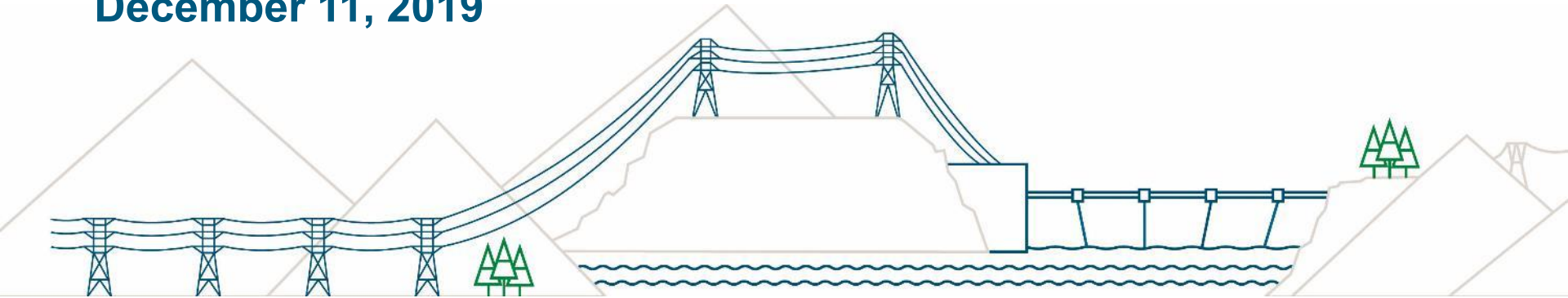
Site C Clean Energy Project

Regional Community Liaison Committee
Project Briefing

December 11, 2019



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2019-2020 Site C Update

Chris Waite

Director, Off Dam Site,
Site C
BC Hydro

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Site C project

Construction phase objectives

- To complete the project safely
- To uphold our environmental and social commitments
- To uphold our commitments to First Nations and our community stakeholders
- To focus on quality
- To complete the project on time
- To complete the project within budget

2019 milestones

Diversion tunnel breakthroughs

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2019 milestones

Diversion tunnel lining underway

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2019 milestones

Roller-compacted concrete placement

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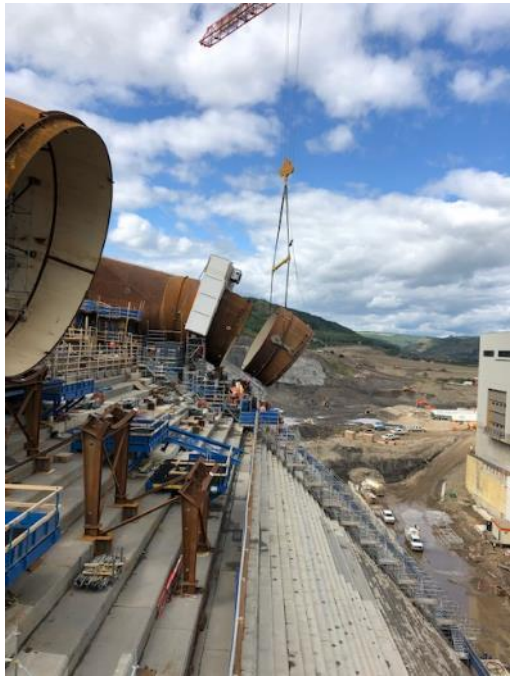
2019 milestones

Penstock delivery and assembly



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2019 milestones

Highway 29 construction

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2019 milestones

Transmission line construction

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2019 milestones

Till conveyor system constructed

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2019 milestones

Affordable housing in Fort St. John

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Peace Agricultural Compensation Fund

First grants awarded December 2019

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Community Open Houses

Hudson's Hope – spring and fall 2019

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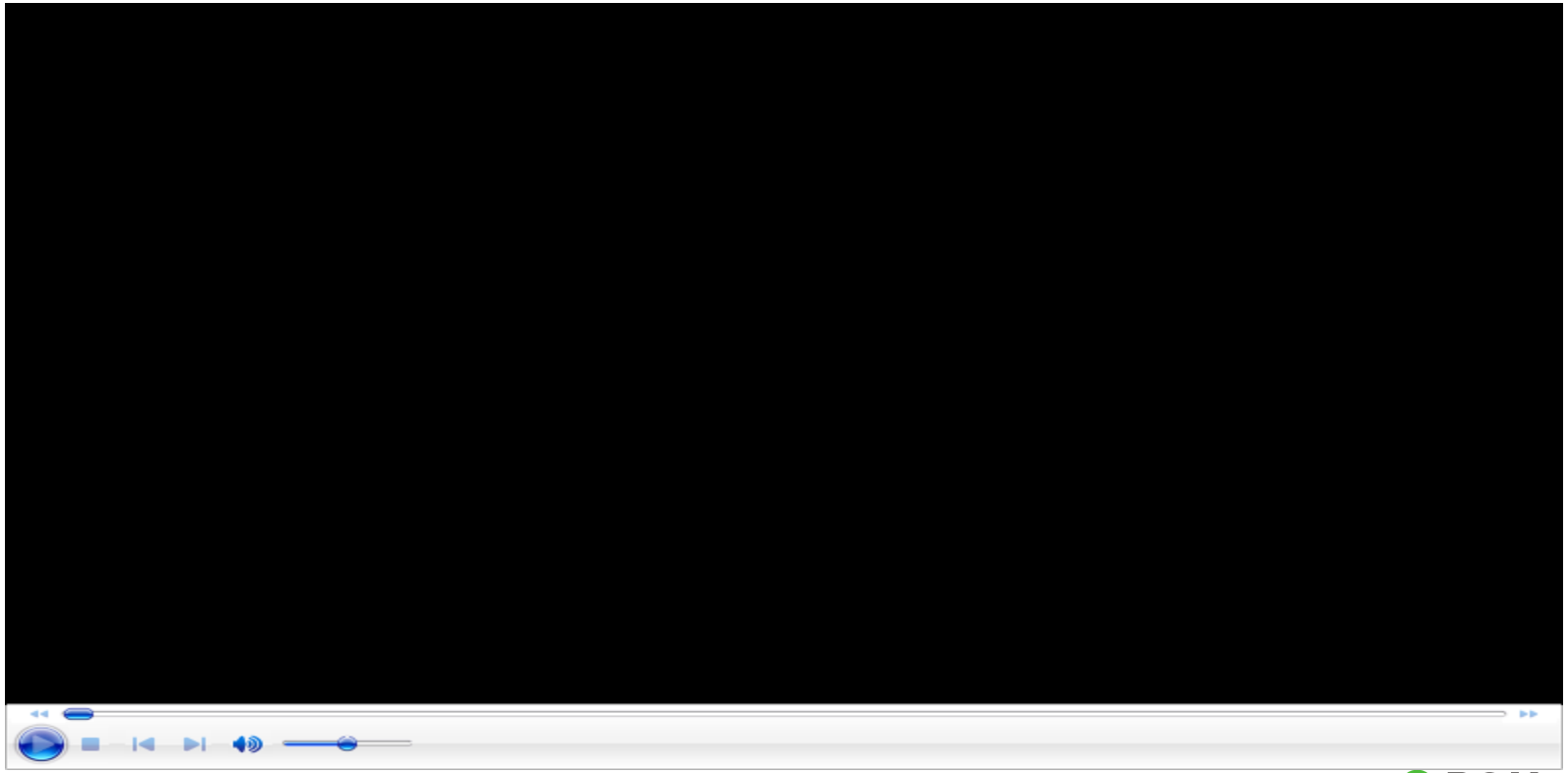
November 2019 Site C drone footage



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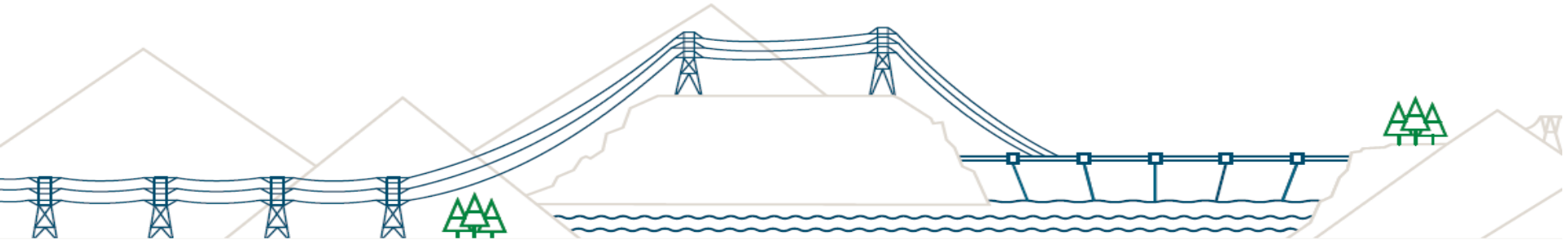
Site C:
Looking ahead to 2020



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2020 focus areas

Focus on 2020 river diversion, substation & transmission line

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2020 focus areas

Focus on advancing work in all project areas

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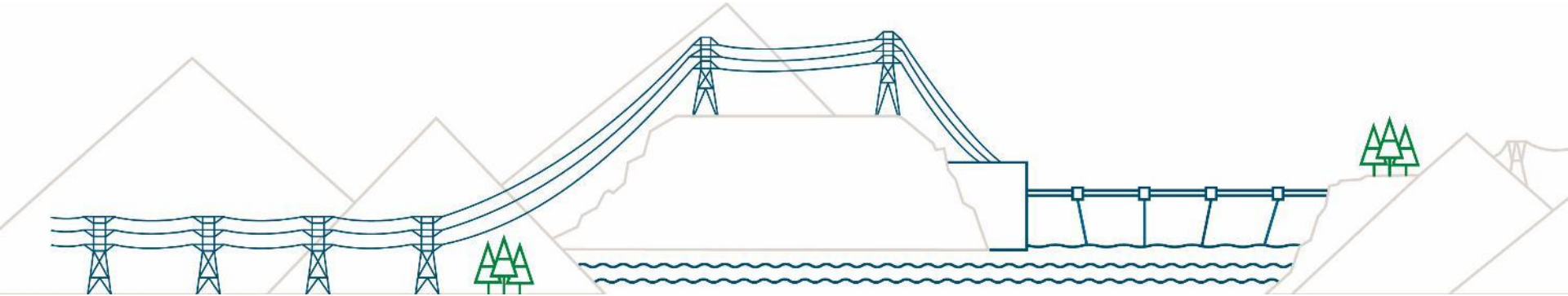
Williston Reservoir - Operations Update

To RCLC



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Agenda

- Opening remarks
- Williston Reservoir Operations
- Peace River basin climate change impacts
- Questions

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Williston Reservoir Operations

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Williston Reservoir - Current Status

- Williston Reservoir is currently (10 Dec) at 2186.7 ft / 666.5 m, about 10 ft above the level on this date last year.
  (Normal range is 2150 to 2205 ft.)
- The Peace River basin is currently in its third consecutive year of below-average inflows (February-September 2019 inflows were 86% of normal).
- However →
- Rainfall in August-September was well above average, and
- Inflows into Williston (and for downstream areas) since September have been above average. Early snowpack readings in the basin are slightly above average.

