

Presentation Prep w/ SJR

Date Jan 29, 2016

- Governance change (15 min)
- Risk - Nancy Olewiler Prof @ SFU course on public policy
- Risk Tues afternoon, Program Wed morning
- John Hart slides from Tom Watson
Ruskin slides from Boyd Mason
- Fracking - any development from regulator? (15 min)
- Kofi full day meeting on Fracking - what can & cannot say
- New dam safety regulation (1 hr)
- Clowhom consequence Flip-Flop
- Wrap-up of WAC Bennett EEP-report out (15 min) when to be finalized?
- Duncan core raising
- La Joie reservoir draw down - present on consultation process for TRZ?
- Upcoming DI's
- Report out on DI's?

Risk - key feature: don't want numerical criteria

- report out on progress w/ Ben Ale & Nancy Olewiler

Feb 1, 2016

Seismic Risk reduction plan for Jordan

- CRD land
 - future prohibition development
 - \$150k for siren
 - property purchase
- } by tomorrow end of day

Campbell & Bridge as well

↳ LAJ @ 734.2

Mtg w/ SJR, FK, FMS, PH, ESM

Date 2 May 2016

- to C/O
- Kofi working to pull together near-field fracking info
 - SFL still doesn't have reliable back-up power
 - need a corporate view on dam safety need for station service
 - spend a lot of money to condition williston for rip rap
- SJR
- major budget cuts to italk but not to dam safety
 - DS GIS project released \$450k 4 IT capital projects
 - Reservoir slope enhancement ~~\$150k~~ \$160k
 - VBG tools \$70k
 - Plotting & annotation ~~\$160k~~ \$142
 - can we spend it this year & what's needed next year
 - Advisory Board report out site C
 - want technical side represented at a higher level when balancing against scope/schedule/cost
 - board wants to see how new instrumentation will integrate
 - will need presentation in the fall (Nov) Hugh, Wally, Tyson
- PH
- Bugaboo soo this week
- FMS
- Working with James C in his new role
 - Tech position with HR
- FK
- James to join leadership meetings
- ESM
- Call w/ Dave Scott today to discuss em. planning report
 - Instrumentation project write-up to me
 - Spring inspections
 - IDSRMPs to finalize
- SJR
- Scorecard this week
- FMS
- Mtg w/ Tara & helicopters
 - want monthly report
 - standing order to get helicopter directly from company

DR Mtg cont.

Date 6 Sept 2016

- downtown for next two days for board mtgs
- KOA • draft EER report rec'd
- need agenda for oil gas commission mtg
- FMS • surv mtg next week at GMS
- 12 applicants for Wally's position
- PH • BRI soo
- ESM • IDSRMP clean-up this week
- JHT plan rec'd for tunneling under block 2
- database review mtgs w/ Chris

Mtg w/ SJR, PH, FMS, JB, JC, PT

12 Sept 2016

- to CO • Comox - Puntledge back up to speed \Rightarrow Feasibility
 - \hookrightarrow simulator tool w/ PI/OI input for training
 - \hookrightarrow Peter looking at top down view (paper to be sent out)
- new ds regulation
- Fracking discussion w/ Glen \Rightarrow has to sit in on mtgs w/ oil gas
- used iphone app for Oliver eq.
- Frank delegate while on AV starting Thurs night
- from CO • 5700 internal, 6000 external end of FIS
 - \hookrightarrow 1100 engineering
- latest sole source $> \$100k$ person or $> \$25k$ material \Rightarrow VP
- verbal: notice on BC Bid for future DS consultants
- different rules for First Nations
- budget answers needed tomorrow morning
- PH • SFL FAP meeting this week \Rightarrow SJR
- LDR spillway mtg
- PT • Pushing on ~~repair~~ HEV minimum flow over winter - heaters not fixed
- SCA INOG - haven't figured out full flow closure yet
- FMS • GMS Surveillance Mtg this week, Site C on Friday
- Wally's posting closed
- GMS - flushing all hydraulic piezos - first time in 12 years
- JC • Prep for tomorrow

DS Mtg w/ SJR, SN, ESM, JC, PT, FMS, KOA, ZS

Date 2017 Dec 12

SJR • First 1 on 1 w/ Maureen on Friday

MTD • Need to come up w/ formal training for Plant Managers on DS
FMS - needs to come top down in operations

SJR • Too early to meet w/ Regulator on John Hart tunnel
- Purpose is for CWR to buy into IDSRMP for tunnel filling plus Plan B

⇒ add onto CWR meeting in January

- Eric to talk to Rob directly to make aware

• Oil & Gas mtg w/ed to discuss disposal near Peace Canyon

ESM • John Hart DI is planning a drilling program at the same time as tunneling watering up - not good to do at same time

• Pile of full inspections to review

• Expecting to have lots of discussion w/ SNC on IDSRMP

• Jan Cui starts Jan 8 on VI

JC • Confined space deliverables - sustainment checklist

PT • Gate testing commentary

• User requirements on gate projects

FMS • 4 days w/ GMS future instrumentation last week was excellent, especially because of 3D model plus good interaction w/ Engineering
⇒ DSR scope w/ surveillance focus

KOA • Strathcona gate mtg - good comments from Peter on functional tests

• Jordan River - may need to reeducate on seismic

- approach agreed upon was based on incremental but Leach River Fault doesn't cause tsunami

Mtg w/ OGC

Date 13 Dec 2017

OGC Richard ^{Slocum} ~~Slocum~~, Stu Venables, Michelle Gaucher

BCH Scott Gilliss, Norm Stephenson, Osmar Penner, Omri Olund, Kofi Addo, SJR

FLNRD Tina Neale, Scott Morgan

Agenda Reasons for decision a path forward a operational restrictions

Richard • Permits allow activities

- Orders are compliance tools, conditions of permits
- Special Project can be done through Order for prescribing authorizations
 - ↳ can be done through permit or order - prefer order
- Most recent decision was around the well permit, allowing it to stand
 - ⇒ Special Project Order w/ conditions

