sands has resulted in litigation by the Beaver Lake Cree Nation against the Province of Alberta. The action alleges breach of constitutional duty to consult with the Nation regarding Phase 3 of the Christina Lake Project headed by MEG Energy Corporation (Dene Sues Alberta). Moreover, development of the Tar Sands has led to extreme degradation of the Athabasca River Basin rendering the river unusable for drinking or fishing by Dene, Cree, and Métis populations (Thoma-Müller, 2008).

Sometimes protest from the community has been victorious in preventing such sites from being developed but in other cases, corporations and government agencies have found methods to get around these objections and continue with their own agendas regardless of who has been affected. As an example, Manitoba Hydro began the planning of its Grand Rapids project in 1957, four years before the people of Chemawawin were informed of the plans (York, 1990). There is clear evidence that both federal and provincial governments were in full knowledge that building the hydro dam would cause serious damage to the Chemawawin community, and yet the dam continued to be built (York, 1990). Similarly, First Nations concerns over Tar Sands development voiced to both Albertan and Federal governments in 2008 have fallen on deaf ears. Treaties 8 and 11 have failed to provide adequate protection to First Nations from uncontrolled and massive development of the Tar Sands, which threatens their "…fundamental right to exist as an indigenous peoples." (Thoma-Müller, 2008)

Although it appears that some safeguards are in place which would promote environmental justice and equality as specified in sections 22 and 185(2) of CEPA, it also appears that a breakdown occurs upon implementation and regulation of the law. The case of First Nations underscores the importance of the adequately implementing this statute and monitoring its enforcement.

Recommendations

The following recommendations provide a means to battle the environmental injustice/racism within Canada. The first involves increasing knowledge and awareness of environmental racism for the general public to promote community activism against environmental injustices. The remaining recommendations involve policy implications with the cornerstone being implementation of a federal "Environmental Bill of Rights."

1. Education and Awareness

In Canada, there has been relatively little policy recognition of community voices raised in concern of environmental issues. If environmental justice is to be achieved, community activism must address these issues. Politicians and even community advocates may not have environmental equality as a priority on their agendas, as witnessed in the water situation of Black Tickle Metis. Communities must therefore advocate on their own behalf for environmental equality. Through this advocacy, communities will be able to influence policy design, as the first step in problem identification (Pal, 2006). If there is sufficient concern among the public regarding issues of environmental racism, policy-makers will be required to address issues of an environmental nature and report their progress to the community.

In order to promote education and awareness of environmental protection methods, individuals and public interest groups need an "access-to-information" statute that requires governmental departments to keep indexes of materials such as brochures, pamphlets, reports, and fact sheets and to make information available on request (Government of Canada, n.d.). Although many people continue to hope that governments will show leadership and commitment toward the challenges of sustaining our environment and attaining environmental justice, the responsibility for reaching these goals must be shared by all Canadians. Public participation is essential for guiding political will to areas of concern. Ultimately, such actions will likely enhance population health through reductions in exposure to environmental hazards for already vulnerable groups (Buzzelli & Jerret, 2004).

2. Additions to CEPA

A second recommendation would be to include additional provisions to CEPA which would incorporate a focus on reducing cases of environmental injustice. As noted, sections 22, 185(2) and part 9 of CEPA would be able to accommodate the principles of environmental justice.

3. Regulatory Bodies

A third recommendation is to increase responsibilities of the current regulatory body of environmental assessment to include regulation of environmental justice issues. An example is the *Canadian Environmental Assessment Act* which is administered by the Canadian Environmental Assessment Agency (CEAA.) The CEAA is an independent agency that reports directly to the Minister of the Environment. The Act requires federal departments, including Environment Canada, agencies, and Crown corporations to conduct environmental assessments for proposed projects where the federal government is the supporter. It also requires environmental assessments when the project involves federal funding, permits or licenses. The infrastructure is already in place, but it requires expansion to include topics of environmental racism.

4. Environmental Bill of Rights

In Canada, environmentalists have been pressing for an environmental bill of rights since the early 1970s with little success (Government of Canada, n.d.). With the exception of provincial statutes of environmental rights in Quebec and Ontario, the majority of Canada has not benefited from any protection². A federal environmental bill of rights would be an effort to make Canadian environmental law more democratic. More democratic environmental law is necessary to empower citizens to protect the quality of the natural environment for their own and future generations.