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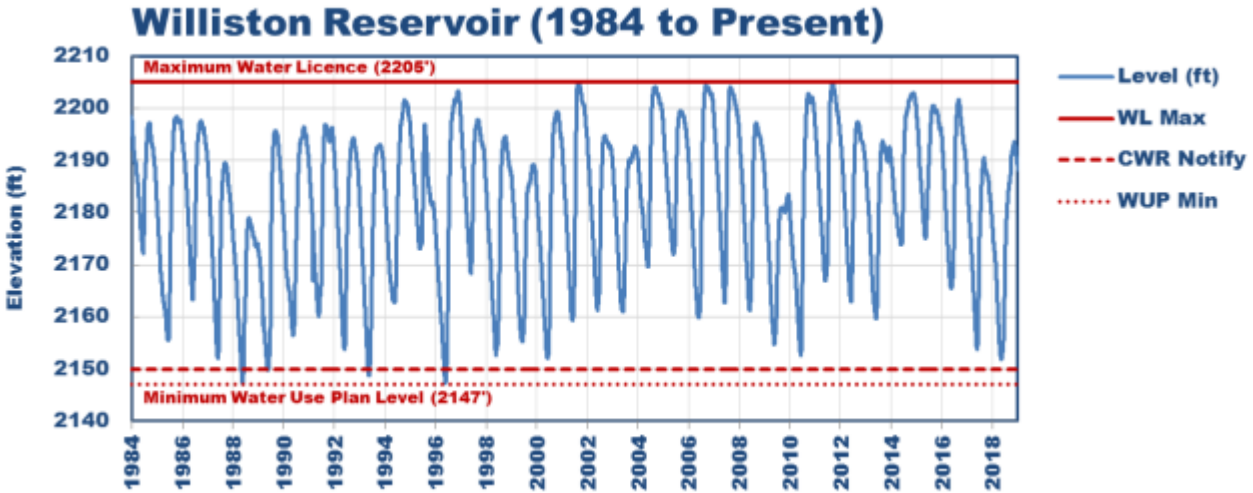
BC Hydro's Energy Backbone



- BC Hydro relies on Williston and Kinbasket reservoirs to meet provincial energy needs.
- Williston, under normal conditions, see drafts and refills >40 feet annually.
- Under unusual inflows or system conditions, reservoir levels that approach the maximum or minimum normal levels are often needed for flood control or low inflow management.

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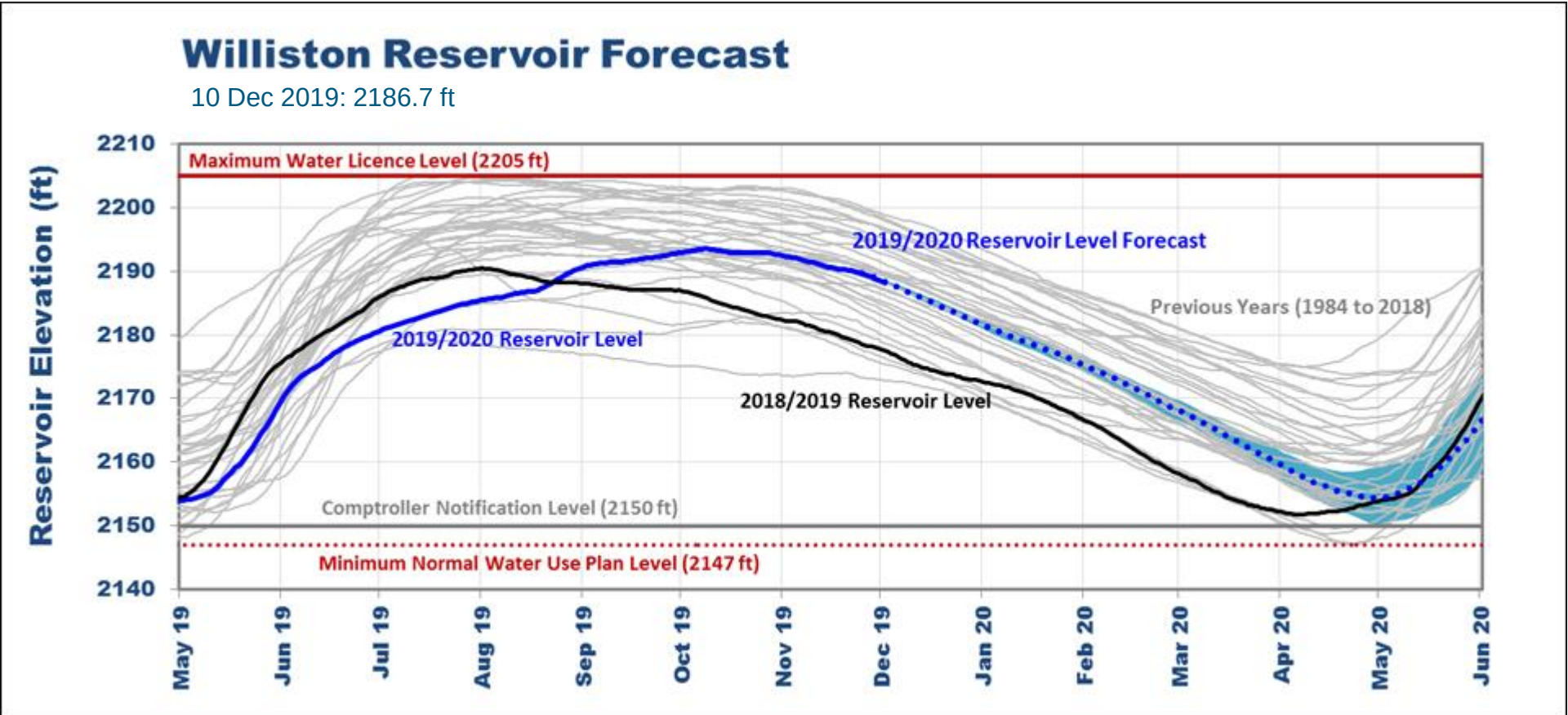
Williston 2019-2020 Actuals & Forecast



Williston Spring 2020 Operations Forecast

- During 2020, the Williston Reservoir is forecast to operate at levels near, or above, those observed during the past year.
- BC Hydro will continue to operate Williston Reservoir to avoid drafting below 2150 feet (655.3 m) under most conditions.
- The likelihood of needing to draft below 2150 feet during Spring 2020 is **much lower than last year.**

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Williston Fall 2020 Operations Forecast

- Preparations have begun for diversion of the Peace River during construction of the Site C earthfill dam, which begins in Fall 2020.
- During 2020, Williston Reservoir will fill no higher than 2200 feet (5 feet below full pool), unless filling above this level is necessary to protect the Site C diversion works.
- During September-October 2020, Peace River discharges will be held very low (near the minimum flow of 283 m3/s) during a critical construction period for the Site C diversion dams.
- After the Site C diversion dams are completed (November 2020), Peace River discharges will return to higher (more normal) winter values.

Williston 2020 Operations Forecast (cont.)

- BC Hydro is planning to manage all of these requirements within existing Peace Water Use Plan (WUP) operation limits.
- BC Hydro will continue to meet regularly with First Nations, local government, and the public to share updates on operations and receive feedback.
- BC Hydro will continue to provide forecast updates on a regular basis or as requested.

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What affects Reservoir Levels?

- **Inflows:**
  - Can be lower, or higher, than forecast
    - Good snowpack data available starting in January, so first good forecast of 2020 inflow volume will be available then
    - inflow forecast uncertainty will reduce over time
  - Can be an early, or delayed, spring freshet
  - Spring/summer rainfall accounts for about 50% of the annual Williston Reservoir inflows
- **Energy Demand:**
  - Residential and industry needs
  - A colder winter will increase energy demand
  - Energy demand is currently within a normal range for time this year
- **BC Hydro system:**
  - Unexpected outages and/or transmission constraints elsewhere in the system

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Summary

- Williston Reservoir levels are forecast to remain above elevation 2150 feet in spring 2020.
- We will maintain a 5 foot buffer below full pool elevation during the summer to help protect the diversion works.
- With so many factors affecting water levels, forecasts may change.
- We are committed to ongoing communication with First Nations, Industry, communities and our regulator. We will provide updates as often as necessary.