Michelle • 100% of disposal wells have had strict conditions imposed over past 5yrs

- maximum pressures allowed in reservoirs
- Supervising reservoir pressure increases every 6 months to get indication of reservoir filling (max ⁸⁰⁰⁰ ~~16~~ kPa - 20% above pre)
- Put max rate on well - rare control - so pressure won't build up quickly
- well head maximum 6,200 kPa
- real-time ^{dense} array measuring tells when small activities are occurring before get larger events
- when reach limits, wells are "shut in"
- most wells don't have any seismicity associated with them
- currently 9 wells active in Bellzona? Formation. closest one is 340 km N in a different aquifer - behaviour is entirely different as lower porosity
- material being disposed in this well is saline water from fracking from third parties, material will be trucked in, expect regular use
- pga, pgr & duration : pga collected to date very small

Stu • 11 sensors in NE BC + ^{near field} arrays - information being shared openly

Michelle • BCH has a position to tell work to stop

SJR • All about monitoring PCN dewatering pumps - not the FOS # because probably a little below 1.5

Stu • If pumps fail a pressurer rise - would want disposal to stop

SJR • FOS not best terminology to use - water levels are a better line in the sand

SAG • New pumps installed so less worried about system.

- Richard • Need a clear definition so that decisions can be made
BCH would need to notify OGC + operator
Order would state cease operation upon notification from BCH
- SJR • Asking Scott to put in more piezos so understanding may change
- Richard ⇒ can revisit w/ OGC, can change Order at any point
- Michelle • Data is submitted monthly & will be reviewed
- SJR • BCH will never be happy about the decision to proceed but need to work together
- Have not done detailed analysis on dam response so dealing with a large amount of uncertainty
 - OGC has made a decision of what is tolerable risk for society
- Stu • How long the well will be in operation depends on how well the reservoir responds plus market demand
- At WAC Bennett, all Crown land w/in 5km & no more tenure will be sold so have 5km buffer there
 - Small amount of land near PCN
 - Site C - we would be notified if a well is being drilled, whether for fracking or disposal
 - If disposal were to be done w/in 5km of Site C, regardless of conditions, BCH would be notified
 - Request SMA's at dam to be telemetred into network to share information w/ UBC, NRCAN
- Michelle • Every 6 month a shut in test is carried out and assessed by a specialist - that assessment is internal. will think about making that information available to BCH

Pre-planning Mtg w/ OGC

Date 13 Dec 2017

SJR, SAG, NS, Omri, Osmar, Tina Neale, Scott Morgan, Kofi Addo

- Purpose is to listen & learn
- Don't think there is a public safety issue even if it causes problems at the dam site - small PAR
- New residence on river bank in Hudson's Hope not captured in FloodSIM + Site C construction site
- Want protocols do we want to have in place
 - change in condition at dam
- Osmar memo says could have $> 1/10,000$ eq load from injection 5.2M-6.2M @ 3.5 km very rough assessment

Norm • Concern at PCN is the scour hole downstream of the spillway

- not eq that's going to fail the dam - it's what follows
- will be acting in ways that are not helpful to the dam
- will have no choice but to react

SAG • May have to upgrade the dam for seismic

Osmar • Don't know what the hazard is & don't know response

- Have no back-up to know if putting public at risk

SJR • Mtg is the OGC mtg - they asked for it

Tina • Don't know how OGC made their decision

- Discussing how this could change the risk classification of the dam
- Don't think regulator has any tool to intervene

Mtg w/ SJR, PT, FMS, JB, KOA, ESM

Date 5 June 2017

- to CO • Barrier run-out - overtopping is a moot point. Even small slide covers dam u/s or d/s - inundation map coming
 - ⇒ possibly not much risk to public due to Barrier slide
 - not significant loss of containment
 - 10 yr capital prioritization this fall
 - need to document risk prioritization - valid to work on
- SAR decommissioning big mess
 - regulatory wording problem
 - what submitted to BCUC is wrong
 - canal is on crown land - looking at purchasing land
- legal depositions & affidavits for injection wells at PCN
- No action on the list of Identified Ds Concerns
- SJR • IT transformations for emergencies
 - control of water is #1 priority - what IT systems are needed
 - & how to harden them
- Employee engagement - SJR to come up w/ presentation
- Campbell River Thursday on piezo response
- FMS • Wilsey high water - weeping on D/S face never seen before
- KOA • RRA stuff due June 12
 - 10 yr capital plan will also get filed
 - needs to be resourced
- PT • Mtg w/ Cweyell on gate G00 this week
- KCL debris boom mtg
- TRZ mtg w/ SJR on Friday
- ESM • Project transition team wants to talk to SJR re: shift electricians X
- MED piezo plots to SJR tomorrow
- Mtg w/ Comox re: emergency preparedness & brochures Friday aft.

Mtg w/ SJR, PH, JB, Zoe, PT, DND, KOA, JC, ESM, FMS

Date 20 March 2017

- SJR • Oil & Gas Commission - Minister put stop work on injection 3 km North of Peace Canyon Dam. Mtg this morning w/ OGC.
→ Future exclusion zone of 5 km is only in an email from OGC to BCH
- FMS • GMS bedding material being placed
- PT • working on Ruskin back-up power
- DND • Draft document on tolerability of risk
 - Shane McGrath - only using risk to prioritize in Australia
- ESM • Coastal data review this week + drone @ SCA
 - JHT MED report from SNC : increased pressure from drilling + liner issue
- JC • working w/ GMS to come up w/ a process w/ GenOps to develop work orders
- PH • Bugaboo update mtg
- KOA • Wahleach instrumentation - too expensive to use PPM process as is
↳ SJR to discuss w/ Alex + Bob

DR Mtg w/ SJR, PH, JB, PH, KOA, JC, ESM

3 April 2017

- SJR+CO • site C 3D GIS needs help
 - Peace Canyon stop work being fought by oil & gas company
- SJR • Employee survey results in - raw data
 - ARN complete turn around in environment
 - DS 24% increase wrt to manageable workload
 - DS highest in company wrt work well together
 - lowest in company wrt work with others
 - v. low wrt equipment & tools to do our jobs
 - v. little difference between DS & surveillance
- PH • hadore 500 & VI work
- JB • Quarterly Report - (need feature dam) - due April 13
- PT • Comox / Puntledge project
 - Ruskin - working w/ Saman
 - GMS - preliminary design
- KOA • Annual mtg w/ GRM
 - Strathcona strategy mtg?
- ESM • Covering for Frank. Chris going to cover for Rick. Piezo levels at Bridge #1 rising - likely going to have to open valves. Seton dewatering next week. KCL had high levels in silt slope & high drain flows - took unit 4005. SEV schiavon staff moving.

