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June 25, 2019

Mr. Patrick Wruck
Commission Secretary and Manager
Regulatory Support
British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Mr. Wruck:

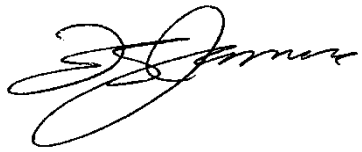
RE: Project No. 3698854
British Columbia Utilities Commission (BCUC or Commission)
British Columbia Hydro and Power Authority (BC Hydro)
W.A.C. Bennett Riprap Upgrade Project
Final Completion and Evaluation Report (Report)

BC Hydro writes to provide its public Report in compliance with BCUC Order No. G-78-16, directive 3(d).

Commercially sensitive and contractor-specific information has been redacted. A confidential version of the Report is being filed with the BCUC only under separate cover.

For further information, please contact Geoff Higgins at 604-623-4121 or by email at bchydroregulatorygroup@bchydro.com.

Yours sincerely,



Fred James
Chief Regulatory Officer

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Enclosure

BC Hydro
Power smart

W.A.C. Bennett Dam Riprap Upgrade Project

Final Completion and Evaluation Report

June 2019

PUBLIC

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1 Board of Directors Summary Report

This section (section 1) provides the content that was submitted to the BC Hydro Board of Directors (**the Board**). The rest of the document (section 2 on) provides more detail consistent with BC Hydro past progress and completion reporting with the BCUC.

As outlined in section 2, BC Hydro filed the Project application and statement of capital expenditures with the BCUC in November 2015. In May 2016, the BCUC issued Order No. G-78-16 stating that the BCUC concluded that BC Hydro's consultation with First Nations was adequate and that the part of the Project expenditure schedule, excluding the part relating to the MES, was in the public interest.

1.1 Executive Summary

The Project replaced and upgraded existing riprap and underlying dam fill at eroded areas of the WAC Bennett Dam (the **Dam**). The objective was to repair and prevent further erosion damage to extend the life of the Dam. In June 2016, BC Hydro's Board of Directors approved full Implementation Phase funding of $171.4 million Authorized, which represents an Expected Amount of $137.1 million plus Project Reserve. The Project was placed In-Service in April 2018, 19 months ahead of the target In-Service-Date of November 2019. The forecast completion cost is $119.5 million or 13 per cent less than the Expected Amount. This was achieved despite the highest cost risk on the Project having materialised; that being the percentage of usable large size (Class 1) riprap produced out of the volume of rock blasted for production (the Yield) being lower than expected. The risk was anticipated and treated with contingency in the Expected Amount. The Project has met its objectives and is delivering the planned benefits.

1.2 Background

The earthfill embankment Dam was constructed between 1963 and 1967 on the Peace River, upstream of the Peace Canyon Dam and the Site C project. The reservoir provides storage for the GMS Generating Station. Since the Dam was originally constructed, the upstream protective riprap and underlying fill materials progressively eroded on the upper portions[1] across approximately two-thirds of the dam face. The key contributing factors included the following: 1. the exposure of the Dam to harsh conditions and erosional forces such as wind generated waves, ice loading, and freeze-thaw action; 2. design deficiencies with the original riprap system; and 3. the existence of over-steepened slopes on the upper part of the Dam.

1.3 Project Objectives

The objective of the Project was to repair the Dam and prevent further damage by designing and installing a more robust riprap protection system for the areas most vulnerable to erosion and by eliminating the over-steepened sections of the Dam. This Project was initiated in 2011. The Project objectives were met and it is estimated that the effective life of the riprap has been extended by approximately 75 to 100 years, with regular maintenance.

1.4 Scope and Scope Variance

The Project upgraded the original sandstone riprap across the damaged areas of the Dam with more robust weather-resistant limestone riprap, and added a bedding layer between the riprap and the dam shell. Over-steepened areas of the Dam were also flattened. All rock material was produced and transported from the Sand Flat Quarry which is located on Crown land, approximately 38 kilometers from the Dam by road. No work changes outside of the general scope of the Project or contract were required during the Implementation Phase of the Project.

[1] BC Hydro engineering did an assessment early in the project to determine where the erosion has taken place. Erosion was found from elevation 2170 feet (661.4 meters) to 2214 feet (674.8 meters).