Peace River basin – climate change research

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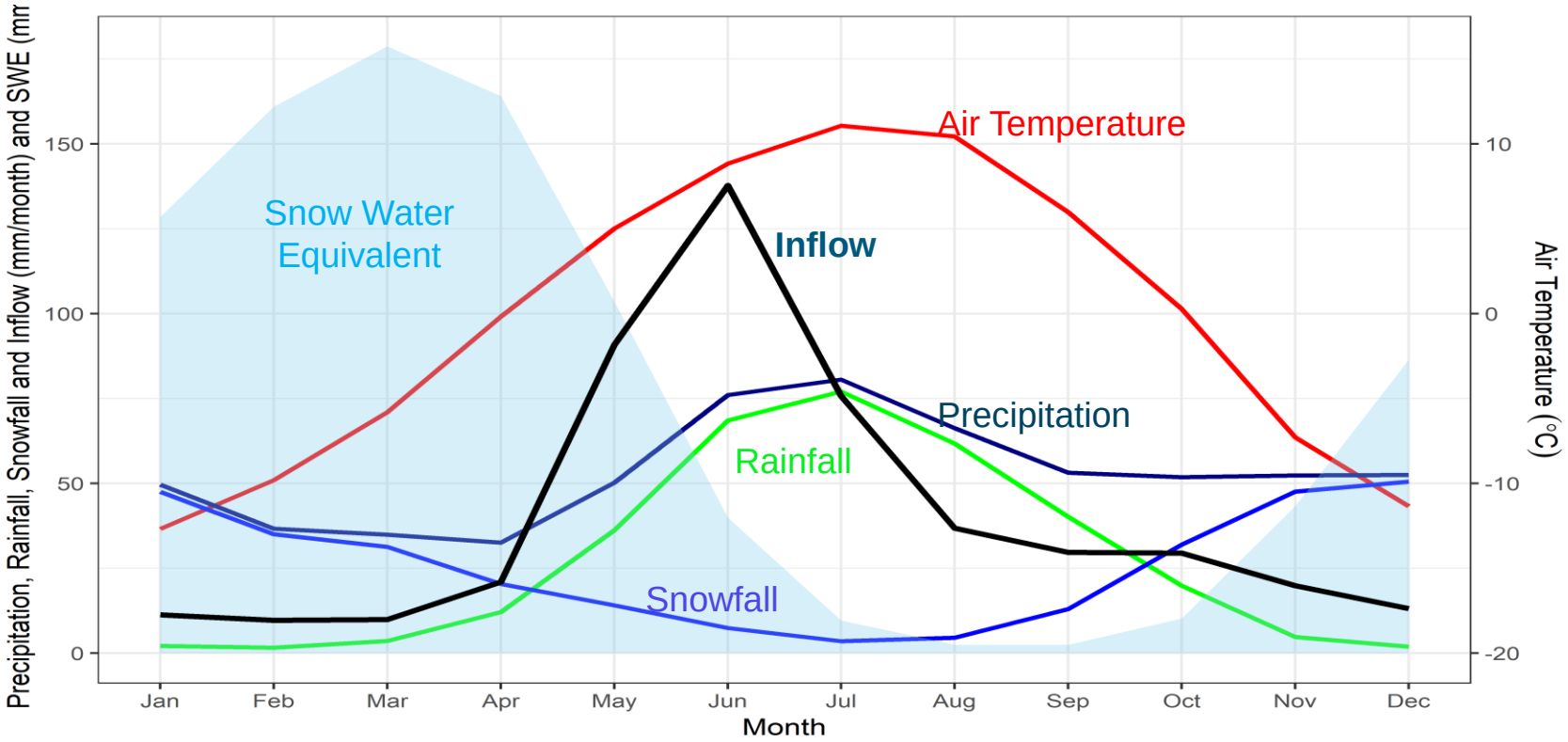
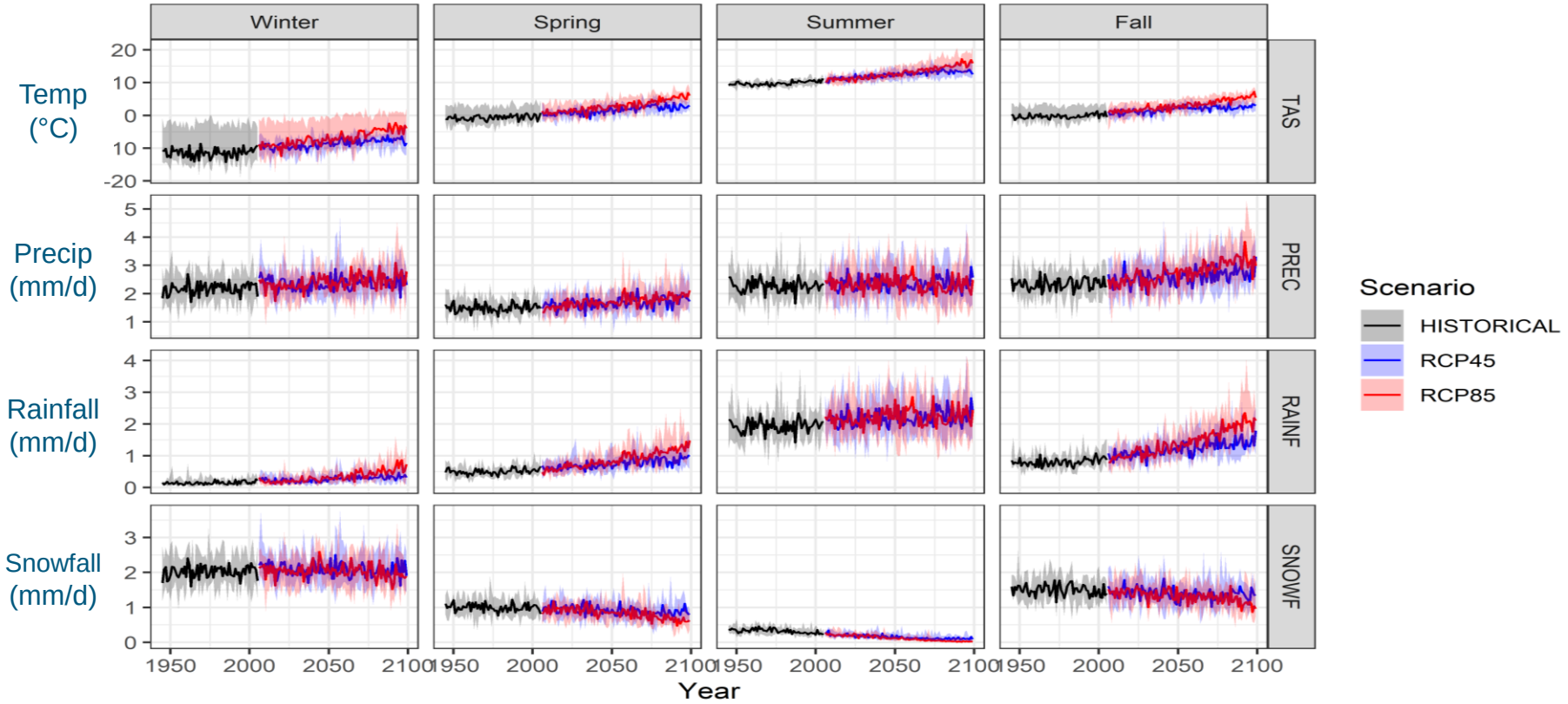
Peace River basin climate