The Government of Canada has outlined several substantive and procedural rights which should be included if Canada was to adopt an Environmental Bill of Rights. Substantive rights would include:

- 1. The right to a clean, healthy environment, and the preservation of its natural, historic and aesthetic values, for present and future generations;
- 2. A public right to participate in the regulation process;
- 3. The right to sue polluters for actual or apprehended environmental harm, without having to show any private interest, and to require the government to enforce environmental protection laws...

Procedural rights would include: reforms of the standing rules; class actions and burden of proof requirements in environmental litigation; and a law to protect retaliation against employees who report environmentally harmful conduct by their employers. As well, it has been suggested that the onus of proof should be shifted from plaintiffs to defendants, so that polluters would have to establish the environmental safety of their activities (Government of Canada, n.d.).

The bill of rights should also mandate that every federal agency make environmental justice a part of its mission. One suggestion may require federal agencies to identify and address environmental health effects of its programs on communities inhabited by minorities and/or the poor.

Conclusion

After examining the current legislation regarding environmental injustice and making recommendations to smooth disproportionate levels of environmental racism among aboriginal groups, a policy solution is still not as clear as initially desired. Policy design is very much an interconnected web, and we can rarely fix one problem without it having an effect on another activity (Pal, 2006). While the recommendations suggested in this paper will provide some relief from the harms of environmental racism, other factors need to be addressed simultaneously. For example, inhibiting factors which prevent the recommendations from being successful must be considered. Some examples include: a reluctance to engage in 'race talk' in Canada and the fact that governments will unlikely pursue environmental equality if economic growth and benefit are jeopardized. In addition, other policy areas may be affected; and these must be considered. Clearly, effective environmental policy requires an interdisciplinary approach; a task beyond the scope of this paper. Despite the fact that an all encompassing approach is best, the recommendations suggested in this paper would be a good starting point to battle the current problem of environmental racism in Canada and the development of socially just policies for First Nations communities.

Notes

- 1. York (1990) provides several examples of past injustices and environmental racism experienced by Aboriginal peoples in Canada. See also Borrows (1997).
- 2. Given the example of Sarnia, Ontario it may be argued that federal policies may be more effective in the case of First Nations environmental issues.

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APPENDIX A

Section 22(3) of CEPA:

In the action, the plaintiff may claim any or all of the following in regards to an environmental violation:

(*a*) a declaratory order;

(*b*) an order, including an interlocutory order, requiring the defendant to refrain from doing anything that, in the opinion of the court, may constitute an offence under this Act;

(c) an order, including an interlocutory order, requiring the defendant to do anything that, in the opinion of the court, may prevent the continuation of an offence under this Act;

(*d*) an order to the parties to negotiate a plan to correct or mitigate the harm to the environment or to human, animal or plant life or health, and to report to the court on the negotiations within a time set by the court; and

(e) any other appropriate relief, including the costs of the action, but not including damages (CEPA, 1999).

APPENDIX B

Section 185(2) and (3) of CEPA:

Refusal to issue permit

(2) if the Minister is of the opinion that the waste or material will not be managed in a manner that will protect the environment and human health against the adverse effects that may result from that waste or material, the Minister may refuse, in accordance with the criteria set out in the regulations, to issue a permit even if the relevant authorities have given their authorization.

Consultation with governments

(3) Before refusing under subsection (2) to issue a permit to import, the Minister shall consult with the government of the jurisdiction of destination.

APPENDIX C

Section 209(3) of CEPA:

(3) Before recommending to the Governor in Council a regulation under this section, the Minister

(*a*) shall offer to consult with the government of a territory if the regulation applies to that territory, and with the members of the Committee who are representatives of aboriginal governments if it applies to aboriginal land over which an aboriginal government has jurisdiction...



<u>NEWS</u>

Megadams Not Clean or Green, Says Expert

Forty years of research show hydro dams create environmental damage, says David Schindler.



By <u>Andrew Nikiforuk</u> 24 Jan 2018 | TheTyee.ca



'When you add the emissions from building and producing materials for a dam, as well as the emissions from clearing forests and moving earth, the greenhouse gas production from hydro is expected to be about the same as from burning natural gas,' says professor David Schindler. Photo from BC Hydro.

Politicians who describe dams as "clean energy projects" are talking "nonsense" and rejecting decades of science, says David Schindler, a leading water ecologist.