At some point following PPM isn't scaleable

Mtg w/ ESM, JR, KOA, ZS, FMS, JB, PT, DND

Date 1 May 2017

ESM • Mediation session w/ Oil & Gas Commission last week

- lawyer felt it went well
- still have order in place restricting injection near PCN
- looking at options to not have any injection ever
- Sent an email to Gareth re: no impact for DS for earthquake
- Comox FAP mtg this week
- Kay to attend site C accountability mtg

FMS • working to get Tom into Revelstoke still then post junior

- Seven Mile gate testing went well. Chris did drone work.
- Seton later this week to look at road/bridge alignment

JC • Training system not working

KOA • Vahid stick-handling RRA Filing for next 3 years for capital projects plus 10 year window - need executive summaries F19-21

- Campbell River • SCA going through EAR revisions
- JHT Advisory Board last week of August ⇒ Kay to send to me ⇒ Rob H.
- Discussing new SMA's for Ruskin for commissioning ⇒ DS position

JB • Distributing Fall inspections

DND • In UK next week: grouting in dams, spillway reliability, interconnection, tolerability of risk mts

Mtg w/ KOA, PT, FMS, ZS, ~~JB~~ JC, ESM

8 May 2017

JC • Rip rap project completed for the season @ GMS

- Kay to follow-up w/ Gord to see if thermister string replaced

ESM • Oil & Gas Commission - more stuff on the table

→ may need to discuss w/ Scott Morgan

- Away Friday & Monday

KOA • GMS stoplog / sluice project starting this year

- Executive Summaries next couple of weeks
- SCA LLD now includes spillway so name will change
- USGS coming to VI next week

ZS • training coming up on employee engagement,

Mtg w/ SJR, PT, JB, DND, KOA

Date 15 May 2017

- KOA • RRA Executive Summaries + strategies
- JB • Need to talk about compliance reports
- DND • legal structure needs to support RIDM if going to do
 - David Averen is being replaced
- SJR • Received acceptance of GMS LLO strategy
- MTD • Seton canal - invite plant to mtg w/ MOTI, DSO, DSE
 - Annual Report
- KOA • RRA pushing to get 1st draft by Friday
 - Need to have a discussion w/ Chris about hadore
 - Campbell River System
 - ⇒ Export Engineering Panel on risk?
 - BMT Isis had retain power system as starting point

Mtg w/ SJR, FMS, JB, PT, KOA, ZS, JC, ESM

29 May 2017

- SJR • Q Report dry-run, Campbell River discussion
 - getting fracking time histories as they come in to SJR & Kofi
 - around for next 3 wks
- FMS • lots of snowpack, especially in Kootenays, economic spilling, peak end of July?
 - Tom signed off on Mica spillway, SJR asked about underdrain system - plant signed off on it
 - Revelstoke drain system - resurgent db issue
- JB • Expectation phase by end of June
- PT • RRA done last week, Executive Summaries drafted - SJR need to review
- KOA • Campbell River last week
 - Project Managers need to be sorted out - 3 different PMs
 - GMS longterm instrumentation plan
- ZS • collecting co-op requests for Sept & Jan
 - need to have budget update
 - Board mtg for salary etc. wk of June 5 - communicate by June 14
- JC • Backfilling for a medical leave, working alone procedures being reviewed
- ESM • CWR Mtg & tour at JHT tomorrow
 - IDSRMP for first filling between cofferdam this week
 - Deep piezos have dropped by ~10m in MED - can be discussed on June 8th tour - no liner decision yet

Mtg w/ Site C & OGC

Date 19 Feb 2018

Andrew, Wim, J-Flord, Peter (OGC) - orphaned wells, John (OGC - Kelowna), Doug (Properties), Rob (Properties), Kofi, SJR, Michelle (OGC), Stu (OGC), Katie (site C - structural), Sebastian (site C - structural - on phone)

- Stu • wave form data being collected is being posted & available for download
- interested in any geophysics - shear wave velocities - carried out below river bed - probably have already received from BCH
- Wim • stage 2 cofferdam in 2020
- stage 1 cofferdam criteria $1/1000$ earthquake, inlet & outlet portals criteria $1/5000$ earthquake because workers ~~downstream~~ below
 - Andrew: withstand may be higher, depends on pore pressures
- Michelle • no data in BC for induced earthquakes greater than M3.0 everything is extrapolated or used from elsewhere
- Katie/Andrew • Can share memo by Gail which shows the time histories that were used by Neil for the structural analysis
- RC buttress analysis - $0.13g$ ^{SLB} acceleration for M5, R 2km critical
- Stu • velocity provides better indication of likelihood of damage
 - need acceleration, velocity & distance
- SJR • wants clarity on what ^{we} would do if we actually got 6 mm of mov't
- Katie • simplistic analysis of diversion inlet structures shows that could be damaged by induced event - doing more analysis
- Sebastian • would like better time history info for analysis - feels Neil's analysis is too conservative
- Stu • McGill is doing a study nearby - nothing ~~>~~ $> M3$ so far
- Michelle • indicative of graben structures w/ strike-slip events, short segmented
- Andrew • what is the scaffolding designed for typically?
- Stu • Since 2013 - 11 stations installed to measure seismic events
 - EOR = Enhanced Oil Recovery - putting water into reservoir to bring sweep oil towards producers - raises pressure in reservoir
 - behave very much like disposal wells
 - 37 events between 2014 & 2017 $> M3$, 2 $> M4$, mostly hydrofracking
 - dry wall cracking @ 5 cm/s, structural damage @ 10 cm/s+, measured 2 cm/s
- Doug • 16 wells within the impact line - to be located this summer

MEETING BETWEEN
B.C. COMPTROLLER OF WATER RIGHTS
(MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS DAM SAFETY)
AND BC HYDRO DAM SAFETY

AGENDA

19 and 20 January 2017
Edmonds, Burnaby, B.C.