1.5 Procurement Strategy

An Early Contractor Involvement (**ECI**) procurement process was followed. This process involved more time up front to plan and negotiate clear contractual terms with the contractor through a collaborative open-book process. This included joint planning for construction; and for identifying, assigning, planning for, and pricing Project risks and mitigations. For example, the Yield was identified as the biggest cost risk on the Project so pre-agreed pricing for lower than expected Yield was included in the Contract and contingency was included in the Project budget to cover this risk.

Many forms of ECI result in a negotiated contract, with one entity, where market tension, inherent in public competitions, is lacking. In this instance however, the proponent was selected through a competition which included proposed contract pricing. The ECI process occurred after baseline prices were secured competitively.

This process resulted in selection of a highly qualified contractor, Peter Kiewit Sons ULC (**PKS**), and a collaborative relationship that supported the ability to work together and to respond to as-found conditions in a timely and efficient way without disputes.

1.6 Schedule Variance

There were three contributors to the strong schedule performance. The first was the inclusion of schedule contingency, along with planning with Generation System Operations (**GSO**). This was required because a key design component of the Project was to place the riprap in dry conditions when the reservoir was at low levels, instead of underwater. The Project team also engaged GSO throughout Implementation to manage this risk. Given the first two years were low reservoir level years, along with collaborative reservoir management, the extra placement year was not required. Another contributor to the positive schedule outcome was the ECI procurement process. The detailed planning that was completed up front mitigated the risk of many issues during implementation. This process also set a

collaborative working relationship that facilitated nimble responses to issues as they arose as noted in the section above. Strong contractor performance was the third contributor.

1.7 Cost Variance

The Project plan and actual/revised forecast amounts are summarized below.

Table 1 Project Cost Variance Summary against the Project Plan[2] Amount [$M, +/(-)]

Cost Item	First Full Funding Expected and Authorised Amounts	Actual/ Revised Forecast Amounts	Variance	Notes
PKS Quarry Development; and Supply, Delivery & Placement	62.8	78.2	15.4	1
PKS Road Upgrades and Maintenance	13.7	11.3	(2.4)	2
BC Hydro Direct and Indirect Costs during Implementation	15.2	14.0	(1.2)	3
IDC/OH on Implementation Costs	5.6	4.4	(1.2)	3
Pre-Implementation Costs including IDC	12.8	10.9	(1.9)	3
Maintenance and Emergency Stockpile (**MES**) including IDC	4.3	0.7	(3.6)	4
Contingency	22.9	-	(22.9)	5
Total	**$137.1**	**$119.5M**	**(17.6)**	

Note:

- Addition errors are due to rounding.
- The table above is in the format provided to the BC Hydro Board as the full funding, including the MES was approved by the Board. Please refer to Table 2 in section 5 where the cost is presented in a similar format to prior BCUC Progress Reports with the MES cost broken out at the bottom of the table.

The Project was delivered $17.6 million (13 per cent) under the Expected Amount. Cost variance notes are provided below:

Note 1. The PKS Quarry Development and Supply, Delivery and Placement cost increases were mostly due to lower than expected Yield. This risk was identified and treated with contractually pre-agreed pricing for lower Yield points and with contingency. PKS and BC Hydro were also able to make proactive adjustments to quarrying and construction methods to mitigate cost impacts from the low Yield. Another

[2] The plan amount refers to the internal First Full Funding amounts, or the BCUC Reference Estimate.

contributor to this cost increase was that the final quantities of rock produced for the Project were 12 per cent higher (for Class 1, Class 2 and bedding) than originally specified.

Note 2. The PKS Road Upgrades and Maintenance line item savings were largely attributable to the early completion of the Project and somewhat to the fact the work was done in winter when the roads were frozen which reduced the impact of traffic on the road.

Note 3. The lower BC Hydro costs and lower Implementation-Phase-Interest-During-Construction (**IDC**) on pre-implementation and implementation costs are largely due to the Project completing ahead of schedule.

Note 4. The Maintenance and Emergency Stockpile (**MES**) cost savings are due to a decision to reduce the size and the volume of rock to facilitate ease of placement in the future. This allowed the MES to be produced from material that would otherwise have been wasted which resulted in lower cost. There were also IDC savings on the MES costs from the Project completing ahead of schedule.