Former premier Christy Clark often touted the Site C dam as a "clean energy project" and Premier John Horgan has adopted (http://www.alaskahighwaynews.ca/site-c/q-a-premier-john-horgan-on-site-c-trade-mission-to-asia-1.23128716) the same term.

But that's not the story told by science, Schindler told The Tyee in a wideranging interview.

In fact studies done by federal scientists identified dams as technological giants with lasting ecological footprints almost 40 years ago, he said.

Dam construction and the resulting flooding produces significant volumes of greenhouse gas emissions. Canadian dams have strangled river systems, flooded forests, blocked fish movement, increased methylmercury pollution, unsettled entire communities and repeatedly violated treaty rights.

Schindler, a professor emeritus at the University of Alberta and an internationally honoured expert on lakes and rivers, pointed to the increased mercury levels as a health and environmental risk. "All reservoirs that have been studied have had mercury in fish increase several-fold after a river is dammed," he said.

"How can any of those impacts be regarded as green or clean?"

The Site C dam is no exception. A report

(http://watergovernance.sites.olt.ubc.ca/files/2017/11/23-11-17-Summary-Research-Site-C-FINAL-clean.pdf) by the University of British Columbia's Program on Water Governance found the Site C project, which faced a federal-provincial Joint Review Panel (https://www.ceaaacee.gc.ca/050/documents/p63919/99173E.pdf) in 2014, "has more significant negative environmental effects than any other project ever reviewed under the Canadian Environmental Assessment Act (including oilsands projects)."

"The scale of impacts results from the rare and ecologically important biodiversity of the Peace Valley," the UBC report noted.

Schindler said other countries, like Brazil, have put the brakes (https://www.theguardian.com/environment/2018/jan/04/brazil-raiseshopes-of-a-retreat-from-new-mega-dam-construction) on hydro development over concerns about Indigenous rights, economics and environmental damage. "Brazilian politicians seem to learn a lot faster than Canadian politicians," he said.

In contrast the Canadian government proposes to meet its failing climate change goals by replacing fossil fuels with massive amounts of hydroelectric power, which government bureaucrats still misleadingly call "non-emitting."

One federal plan, the Mid-Century Long-Term Low-Greenhouse Gas Development Strategy (http://unfccc.int/files/focus/longterm_strategies/application/pdf/canadas_mid-century_longterm_strategy.pdf), includes scenarios that would see the equivalent of another 118 Site C dams built across Canada by 2050, many on Indigenous land in northern Canada.

But to call dams "non-greenhouse gas emitting" sources of power, as the Canadian government now does, is completely dishonest, said Schindler.

Dams create greenhouse gas emissions by flooding soils and vegetation, which then decompose and release methane and carbon dioxide over time.

The same microbial decomposition also helps to accelerate the production and bioaccumulation of mercury in fish and eaters of fish.

Schindler said each reservoir's emissions are different depending on the depth, size, amount of land flooded and location.

In extreme cases, energy from dams can produce as much greenhouse gas as burning coal, he said. Some reservoirs can release methane and CO2 for more than a hundred years, he added.

On a global average reservoirs created by dams release three to five times more emissions than natural lakes or wetlands due to the high volume of wood, vegetation and peat decomposing in flood waters.

"When you add the emissions from building and producing materials for a dam, as well as the emissions from clearing forests and moving earth, the greenhouse gas production from hydro is expected to be about the same as from burning natural gas," said Schindler.

According to one 2012 study

(http://www.globalforestwatch.ca/sites/gfwc/files/publications/20120118B _Hydro2_GHGs_Energy_Environment.pdf), Canada's 271 large dams have affected 130,000 kilometres of rivers and flooded tens of thousands of hectares of land. Calculating greenhouse gas emissions from the nation's hydro reservoirs is not an exact science, but estimates range from 1.5 megatonnes to 17 megatonnes a year.

According to a recent UBC analysis of greenhouse gas emissions from Site C, its reservoir will create meaningful greenhouse gas emissions, primarily in the 2020s and 2030s, and the project would "make it harder to meet Canada's 2030 greenhouse gas reduction commitments."

Schindler said he began concluding dams are not clean 40 years ago.

"My realization that dams weren't clean came when federal researchers started research on South Indian Lake in the 1970s," he recalled.

The lake, Manitoba's fourth largest, was located north of Lake Winnipeg and supported a small Cree community that depended on a thriving white fish fishery, North America's second largest, for its livelihood. That self-sustaining resource provided families with incomes of \$100,000 a year.