Climate summary for Peace River above Bennett Dam, 1971-2000



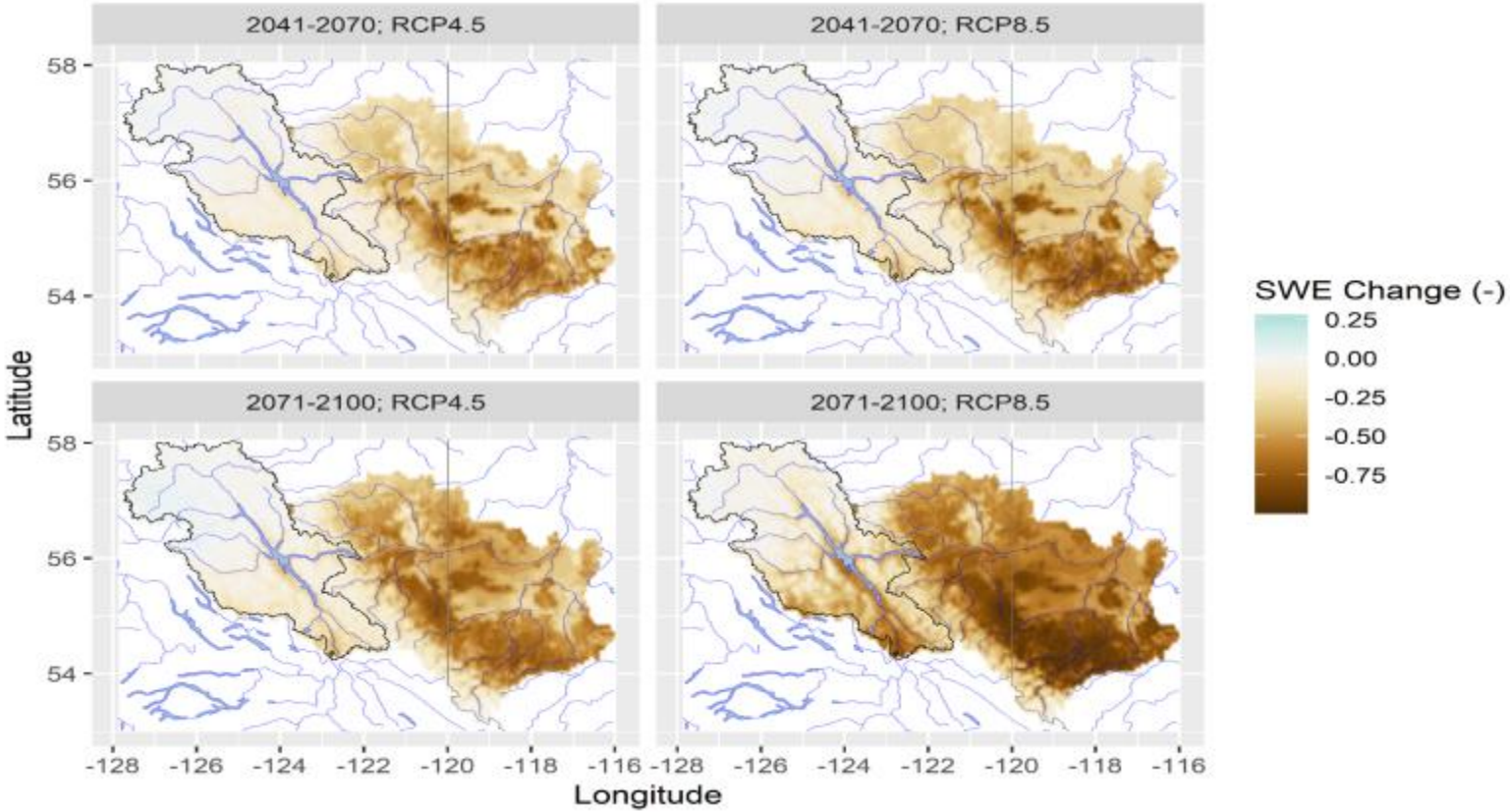
Changing Climate

PCIC study: Projected changes in seasonal climate for Peace R. basin



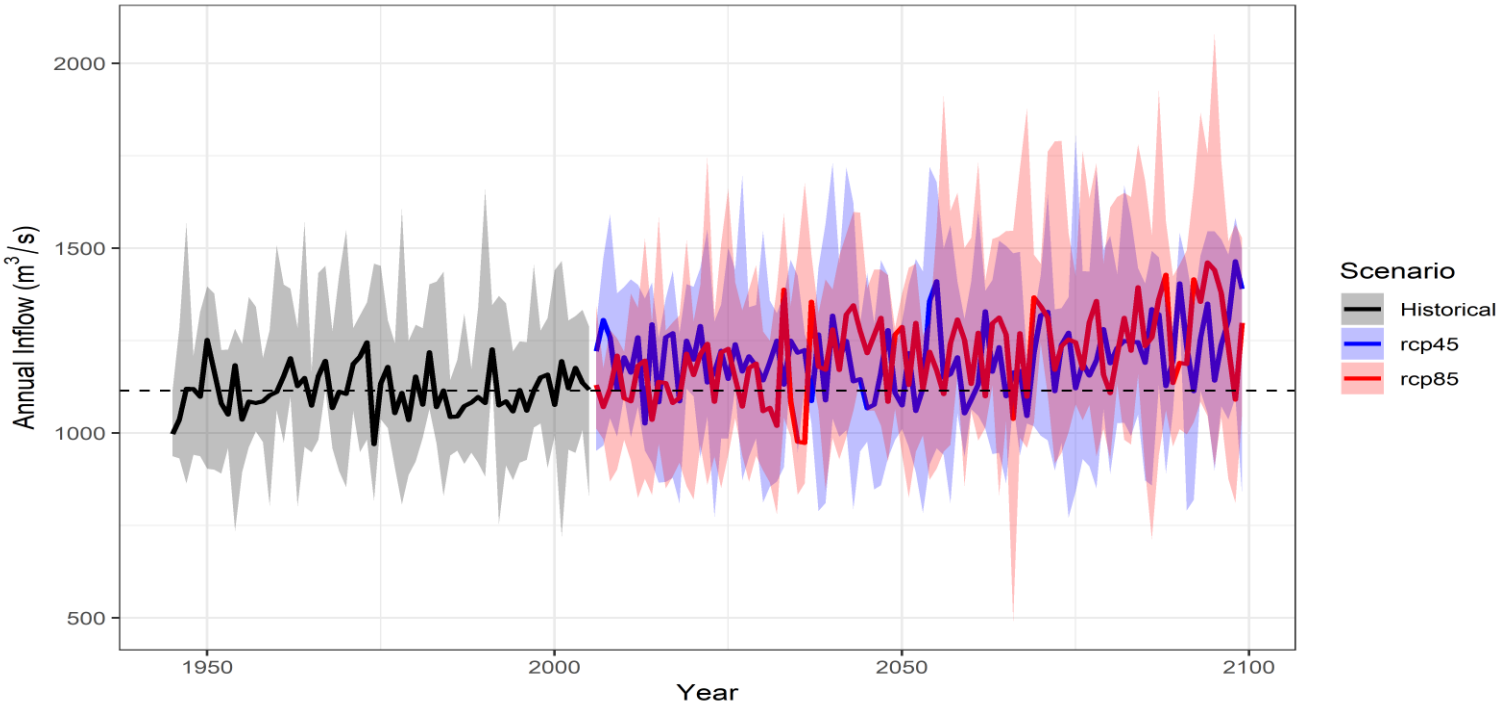
Changing Hydrology

PCIC study: snowfall is projected to gradually reduce



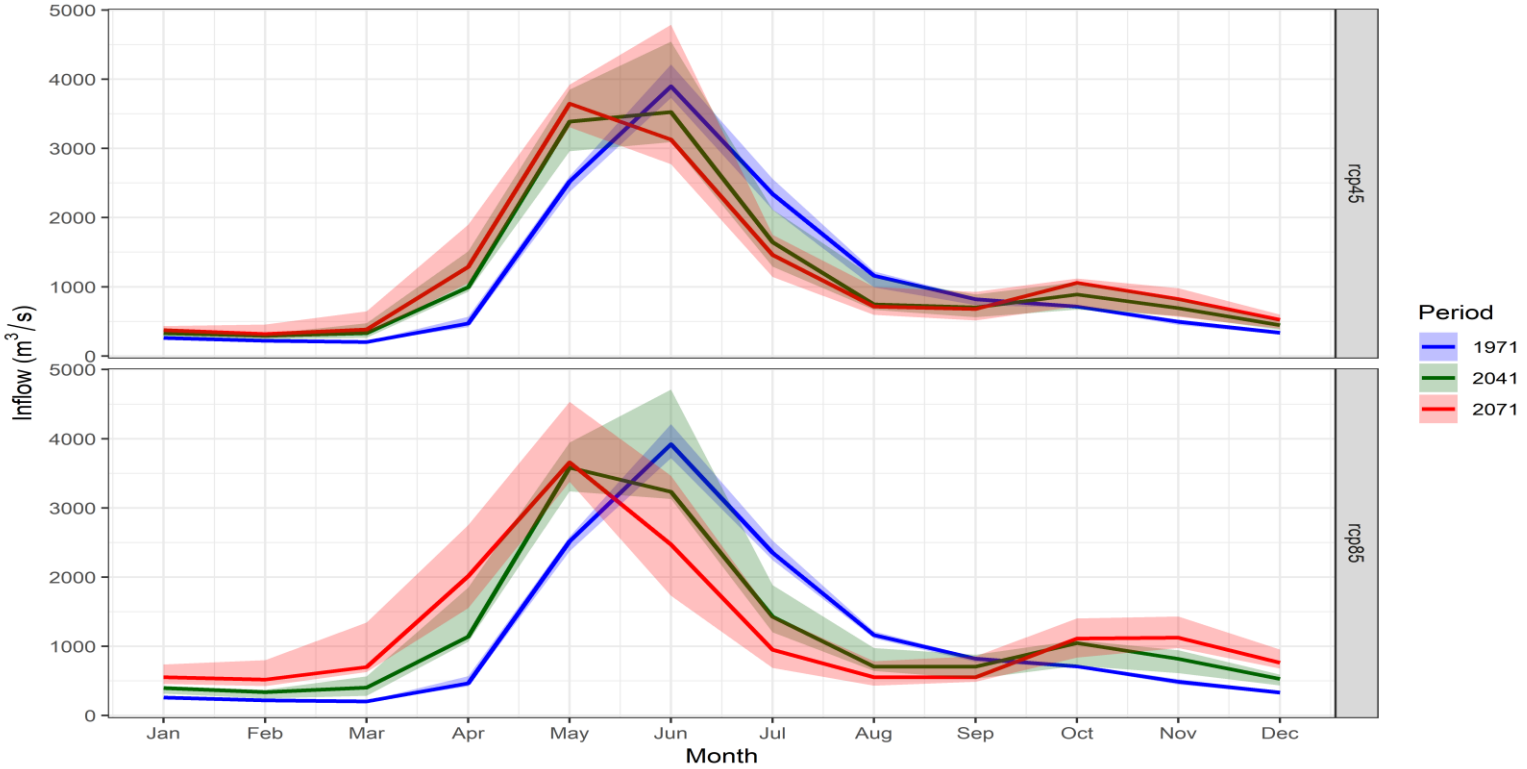
Changing Hydrology

PCIC study: annual reservoir inflows are projected to gradually increase



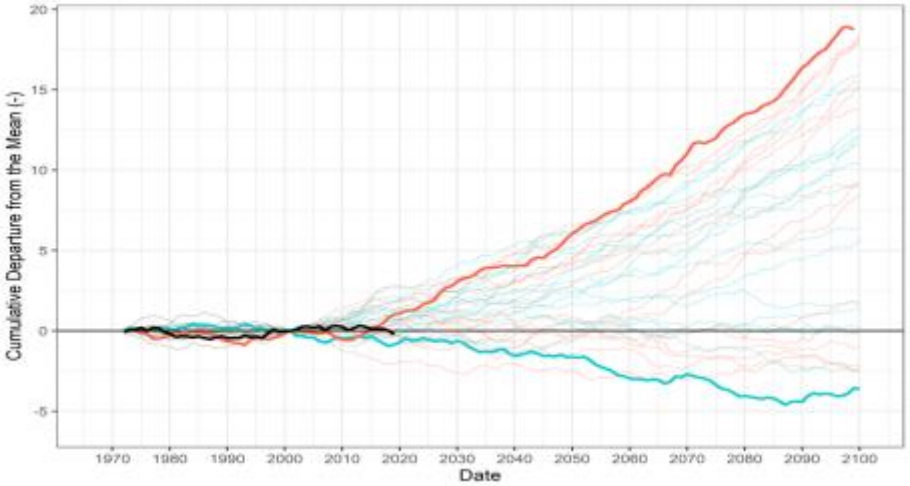
Changing Hydrology

Snowmelt runoff is projected to gradually occur earlier

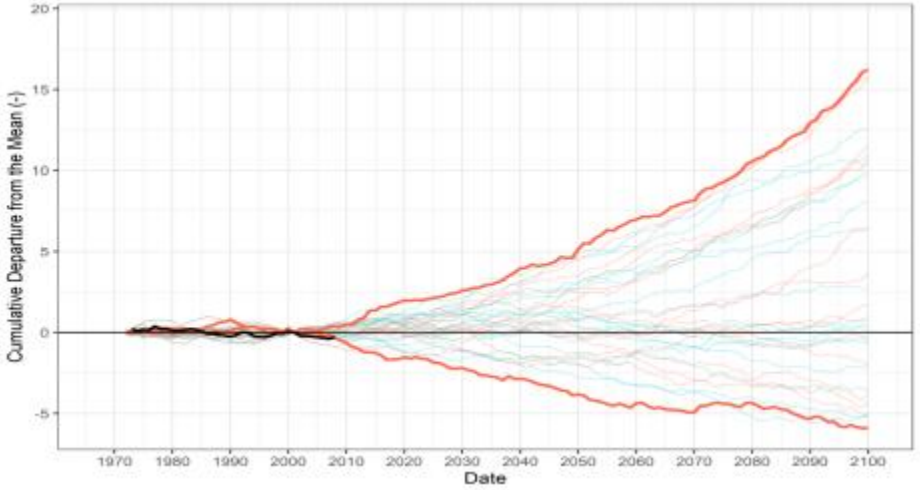


Many possible futures

Planning for a broad range of uncertain projections



Williston (Peace)



Kinbasket (Columbia)

Annual inflow cumulative departure from 1971-2000 average

Source: PCIC

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Conclusions

PCIC climate change study:

- The Peace River basin in BC is projected to gradually get warmer and, likely, wetter
- Wetter includes gradually increasing rainfall and decreasing snowfall
- Decreasing snowpack accumulation is expected, especially in southern part of basin
- Average annual inflow will likely increase gradually, although trajectory is uncertain
- Annual snowmelt freshet will gradually shift earlier
- Likely higher winter inflows and reduced late-summer inflows
- All climate change projections include lots of uncertainty
- Annual variability in weather and inflow will continue to be much larger than the gradual trend due to climate change impacts

Key Messages

Addressing climate change impacts:

- BC Hydro is actively engaged in understanding climate change risks and the gradually increasing impacts on our system.
- We are working collaboratively across the company, and with external partners, to address climate change impacts and implement solutions.
- BC Hydro's reservoir operations will be adjusted as required to meet system needs and respect all constraints (including those developed via the Water Use Plan process)

Questions

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On Dam Site Construction Update

Ross Turner

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On Dam Site Construction Update

- 2019/2020 Winter Schedule
- Left Bank
  - Worker accommodation lodge expansion spring 2020
  - L3 sediment basin
  - 85th Avenue Industrial Lands & till conveyor
  - Diversion tunnels
  - Core trench & earthfill dam
  - Temporary fish passage
- Right Bank
  - Powerhouse concrete placement
  - Spillway RCC placement
  - Penstock installation
  - Fish habitat enhancement

On Dam Site Summary Schedule: 2019/2020

Construction Activity	Anticipated Schedule
Diversion Tunnels	Q3 2018 to Q4 2019
Assemble Till Conveyor	Q4 2018 to Q2 2019
Left Bank Dam Grout & Fill	Q3 2019 to Q3 2020
Crusher & Aggregate Production	Q1 2017 to Q3 2021
Spillway RCC	Q2 2019 to Q4 2019
Powerhouse Concrete	Q3 2018 to Q4 2020
Penstock	Q2 2019 to Q1 2021
Infrastructure Upgrades	Ongoing
*All major construction activities	*To be completed by Q4 2024

Left Bank

Left Bank: Worker Accommodation Lodge
Expansion

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Left Bank: L3 Sediment Basin Upgrade