Attendance from CWR: Glen Davidson, Tina Neale, Scott Morgan, Rob McLean, Will Jolley

Date: **19 January 2017**

Location: Edmonds 13th floor, Meeting Room 2

Attendance from BC Hydro: Stephen Rigbey, Des Hartford, Terry Oswell

2:00	CWR and Ministry Update <input type="checkbox"/> Changes in staffing <input type="checkbox"/> Other?		Glen
2:15	BC Hydro Application of the Dam Safety Regulation / Dam Safety Governance Manual	1	Terry
3:00	2016 Surveillance, DSR and OMS update - Walter Hardman Instrumentation	2	Terry
3:15	Engineer of Record discussion	3	Des
3:45	Miscellaneous Discussions -Decommissioning the GMS Low Level Outlets -Oil and Gas – next steps? -Mount Polley fallout? -Jordan Diversion Risk Mitigation / incremental consequence? -Other?	4	Stephen

Date: **20 January 2017**

Location: Edmonds - Conference Room 1

Attendance from BC Hydro: Stephen Rigbey, Terry Oswell, Kay Ahlfield, Peter To (part-time), Paul Henderson (part-time), Gord Anderlini (part-time)

8:30	Capital Projects Update - Overview and Update on selected projects <input type="checkbox"/> Spillway Gate Projects Update: Clowhom, Peace Canyon, WAC Bennett <input type="checkbox"/> Comox – Puntledge Flow Control Improvements <input type="checkbox"/> Reservoir Boom Project <input type="checkbox"/> Bugaboo Decommissioning <input type="checkbox"/> Bridge River Penstock Leak Detection & Protection <input type="checkbox"/> Alouette Headworks and Surge Tower Seismic Upgrade <input type="checkbox"/> Duncan Dam Core Raising and Instrumentation <input type="checkbox"/> WAC Bennett Projects, chute, rip rap, core casings <input type="checkbox"/> Wahleach – tailrace, instrumentation, OVDS <input type="checkbox"/> Campbell River System – JHT, LDR and SCA		
		5	Peter Peter Paul Paul
		6	Kay Kay Kay Kay Kay

MEETING BETWEEN
B.C. Comptroller Of Water Rights
(Ministry Of Forests, Lands And Natural Resource Operations & Rural Development, Dam Safety Unit)
and BC Hydro Dam Safety Staff

AGENDA
25-26 January 2018
395 Waterfront Crescent, Victoria, B.C.

Attendance from BC Hydro: Stephen Rigbey, Terry Oswell

Part-time: Bob Schubak (Thursday only), Amy Stevenson (Thursday afternoon only)
Kay Ahlfield (Friday only)

Attendance from CWR: Ted White, Tina Neale, Scott Morgan, Rob McLean

Day 1 – 3rd Floor, Meeting Room 3

Time	Presentation	PPT #	Presenter
9:00	Introductions and confirmation of agenda		
9:05	CWR and Ministry Update		Ted
9:15	BC Hydro Update		Stephen
9:25	2017 Dam Safety Unusual Conditions, DSR and OMS update		Terry
10:00	Break		
10:30	Oil & Gas Updates - Injection / Peace Canyon Dam - Fracking near Site C		Stephen Terry
11:00	Cheakamus – Barrier Slide and Seismic		Terry
11:30	Walter Hardman Consequence change & upcoming work		Terry
12:00	Lunch		
1:00	John Hart Redevelopment Project Update		Amy
1:40	Oroville Spillway & BC Hydro Implications (discuss Terzaghi here)		Stephen
4:20	End Meeting		

Day 2 – 3rd Floor, Meeting Room 3

9:00	Capital Projects Update <input type="checkbox"/> Bugaboo Decommissioning <input type="checkbox"/> Salmon River Decommissioning <input type="checkbox"/> Jordan River Next Steps in Risk Mitigation <input type="checkbox"/> Ruskin Seismic Upgrade <input type="checkbox"/> Alouette Headworks and Tower <input type="checkbox"/> Wahleach – Tailrace Improvements, Over-velocity System		Kay
10:15	Break		
10:30	Capital Projects Update cont. <input type="checkbox"/> Campbell River System – Strathcona, John Hart (seismic) <input type="checkbox"/> La Joie / Terzaghi		Kay
11:40	End Meeting		

*Could have used more time.

2019 ANNUAL MEETING
B.C. Comptroller Of Water Rights
(Ministry Of Forests, Lands And Natural Resource Operations & Rural Development, Dam Safety Unit)
and BC Hydro Dam Safety Staff

AGENDA
4-5 February 2019
6911 Southpoint Drive, Burnaby B.C. (Edmonds)

Attendance from BC Hydro: Bob Schubak, Terry Oswell, Eric Mainprize
Part-time: Kay Ahlfield, Maureen DeHaan, Kendra Gibbons, Saman Vazinkhoo

Attendance from CWR: Ted White, Scott Morgan, Rob McLean,
Part-time: Connie Chapman

Day 1 – 13rd Floor, Meeting Room 2

Time	Presentation	PPT #	Presenter
10:00	Introductions and confirmation of agenda		
10:05	CWR and Ministry Update		Ted
10:15	BC Hydro Update		Bob
10:30	DSR and OMS update		Terry
11:00	Surveillance Highlights		Eric
11:40	Fracking near Site C update		Terry
11:50	Flood Studies		Terry
12:05	Lunch		
1:00	Overview of Capital and DI Projects, 10 year outlook		Kay
	GIS / 3-D CADD Model Development, DSIS - demonstration		Kay Kendra
	Hazards – update on Seismic and Flood		Kay
2:30	Break		
3:00	Capital Projects Update <ul style="list-style-type: none"> o Campbell River System (Strathcona, Ladore and John Hart) o Bridge River (La Joie and Terzaghi) 		Kay
4:00	End Meeting		