But in the 1960s the Manitoba government proposed a massive \$2-billion project to divert water from the Churchill River into the Nelson River to provide cheap power for city dwellers and U.S. customers.

At the time Robert Newbury, a professor of civil engineering at the University of Manitoba, raised serious concerns about whether the project was needed and its impact.

"Nowhere is the cost of the loss of the Churchill River calculated. Its existence, aesthetics, native community options, ecology and unique role of creating a livable environment in an otherwise harsh land are considered to be worthless in the energy budge," wrote Newbury at the time.

Despite stiff opposition from First Nations and many southern Manitobans, the new government of the day pushed the project forward.

"Can we... face up to the prospect of disrupting two communities of 700 people, completely upsetting the lake on which they depend for their livelihood making it quite impossible for at least some of them to continue to live independently?" asked then-NDP premier Ed Schreyer before the decision — before doing just that.

The diversion, which promised a "brighter future" for southerners, flooded the community with three metres of water and destroyed 800 square kilometres of Cree land.

"Mercury levels went up and destroyed the fishery," recalls Schindler.

In exchange for lost land and livelihoods, the NDP government relocated (http://www.mhs.mb.ca/docs/mb_history/15/hydroelectricdevelopment.sh tml) Cree residents and offered them "direct colour TV broadcasts of improved quality." (The damage continues to this day. "Our government talks about reconciliation and a bright future for all," wrote (http://www.thompsoncitizen.net/news/nickel-belt/associationannounces-collapse-of-once-lucrative-south-indian-lake-fishery-1) a Manitoba Indigenous fisher in 2016. "We don't see it.")

In the 1990s more research confirmed the dirty impact of dams on waterways that sustained Canada's First Nations at the Experimental Lakes Area in northwestern Ontario, a research station that Schindler founded.

Scientists flooded boreal wetlands and then boreal forests covered by different amounts of soil and vegetation and discovered the inundation of all kinds of landscapes increased both greenhouse gas emissions and the volume of methymercury being released into the water.

The researchers also noted

(http://pubs.acs.org/doi/pdf/10.1021/es040614u) that "Boreal developments generally involve reservoirs with large surface-area-to-volume ratios that flood substantial quantities of organic bio-mass, which predisposes these reservoirs to high production rates of greenhouse gas and methylmerucy relative to the amount of power produced."

Similar results were found at the La Grande complex in northern Quebec, which created 15,000 megawatts of hydroelectric capacity by flooding nearly 13,000 square kilometres of boreal forest and wetlands.

"Researchers found the same impacts there," said Schindler. "The findings were parallel. More mercury and greenhouse gas were being released because of the dams in the James Bay area."

Just 10 years after the flooding of the La Grande complex mercury levels *(https://www.internationalrivers.org/dams-and-water-quality)* in pike and walleye rose six times above their baseline levels.

By the 1980s, 60 per cent of the Cree living near the La Grande estuary reported mercury levels above the World Health Organization tolerance limit.

International studies have all reached similar conclusions: dams have high environmental and economic costs.

"I don't know what our politicians are doing," said Schindler. "Are they not reading science at all? How can they come out and call dams clean power. There is no excuse for this kind of ignorance." Nor have the issues gone away. Only sustained protests and hunger strikes over the Muskrat Falls dam (https://thetyee.ca/Opinion/2017/12/22/Ghost-Of-Muskrat-Madness/) forced the Newfoundland government to respond (http://www.cbc.ca/news/technology/muskrat-falls-labradormehyImercury-1.3821827) to scientists' concerns about mercury contamination. Premier Dwight Ball committed to making all future decisions "using science-based research."

Megadams have other impacts that have not been fully studied, Schindler said.

Development fragments watersheds as industry builds roads and transmission lines. In turn the fragmentation destroys or disturbs wildlife habitat, and opens the surrounding area to hunters and fishermen who are not entitled to treaty benefits.

"Both can quickly deplete the resources necessary for Indigenous subsistence in the region of a dam," says Schindler.

"Everywhere Canadian engineers have changed water levels with dams, communities have been shattered," he said.

Politicians, said Schindler, need to recognize that all energy sources emit carbon dioxide and all have an ecological cost.

Although dams may sometimes be low-carbon emitters, the destruction of fisheries and violation of First Nation treaties and communities can't ever be whitewashed as green or clean, he maintained.

"As Site C, Muskrat Falls and developments in Manitoba and Quebec illustrate, these are not problems of colonial attitudes of a distant past: they are as acute now as they ever were."