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Left Bank: 85th Avenue Industrial Lands & Till Conveyor

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Left Bank: 85th Avenue Industrial Lands & Till Conveyor

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Left Bank: Inlet Portals

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Left Bank: Diversion Tunnels

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Left Bank: Outlet Portals

Diversion Outlet Portal Structure

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Left Bank: Core Trench & Earthfill Dam

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Temporary Fishway

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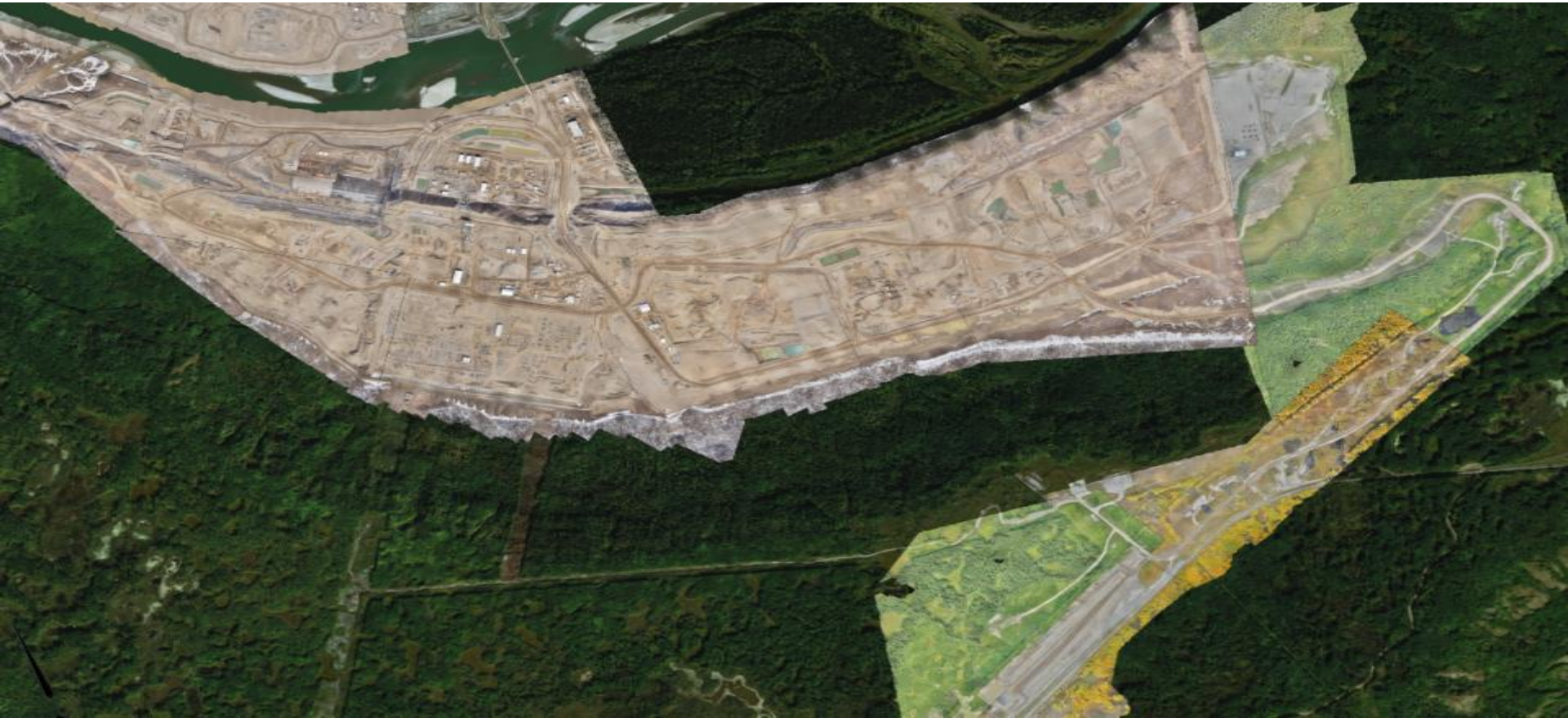
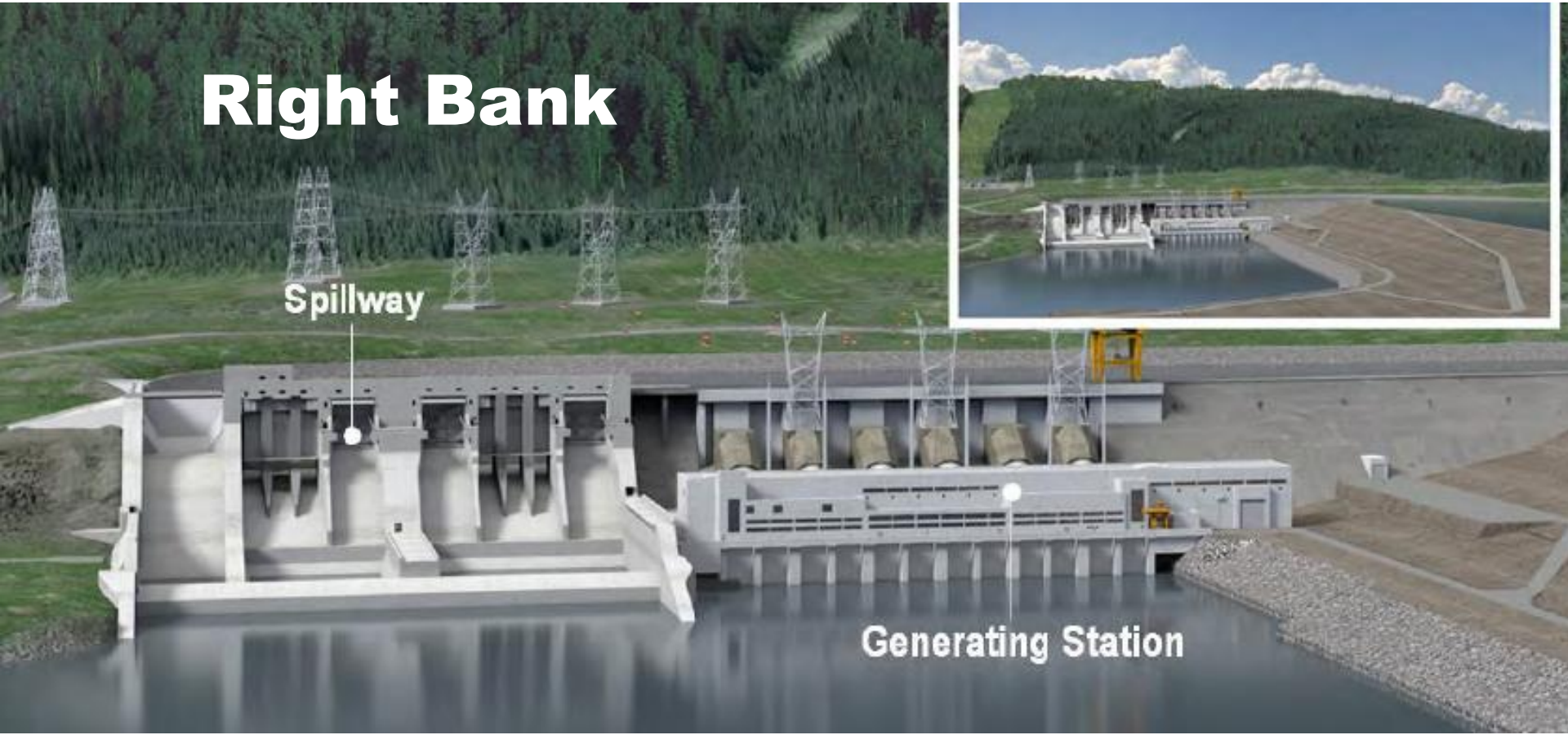
Right Bank





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Powerhouse, Intakes and Service Bay

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Right Bank: Spillway

RCC Placement Complete – winter cladding in place

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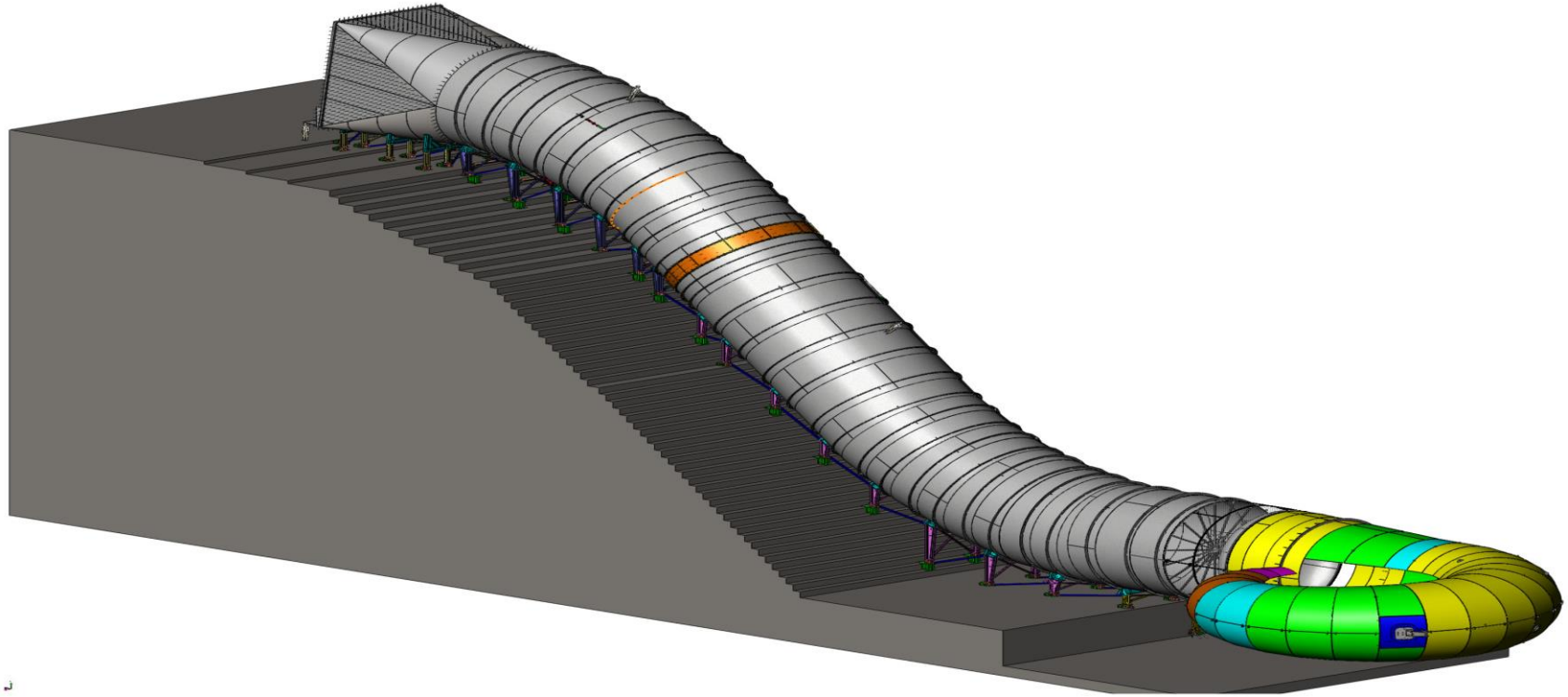
Right Bank