Day 2 – 1st Floor Conference Centre, Meeting Room 1

8:45	Alouette interim risk management (Phoned Connie + Web-Ex)		Bob
9:50	Break		
10:00	Capital Projects Update cont. <ul style="list-style-type: none"> o WAC Bennett Dam o Ruskin 		Kay Saman
11:00	Open discussion		All
12:00	Lunch / End Meeting at 12:50		

Subject: Dam Safety Annual CWR Meeting
Location: EDME13, Mtg Rm 2

Start: Mon 2019-02-04 8:00 AM
End: Mon 2019-02-04 5:00 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Organizer: Oswell, Terry

Required Attendees: Neale, Tina FLNR:EX; Lazarte, Edgar; Schubak, Bob; McLean, Robert FLNR:EX; Mainprize, Eric; Morgan, Scott FLNR:EX; monty.miedreich@gov.bc.ca; Linda.Siperka@gov.bc.ca; Ted White (ted.white@gov.bc.ca); Hajiabdolmajid, Vahid; Hartford, Desmond; Ahlfield, Kay
Resources: EDME13, Mtg Rm 2

Agenda attached



CWR Agenda
2019 Final.doc

2019 ANNUAL MEETING

B.C. Comptroller Of Water Rights

(Ministry Of Forests, Lands And Natural Resource Operations & Rural Development, Dam Safety Unit)
and BC Hydro Dam Safety Staff

AGENDA

4-5 February 2019

6911 Southpoint Drive, Burnaby B.C. (Edmonds)

Attendance from BC Hydro: Bob Schubak, Terry Oswell, Edgar Lazarte, Eric Mainprize
Part-time: Kay Ahlfield, Maureen DeHaan, Kendra Gibbons, Saman Vazinkhoo

Attendance from CWR: Ted White, Scott Morgan, Rob McLean,
Part-time: Connie Chapman

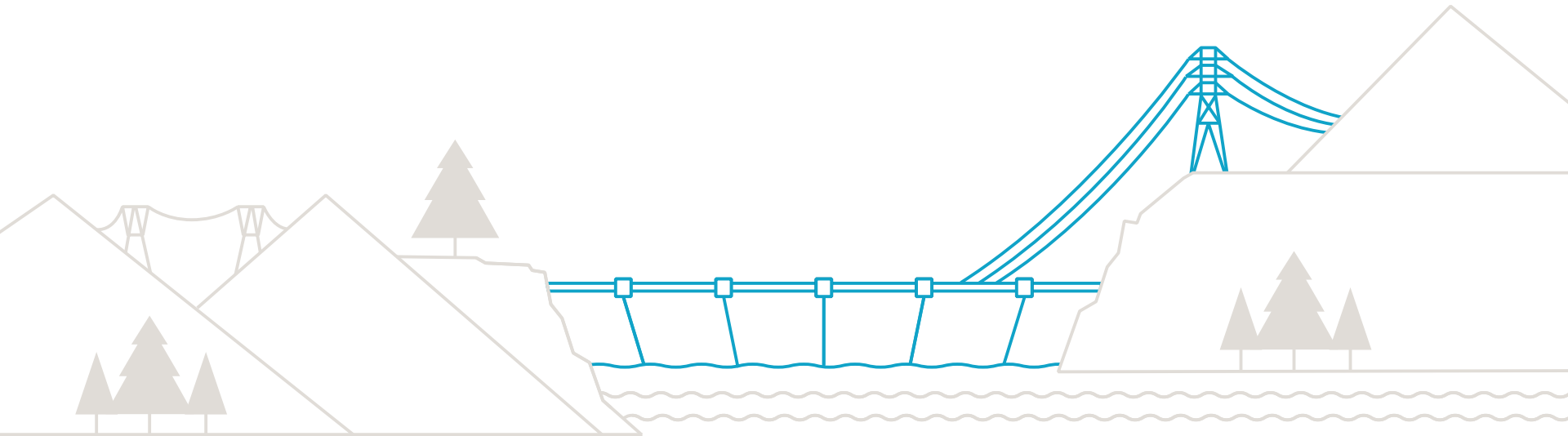
Day 1 – 13rd Floor, Meeting Room 2

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10:50	Surveillance Highlights		Eric
11:20	Fracking near Site C update		Terry
11:30	Flood Studies		Terry
12:00	Lunch		
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4:00	End Meeting		

Day 2 – 1st Floor Conference Centre, Meeting Room 1

8:30	Alouette interim risk management		Bob
9:30	Capital Projects Update cont. <ul style="list-style-type: none">o WAC Bennett Damo Ruskin		Kay Saman
10:30	Break		
10:45	Open discussion		All
12:00	Lunch / End Meeting		