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Reject Canadian Hydropower: A Human Rights and Environmental Disaster

 GOVERNOR JANET MILLS (MAINE), GOVERNOR CHARLIE BAKER (MASSACHUSETTS), GOVERNOR PHIL SCOTT (VERMONT), GOVERNOR ANDREW CUOMO (NEW YORK), MAYOR BILL DE BLASIO (NEW YORK CITY)



As the climate emergency escalates, governments are seeking ways to reduce greenhouse gas emissions and "go green." The hydropower industry is seeking to profit from the climate emergency by falsely marketing its power as "clean, green, Only 57 more until our goal of 400 SIGN THIS PETITION Welcome back, North American! Not North American? Click here.

> ADD YOUR NAME

You may receive email updates from *Meg Sheehan*, the creator of this petition. sustainable and renewable." Canadian hydropower is dirty energy and should not be allowed to qualify for subsidies or be considered "clean energy." It is a human rights, climate, and environmental disaster.

Sign our petition to stop new megadams in Canada and join us in calling for American politicians to reject Canadian hydropower as a source of renewable energy.

Human rights violations:

•Megadams flood thousands of acres of traditional Indigenous land and are often built without the consent of the communities that they will be adversely affecting.

•Hydropower destroys traditional ways of life and prevents Indigenous People across the world from practicing their cultural pursuits.

•Hydro-Quebec, Nalcor Energy, Manitoba Hydro, and B.C. Hydro are responsible for the cultural genocide of Indigenous communities throughout Canada. The creation of the Nalcor Energy and Hydro-Quebec Upper Churchill Falls dam in 1974 in Labrador flooded 2,000 square miles of Innu First Nation hunting grounds displacing communities that continue to suffer from these impacts today.

Methylmercury poisoning:

•The flooding of forests, rivers, streams, and wetlands to create reservoirs releases toxic methylmercury that persists in the environment for up to 30 years and poisons food supplies relied on by local communities.

•According to a recent Harvard University study, 90 percent of proposed Canadian hydroelectric facilities may expose local

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Indigenous communities to unacceptable levels of methylmercury.

Greenhouse gas emissions:

•Electricity produced from large dams can emit greenhouse gases on par with fossil fuels according to recent science. With less than twelve years to significantly reduce greenhouse gas emissions in order to have hope of a livable future, there is no time to invest in false climate solutions such as hydropower.

•Canadian megadams are in an area where the amount of power produced per acre of flooded land is among the lowest in the world.

•A recent study published in BioScience shows that hydroelectric dams worldwide release a billion tons of greenhouse gases per year due to the flooding of forests, peatlands, rivers, and other ecosystems. The creation of reservoirs for power generation also wipes out important sources of carbon sequestration such as boreal forests.

Biodiversity:

•Megadams have destroyed hundreds of thousands of acres of boreal forests, wetlands, and peatlands and diverted and dammed hundreds of rivers and streams, negatively impacting the flow, function, and ecology of rivers and forests.

•According to the Food and Agriculture Organization of the United Nations, biodiversity in freshwater ecosystems is being lost more quickly than in any other ecosystem with an 88% decline in freshwater megafauna between 1970 and 2012.

•The damming of rivers and altering of their flows have dire effects on the organisms dependent on these ecosystems by blocking nutrients, destroying critical habitat, disrupting the food chain and causing higher amounts of stress in plants and animals, which can lead to illness, genetic mutation and/or death.

No transparency or accountability:

•The Canadian hydropower industry is a government-owned monopoly with the exclusive right to exploit rivers for profit across the country.

•Companies such as Hydro-Quebec have not had to disclose their greenhouse gas accounting models or other information concerning emissions and large dams that the public has every right to see.

New megadams are underway and more are planned to satisfy export markets in the United States:

•In Quebec, Hydro-Quebec is building the massive Romaine dam complex. This project consists of four separate megadams producing 1,550 MW.

•In Labrador, Nalcor Energy finished flooding the Muskrat Falls reservoir in Summer, 2019 and is finalizing plans to build the 2,250 MW Gull Island dam. The Gull Island Dam will be almost three times the size of Muskrat Falls. This project further fragments the river increases methylmercury contamination and threatens Indigenous ways of life.