Penstock Installations



Right Bank: Penstock Installation

Units 1, 2 and 3 underway

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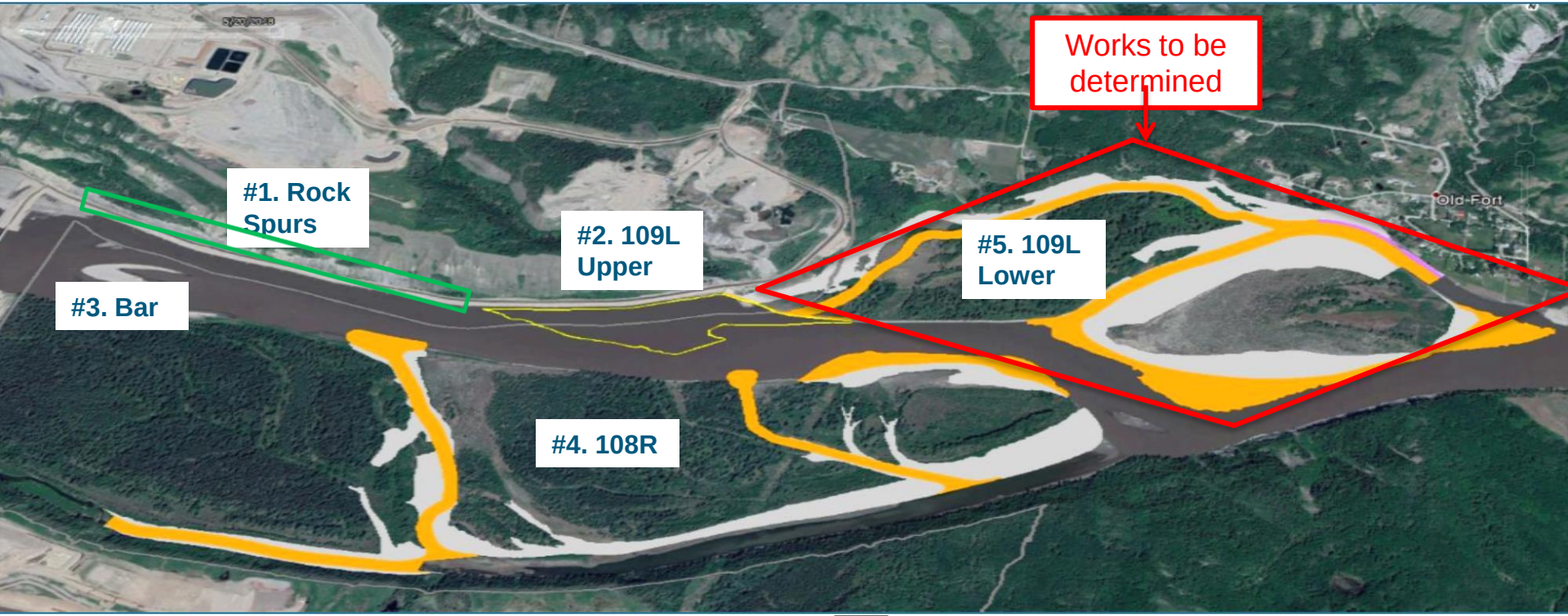
Fish Habitat Enhancement

Downstream offsets



Fish Habitat Enhancement

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Fish Passage During River Diversion
Site C Clean Energy Project

Brent Mossop

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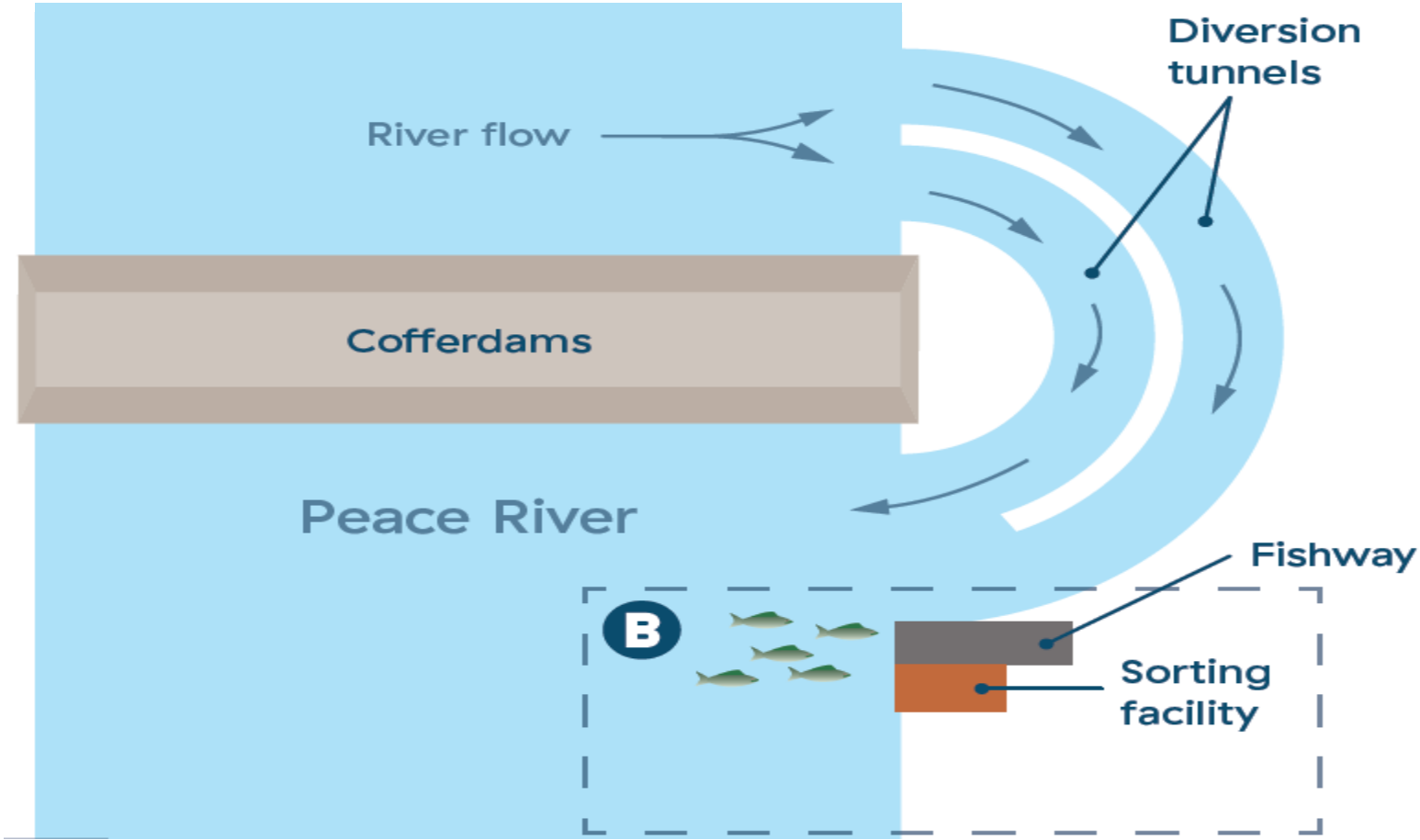
Debunk a myth

Project will block upstream fish movements

Upper Halfway River
Turnoff Creek
Fiddes Creek
Cypress Creek
Chowade River
Many Islands
Site C
Fort St. John
Taylor
Hudson's Hope
Dawson Creek