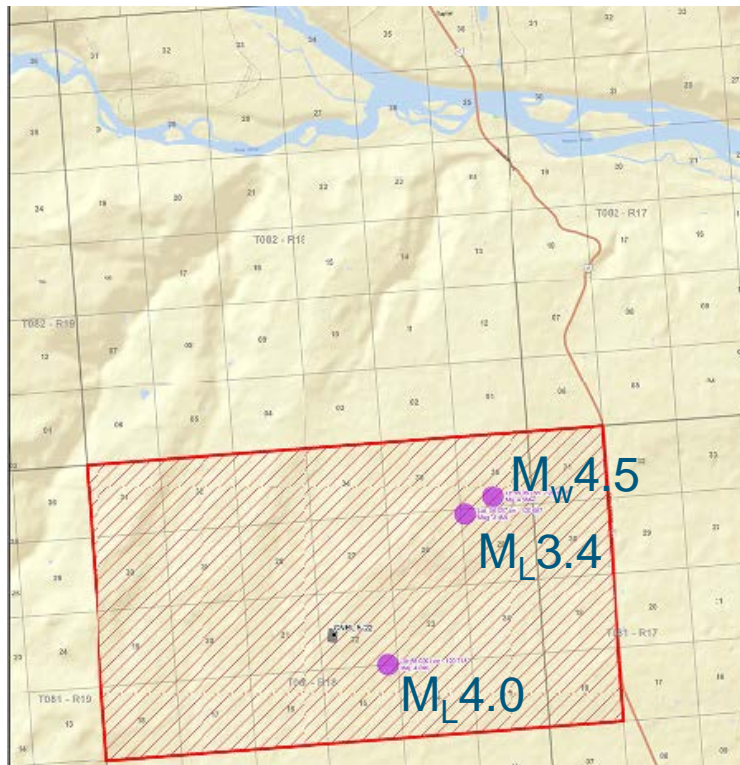
Fracking and Flood Studies



February 4, 2019

Nov 29, 2018 Seismic Event

Cause

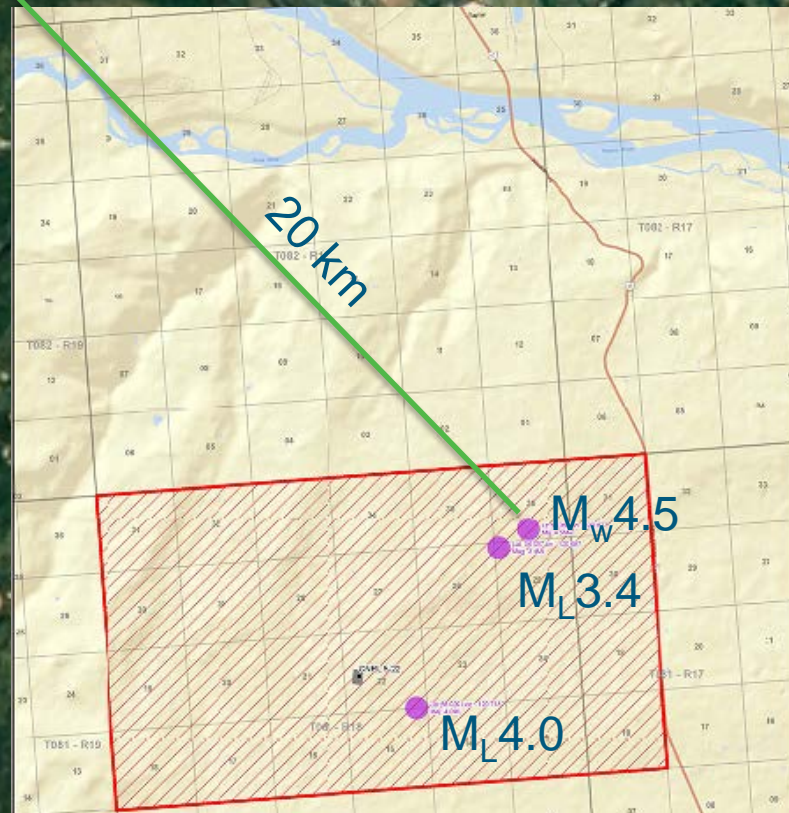


Information from the OGC

- Three felt events
- Caused by Fluid injection during hydraulic fracturing operations by CNRL
- Located in the Kiskatinaw Seismic Monitoring and Mitigation Area
- Immediate shutdown of fracking operations

Site C dam

Location of
epicenters in
relation to Site C



Nov 29, 2018 Seismic Event



Response at Site C

- Felt at site as a “strong jolt”
- Construction related activities stopped immediately following the earthquake
- Workers evacuated from behind cofferdams and tunnels
- Visual inspections carried out next day
- No damage observed
- No changes recorded in instruments

Nov 29, 2018 Seismic Event

Activities since the event

- Communications with the OGC
- Meetings with Crew Energy
- Notification of upcoming activities within the 5 km buffer zone of Site C
- Gathering of data from event

Flood Studies

Ways in which a flood study is triggered

- Dam Safety Reviews
- Spillway Functional Requirement reviews
- FloodSiMM Study
- Capital Project
- Historic event (1999, 2012)

Flood Studies

2013 Review

Table 1: Approximate Return Period of Peak Daily 2012 Inflow

Location	Peak Daily 2012 Inflow (m ³ /s)	Approximate Return Period of 2012 Inflow (yrs)
Cheakamus Dam	173	< 10
Comox Dam	438	10 – 20
Clowhom Dam	229	< 10
Duncan Dam	661	< 10
Bennett Dam	2492*	< 10
Mica Dam	2844**	20 – 50
Stave Falls Dam	946	< 10
Sugar Lake Dam	351	50 – 100
Seton Dam	102	< 10

*Peak daily inflow for July 15 – Oct 31, 2012 (time period when reservoir typically at max normal level)