Stop transmission corridors for American importation of dirty Canadian hydro:

•In Massachusetts, Governor Charlie Baker has signed a Power Purchase Agreement with Hydro-Quebec to provide the state with this so-called "clean energy." •In New York City Mayor Bill de Blasio, is also considering signing a similar agreement.

•In Maine, Governor Janet Mills is supporting the New England Clean Energy Connect (NECEC) which will bring electricity produced by megadams in Canada to Massachusetts through Maine. This 145-mile transmission line will slice through Maine's forests, wetlands, streams, rivers, and ponds threatening vital wildlife habitat and carbon sequestering ecosystems, as well as tourism and recreation interests.

•According to a recent poll, over 65% of Mainers oppose this project and signatures are currently being collected for a referendum on this ill-advised project in the fall of 2020.

•NECEC will not provide significant economic benefits to Maine. Instead, this corridor will jeopardize the creation of real clean energy jobs in Maine.

•This transmission line threatens Maine's thriving outdoor recreation industry and will also threaten local, long-term renewable energy jobs.

About us:

The North American Megadam Resistance Alliance is an alliance focused on protecting rivers and their communities by resisting megadams and their transmission corridors.



To: Governor Janet Mills (Maine), Governor Charlie Baker (Massachusetts), Governor Phil Scott (Vermont), Governor Andrew Cuomo (New York), Mayor Bill de Blasio (New York City) From: Meg Sheehan

As the climate emergency escalates, governments are seeking ways to reduce greenhouse gas emissions and "go green." The hydropower industry is seeking to profit from the climate emergency by falsely marketing its power as "clean, green, sustainable and renewable." Canadian hydropower is dirty energy and should not be allowed to qualify for subsidies or be considered "clean energy." It is a human rights, climate, and environmental disaster.

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OPINION

Letter: Canadian hydroelectricity not clean

to the editor

Updated: July 20, 2021 5:18 p.m.





https://www.timesunion.com/opinion/article/Letter-Canadian-hydroelectricity-exports-into-16301488.php



FILE. Letter writer says, 'Contrary to recent news articles, Canadian hydroelectricity exports into New York state are not clean.' (Paul Buckowski/Times Union)

Paul Buckowski/Albany Times Union

Contrary to recent news articles, Canadian hydroelectricity exports into New York state are not clean. Hydroelectricity can be generated in several ways, some of which are extremely destructive.

During the past 50 years, Hydro-Quebec has blocked many formerly spectacular, free-flowing major rivers with dams and power stations, flooding river valleys and drowning forests. The natural, seasonal river flows to the seas is destroyed, wrecking water quality and severely damaging freshwater and ocean aquatic life. Impounding river water behind many dams probably contributes to the rapid warming of the Arctic region.



ADVERTISEMENT Article continues below this ad Submerged forests can no longer remove carbon from the air. When vegetation rots, carbon and methane are released into the water and air. Neither Hydro-Quebec nor anyone else quantifies greenhouse gas emissions from their so-called reservoirs, some of which are much larger than Albany County. The company's hydroelectricity carbon footprint is undoubtedly huge.

Hydro-Quebec has reached an agreement with the Mohawk Council of Kahnawà:ke to become partners in the Canadian portion of the proposed Champlain Hudson Power Express transmission corridor into New York. Nevertheless, many native nations in Quebec, Labrador and across Canada strongly oppose megadam developm


HYDROELECTRICITY

the most impacted. Hydroelectric systems have displaced at least 40 to 80 been impacted.^{3,4} Hydropower development frequently violates Indigenous million people and an estimated 472 million people living downstream have and gather wild foods. Indigenous and marginalized communities are often survival of people who rely on functioning river systems to hunt, fish, trap Generating electricity by altering river systems disrupts ecology, harms and their reservoirs displace people from their lands and undermine the physical and ecological conditions of river systems.^{1,2} Hydroelectric dams run of the river and pumped storage hydropower all negatively impact the communities and is financially unsound. Megadams, large dams, small dams Functioning rivers are essentia С О Q \square

globally there has been an overall average decline of 76% in monitored from spawning to feeding grounds and back again. In less than 50 years, downstream interferes with ecological functioning and warms the ocean pollution and disrupting drinking water supplies. When water is stored in Hydroelectric dams artificially manipulate seasonal river flow causing water Dams often block or impair fish migration, impacting their ability to move reservoirs behind dams the water temperature rises and when released migratory freshwater fish populations.³

sovereignty and often occurs without the consent of people with ancestral

rights to the lands and waters.