Location, location, location



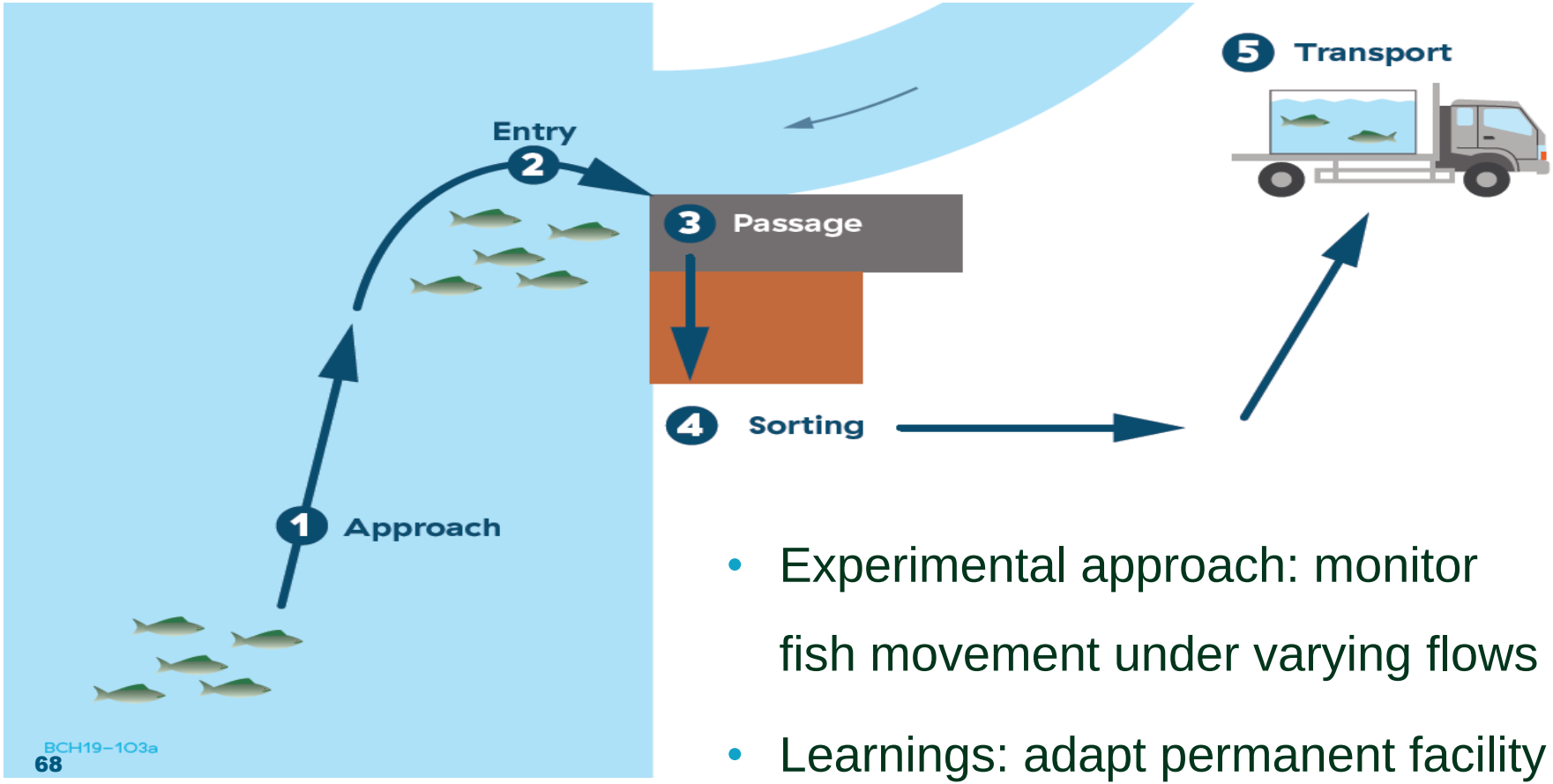
Not reinventing the wheel

Construction is advancing

Operating the facility

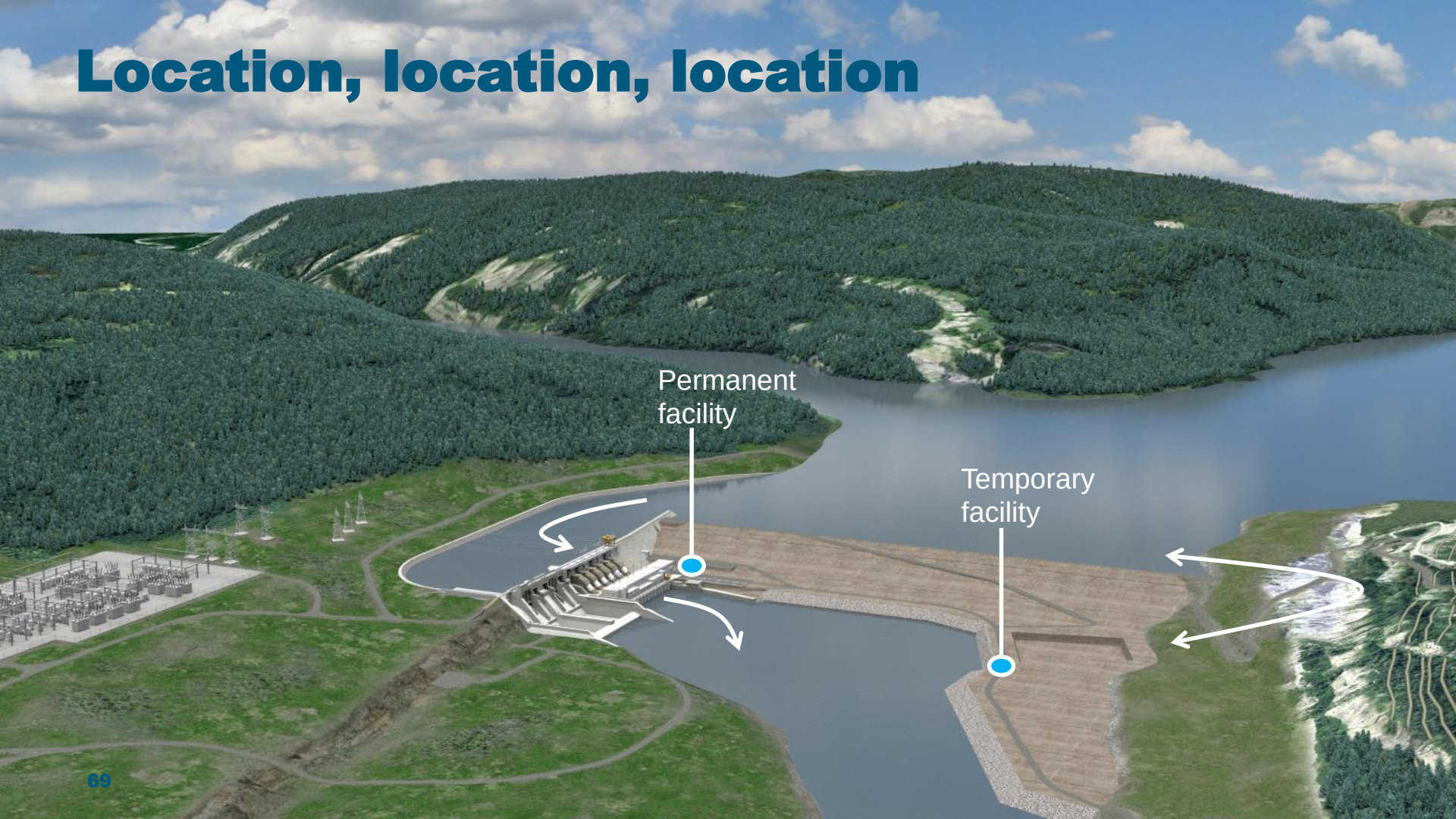
Cougar Dam Trap
and Haul Facility, OR

Monitoring fish passage



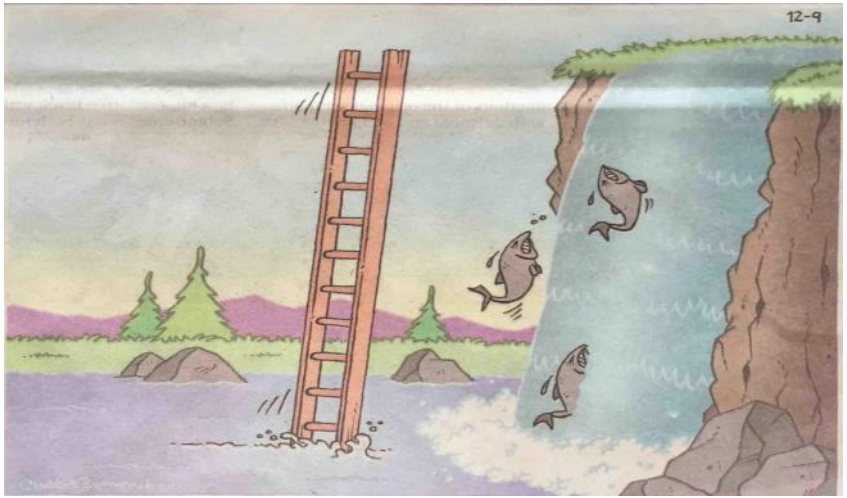
- Experimental approach: monitor fish movement under varying flows
- Learnings: adapt permanent facility

Location, location, location



Take away messages

- Providing for passage during river diversion
- Trap and haul is a proven approach to passing fish around barriers
- Entrance location is key
- Monitor to learn ways to maximize passage, adapt for permanent facility



Off Dam Site Construction Update

Chris Waite

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Off Dam Site Construction Update

- Transmission Work
- Highway 29 realignment/Hudson’s Hope berm
- Reservoir clearing work

Transmission work: Site C substation

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Transmission work: Transmission lines

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Peace Canyon gas insulated switchgear building expansion – complete

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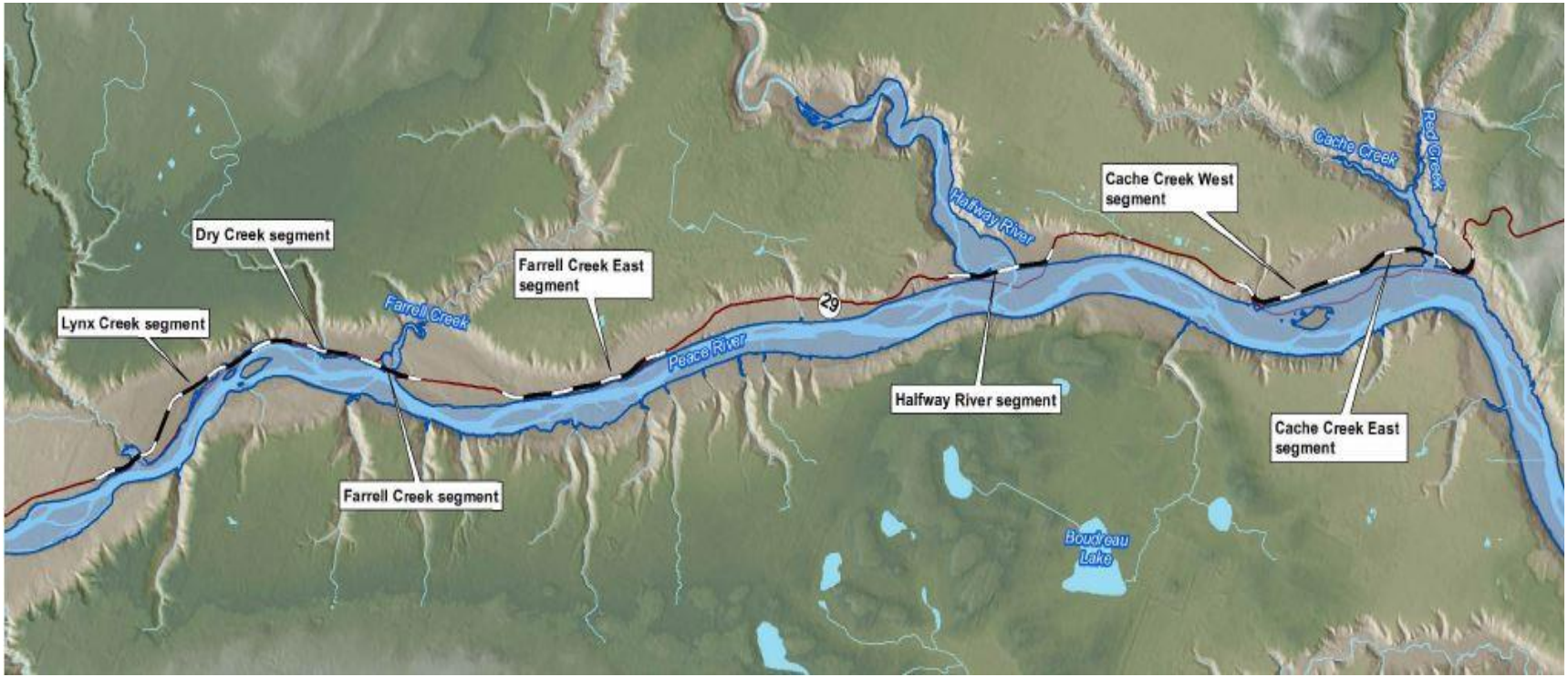
Highway 29 realignment locations



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Highway 29 realignment: Cache Creek West

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Highway 29 realignment

Halfway River site preparation
September 21, 2019

Cache Creek East
November 15, 2019

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Portage Mountain Quarry

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Hudson's Hope shoreline protection

Location	Type of shoreline protection				
Zone A: Below the residential area and extends just downstream of the hotel on Clarke Ave	1,650 metre berm	**Zone B:** Below the light industrial land	550 metre slope flattening and armoring of the shoreline	**Zone C:** Below the municipal sewage treatment lagoons	450 metre berm