**Peak daily inflow for July 15 – Nov 30, 2012 (time period when reservoir typically at max normal level)

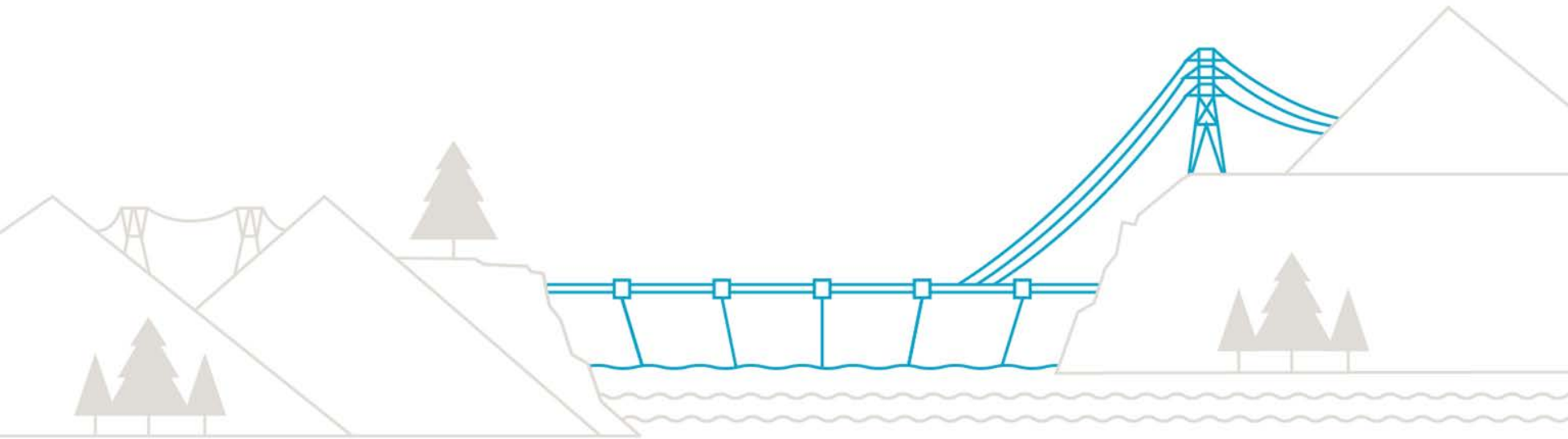
Flood Studies

Current Status

Dam/Landslide	Consequence	Inflow Design Flood as per OMS			Capable of Routing Flood?	Latest IDF Review		
		IDF	Last updated	Reference		Date	Reference	Conclusion
Aberfeldie Concrete Dam	High	50% PMF	1983		Yes	1999	N1732	No need to update
Alouette Earthfill Dam	Extreme	PMF	1983	H1576	Yes	2006	ALU06DI-B500	No need to update
Alouette Concrete Spillway	Extreme							
Bear Creek Earthfill Dam	Low	PMF	1985	H1850	Yes	2010	E823	No need to update
Buntzen Dam	Significant	200	1983, 1985	H1543, H1788	No - dam overtopped but stable	2012	E924	1/1,000 routed
Cheakamus Concrete Dam	Extreme	PMF	1983	H1625	Expected to be yes once the PMF is recalculated	2005	CMS06DI-B400?	Peak 6 hour inflow decreased from 4173 cms to 2900 cms
Cheakamus Earthfill Dam	Extreme							
Cheakamus Wing Dam								
Cheakamus Saddle Dam No. 1	Significant							
Cheakamus Overflow Channel Saddle D No. 2								
Cheakamus Shadow Lk Saddle Dam	Significant							
Cheakamus The Barrier								
Clayton Falls Dam	Significant	200	1987	H1971				
Clowhom Dam	Significant	50% PMF	1986		Yes	2011	Memo J.Finkenbine to P. To	Relatively unchanged
Clowhom Saddle Dam	Significant							
Comox Dam	Extreme	PMF	2017	MER-261	No	2017		