Varoelectric

play an important role in climate crisis. Rivers also sharp increase in greenhouse gas emissions today as we seek to slow the on flooded vegetation.¹⁰ This means new hydropower projects will cause a coal burning through on-going methane releases fueled by microbes feeding system is built, it can contribute to more greenhouse gas emissions than climate change. In the first decade after a new hydropower generating sions are methane, a greenhouse gas 86 times more potent than carbon Seventy-nine percent of the hydropower reservoir greenhouse gas emisgas emissions.⁶ Emissions from individual facilities can exceed fossil fuels.⁷ Hydroelectric dams and their reservoirs are a major source of greenhouse from hydropower reservoirs accounts for more than 4% of all human-caused dioxide in accelerating climate change over a decade or two.^{8,9} Methane

electric projects will expose proposed Canadian hydroexposed to methylmercury relying on wild caught foods Ninety percent of new anc these river systems are who consume foods from the food chain. People the water where it enters the Hydropower dams stimu-Indigenous communities vegetation and soils into late the production of to methylmercury.¹³ releasing mercury from toxin **methylmercury** by bioaccumulative



hydropower is expected to grow by 45 to 70% by 2040.16 New hydropower planned or under construction across the world.¹⁵ Electricity production from is of negligible benefit in transitioning to climate neutrality in the European At least 3,700 new hydroelectricity facilities (greater than 1 megawatt) are

projects, despite developers' claims that the energy is intended for under-96% and time overruns of 44%.¹⁸ served communities. On average, large dams experience cost overruns of the poor. They are often built to meet the demands of mining and industrial Large hydropower projects fall short of truly expanding energy access for Union.17

and voluntary carbon pricing schemes throughout the world.¹⁹ These credits offsets. In fact, hydroelectricity offsets currently make up 26% percent of and as such, are considered a suitable project used for generating carbon finance for large hydropower projects creates the illusion of climate action the hydro projects and those near extraction and combustion sites. Climate neutrality and net-zero emissions, harming both the rivers and people near are often sold on to the fossil fuel industry to boost their claims for carbon all projects registered with the United Nations-backed Clean Development Hydropower projects are categorized as renewable energy around the world to the exclusion of real solutions.²⁰ Mechanism (CDM). In addition, offset credits are sold in national, subnational

43^{nydroelectric}

hydroelectric

unpredictable extreme weather life are facing intensifying and or soon will exceed their design Aging dams, that have exceeded

> downstream affected communities.²¹ of impounded water, flooding the rapid uncontrollable releases structural integrity of dams and events that threaten both the

Rivers and freshwater ecosystems



ana

ship with water respected. We must work towards freeing the rivers and efforts in New Zealand and communities such as the Innu Council of Ekuanis a growing movement to secure legal rights for rivers with successful not build more dams in the name of the manmade climate crisis. There must be protected and our relationinseparable from the people: "I am the river and the river is me."22 its biodiversity and the right to take legal action. In this view, the river is Muteshekau-shipu nine legal rights, including the right to flow, to maintain itshit and Minganie County which adopted similar resolutions granting the

Brazilian Movement of People Affected by Dams:

mab.org.br

Mexican Movement of Dam Affected People in Defense of Rivers:

mapder.lunasexta.org

North American Megadam Resistance Alliance:

northeastmegadamresistance.org





START ORGANIZING:

ACTIONS

PEOPLE DETAILS

TAILS SUPPORT

GO TO A GROUP

Comments on the ISO-NE 2019 Electric Generator Air Emissions Report

Dear ISO New England Environmental Advisory Group:

ISO New England plays a pivotal role in influencing energy policy in our region.

It is imperative that your reports contain accurate and complete data about greenhouse gas emissions from electricity used in New England.

The 2019 Air Emissions Report undercounts the greenhouse gas emissions because it treats imported Canadian hydropower as having zero emissions.

Hydro-Quebec's own reports show the emissions are not zero. Science shows its emissions can be on par with fossil fuels.

We are in a climate crisis. There is no time for shell games with counting carbon emissions to the atmosphere.

We ask you to add a caveat to the 2019 Air Emissions Report to show that the report is undercounting emissions because it is not counting greenhouse gas emissions from Hydro-Quebec electricity used in New England.

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We urge you to take steps to immediately close this carbon accounting loophole by requiring accurate and complete accounting of greenhouse gas emissions from Canadian hydropower imported to New England.

Thank you.

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