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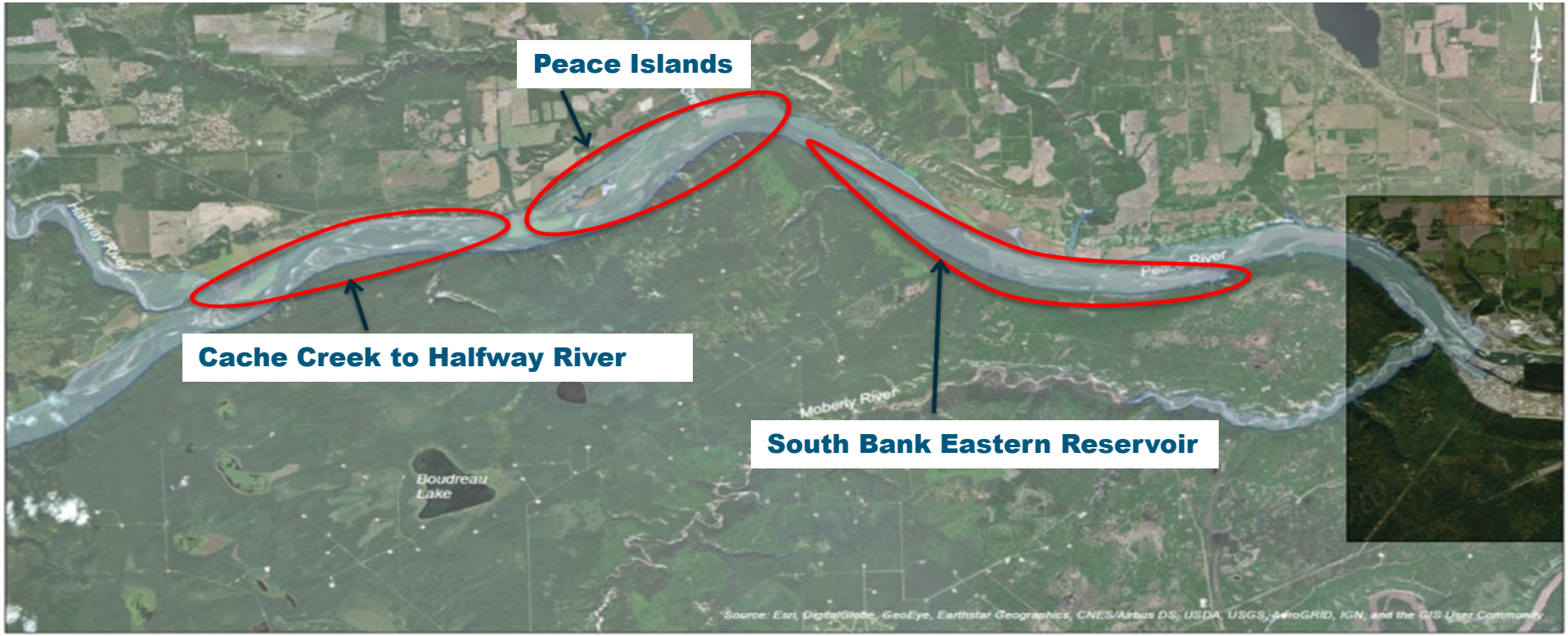
Reservoir clearing: Work plan for 2019 / winter 2020



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Reservoir clearing work

Current work:

- South Bank Eastern Reservoir
- Peace Islands
- Cache Creek to Peace Islands

Peace Island clearing work

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Jobs and business opportunities

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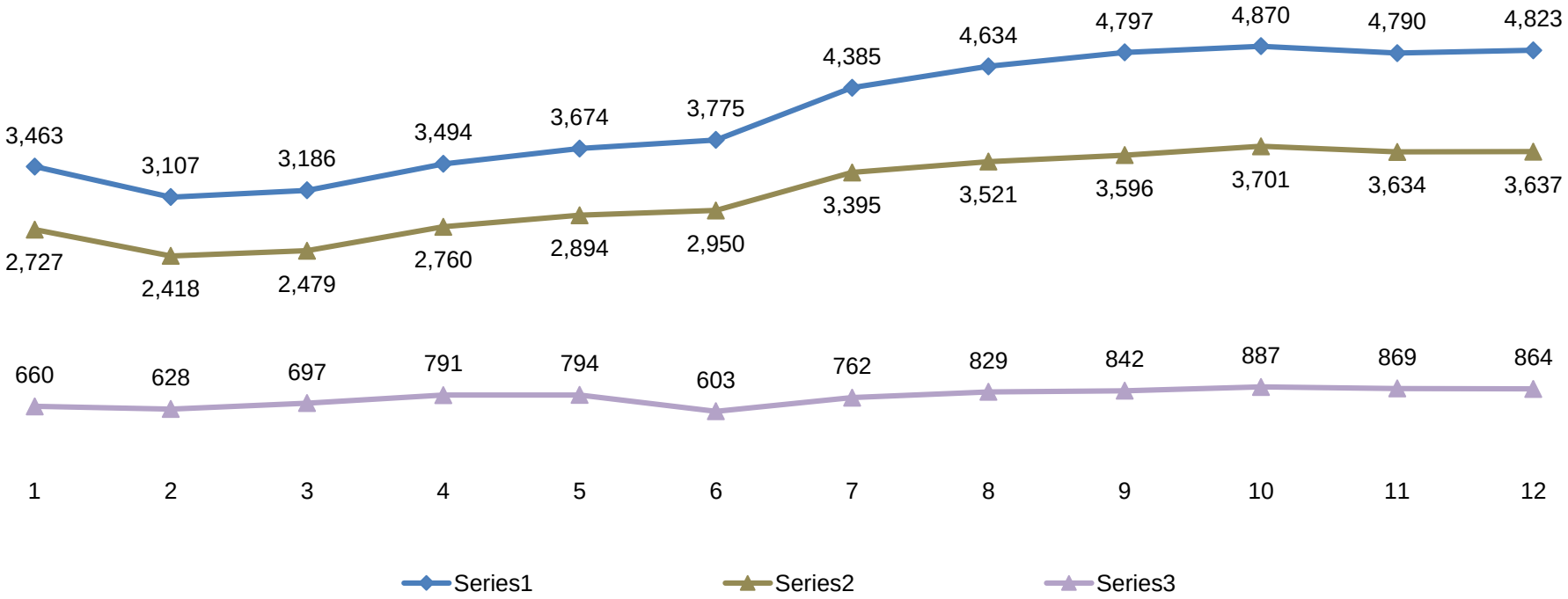
Employment statistics

- Site C jobs posted to WorkBC / Employment Connections (Fort St. John) website; all contractors listed on Site C website.
- BC Hydro requires all major contractors to report employment information.
- Total of **4,823 workers** in October 2019; **3,637** from B.C (75%). Total of **864** workers from PRRD (21%).

Site C Employment Statistics – October 2019			
	# of Total Workers	# of BC Primary Residents	% of BC Workers
Construction and Environmental Contractors	4,092	2,954	72%
Engineers and Project Team	731	683	93%
Total Workforce	**4,823**	**3,637**	**75%**

Site C jobs snapshot (October 2019)



2019 Q3 Regional Business Participation

Companies engaged by BC Hydro and Site C contractors to provide goods & services in relation to Site C construction between July–September 2019

Community	Number of Businesses	Community	Number of Businesses
Cecil Lake	1	Montney	1
Charlie Lake	25	Pouce Coupe	3
Chetwynd	49	Prince George	48
Dawson Creek	36	Rose Prairie	1
Fort Nelson	1	Taylor	9
Fort St. John	469	Tumbler Ridge	4
Hudson's Hope	12	Wonowon	1
Total		**660**	

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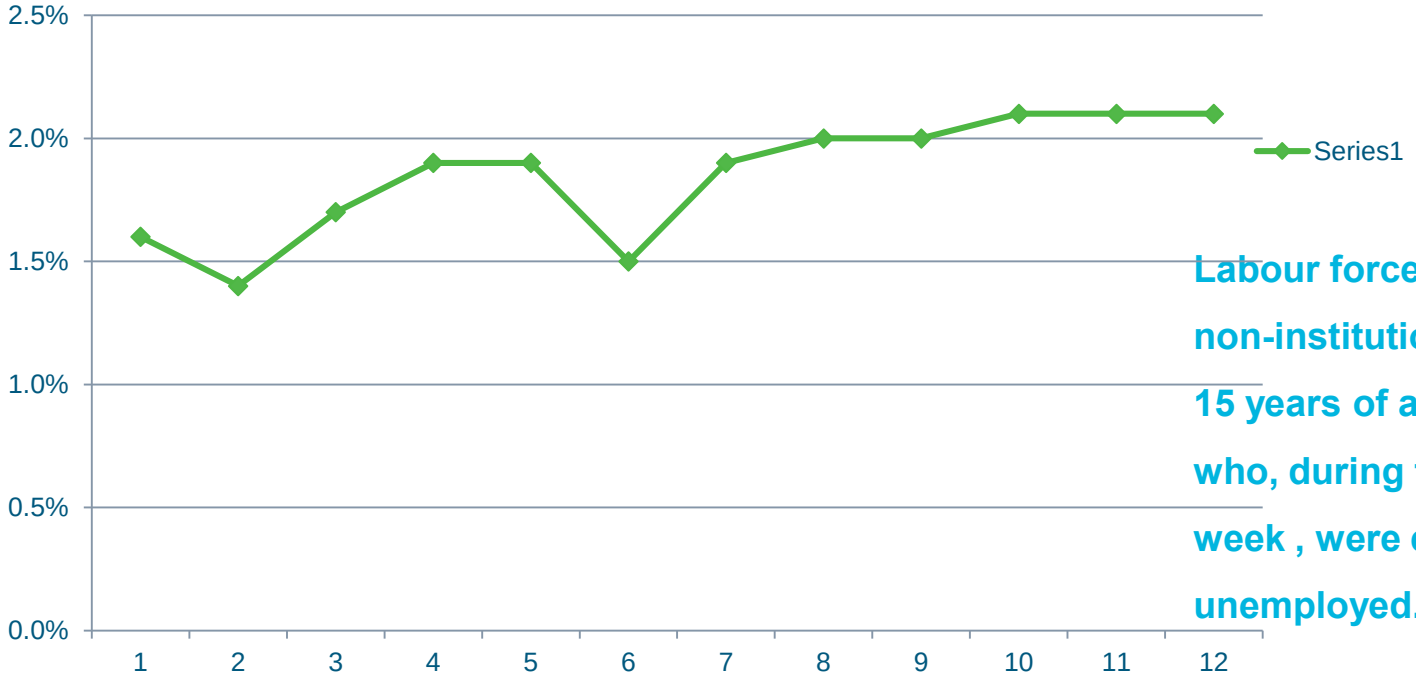
Northeast labour force comparison 2019



Labour force: # of civilian, non-institutionalized persons 15 years of age and over who, during the reference week , were employed or unemployed.

*Monthly Northeast labour force stats are from Statistics Canada.

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Questions

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