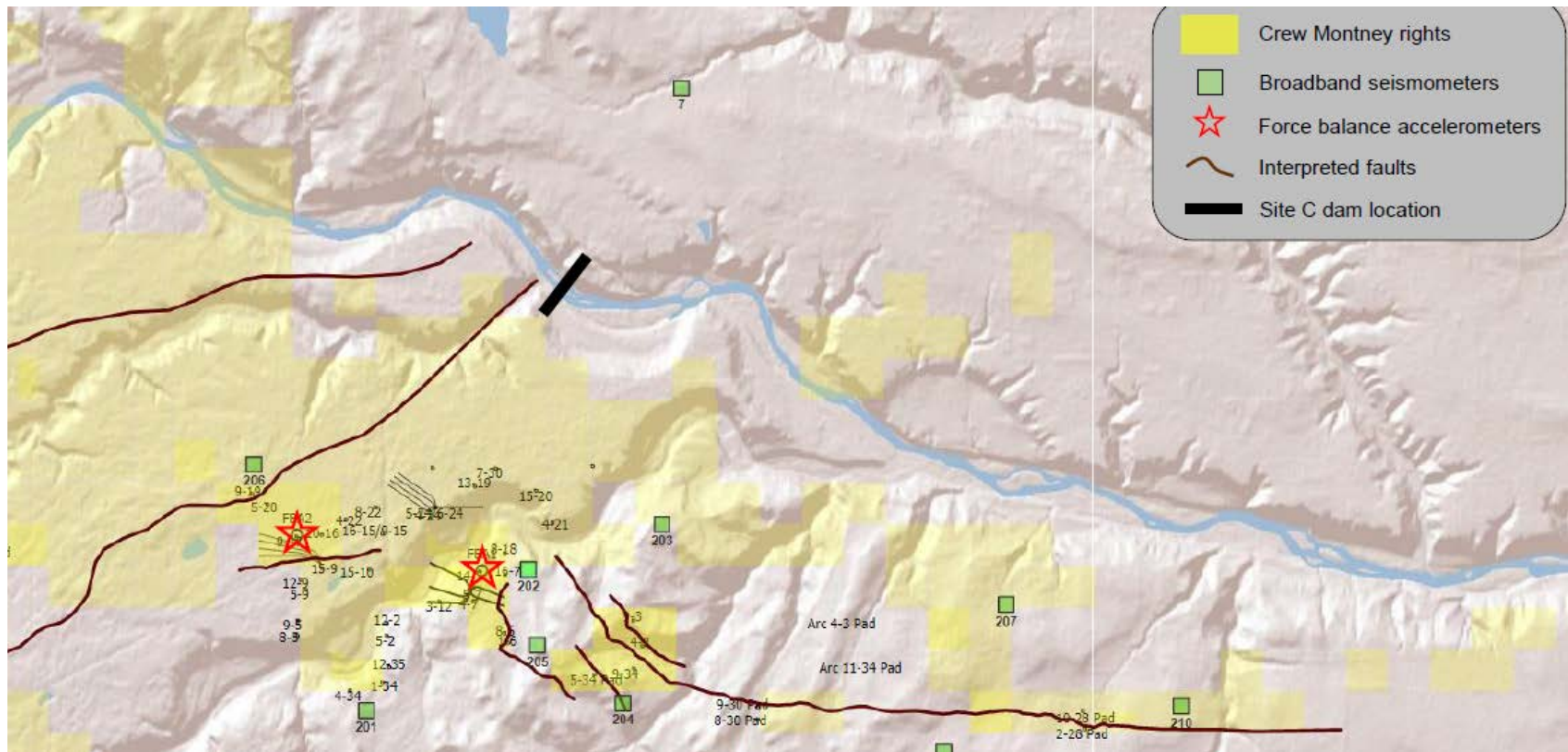
Fracking Induced Seismicity



Date

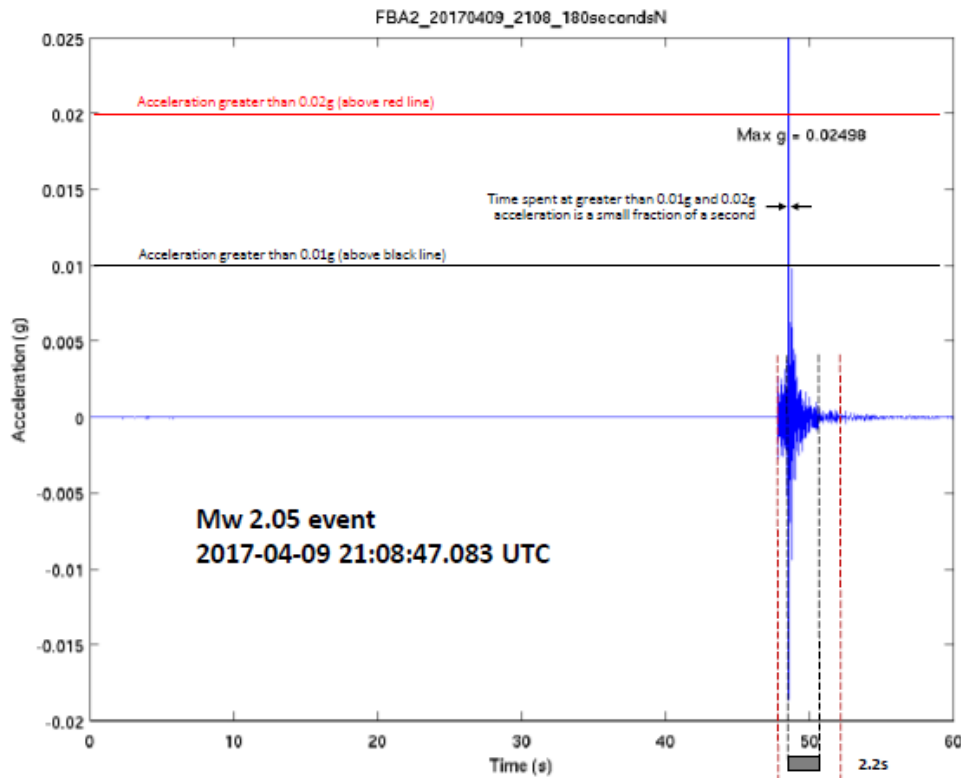
Induced Seismicity near Site C

Septimus – Tower Seismicity Monitoring Array



Induced Seismicity near Site C

Magnitude 2.05 event – April 2017



Averages of 6 such events near 15-09 pad

Duration = 4.5 seconds (red)

Frequency at peak acceleration = 37 Hz (black)

* Note the time spent above 0.01g and 0.02g is a small fraction of a second

Discussions to Date

Crew Energy

- Notification of activity within the 5 km buffer zone could happen in the next couple of months
- BC Hydro proposes to go to the Oil and Gas Commission once notified requesting the following actions from Crew
 - For earthquake $>M_w 2$ or measured ground motion $>0.05g$ (initial level chosen for discussion), Crew Energy will notify BC Hydro (through DSOP) within 24 hours and provide the date, time, magnitude (M_w), epicenter (latitude, longitude), focal depth and the associated uncertainty.
 - Within two weeks of the event, Crew Energy will provide full SEED files for the event.
 - Within 30 days after well operations are complete within the buffer zone, full SEED files for all recordings from earthquakes with ground motions greater than $0.02g$ (or $0.008g$ once the OGC requirement changes) are to be provided to BC Hydro.
- Further discussion with Crew and the Oil and Gas Commission planned to discuss above





From: Mainprize, Eric
Sent: 2018, January 24 12:22 PM
To: Seki, Frank
Cc: Oswell, Terry
Subject: RE: F18 Surveillance highlights.docx
Attachments: F18 Surveillance highlights (2).docx

From: Seki, Frank
Sent: 2018, January 19 1:36 PM
To: Mainprize, Eric
Subject: F18 Surveillance highlights.docx

Can you add to this and send to Terry and copy me

Thanks

Frank

F18 Surveillance highlights

- Fracking water Disposal well near PCN allowed to go back into production
- Mini re-org of Surveillance in progress to meet succession planning, knowledge transfer and technical expertise
- Dewatering and repairs to SON canal
- GIS initiative and how it made the longterm GSM instrumentation capital project meetings extremely productive.
- Drone work at
 - TRZ: scan of spillway and low reservoir including sinkhole area
 - SCA: differential scan compared to conventional LiDar
 - SON: photos of entire dewatered canal for future repair work planning
 - CQD: change detection testing, can easily detect 10 to 20cm changes
 - LAJ: Scan of upstream repair work
 - 731 block: scan of exposed rock face
- Surveillance Manager retiring
- Nicole Fink started as our new GIS resource
- Jeremy Wishart was hired as the new Upper Columbia Surveillance Engineer under Tom Stewart
- Yan Cui hired as Vancouver Island Surveillance Engineer
- Eric Allarie was hired as a new Surveillance Technologist in the Peace Region

- James Cryderman new baby
- Ouge Wang returned from maternity leave
- Julia Marsh became FTR fully funded
-