Note 5. The contingency was $22.9 million. $5.3 million was moved to other line items to cover the net cost increases noted above and the $17.6 million remainder was removed from the forecast as the Project is substantially complete; there is no contingency in the current Project forecast.

No Reserve draws were required on the Project.

1.8 Deficiencies and Ongoing Commitments

The Project is now substantially complete. Only minor road repairs and road signage, access to a new debris boom anchor block, and Project close out activities remain to be done. In total, these are forecast to cost $0.4 million.

There are no material incremental ongoing costs or savings to Operations from the Project.

1.9 Regulatory Approvals

On November 13, 2015, BC Hydro filed the Project Application and Statement of Capital Expenditures with the BCUC requesting acceptance that the Project expenditures are in the public interest.[3]

An application to the Comptroller of Water Rights to allow riprap placement was also obtained in support of the Project. Fisheries Act authorizations and environmental assessments were not required. There are no material ongoing regulatory requirements related to the Project.

1.10 Indigenous Relations (IR)

The Project is located within the boundaries of Treaty 8, whose BC-based signatories are: West Moberly First Nations; Saulteau First Nation; McLeod Lake Indian Band; Halfway River First Nation; Doig River First Nation; Blueberry River First Nations; Prophet River First Nation; and Fort Nelson First Nation.

Collaborative planning during the early stages of the procurement process provided time for BC Hydro and PKS to work with First Nations to address their environmental, safety and traditional use concerns. Their concerns were mainly related to dust management, heavy truck traffic, and road conditions from a safety perspective. Since most of the quarry work and transport was conducted in the winter instead of in spring/summer as originally planned, potential impacts to dust and traditional use activities were significantly reduced, and sediment and erosion at watercourses were mitigated as the ground was frozen and covered with compact snow.

[3] The Project Expected Amount included $4.3 million for the MES. The BCUC rejected the cost of the MES scope as not being in the public interest, and directed BC Hydro to include an explanation in a future Revenue Requirements Application (**RRA**) whether or not the costs were included in the rate base. BC Hydro believes that the work is in the public interest so proceeded with the work, and provided explanation in the F2020 to F2021 RRA as allowed for in the Order.

First Nations, PKS and BC Hydro also worked together to find contract, services, and employment opportunities. This resulted in approximately $21 million in First Nations contracts, services and employment during Implementation. 3,942 First Nations direct employment hours were achieved.

1.11 Environment and Archaeology

There were no reportable environmental incidents and no Archaeological finds or issues on the Project. During earlier stages of the Project, First Nations were involved in Archaeological Impact Assessment of the areas impacted by the Project with no Archaeological finds.

1.12 Stakeholder Engagement

There were no Stakeholder Engagement issues on the Project. Distribution of semi-annual newsletters began in 2011 and continued to the end of the Implementation phase. Additional updates and notifications were also provided, such as those provided for road closures.

1.13 Safety

There were no reportable safety incidents and no lost time injuries on the Project. However, there was one safety incident related to truck-air-brakes, but there was no injury from the incident and corrective actions were taken. There was also one major near miss around quarry blasting operations with corrective actions taken.

1.14 Key Lessons Learned

For lessons learned, we have identified some valuable activities that had favourable outcomes that can be leveraged by applying these to future projects, and some items where we experienced some challenges that other Projects could avoid.

The ECI Procurement Approach benefitted Geotechnical, Environment and Safety Risk Management, as well as First Nations Procurement, Outcomes – Use of the ECI approach, which included up-front planning and engagement with

First Nations, was a significant contributor to the Project in the noted areas. As a result of planning and pre-agreed pricing of reasonably possible yield outcomes, the Project was still delivered under budget despite this significant materialised geotechnical risk. The ECI process also included early engagement with First Nations to address their environmental and safety concerns, which resulted in better safety, environment, archaeological, and First Nations procurement outcomes. Consideration of an ECI process, along with the competitive Request for Proposals (**RFP**) process is strongly recommended for future large projects.

Competitive Market Pricing – Many forms of ECI result in a negotiated contract, with one entity, where market tension, inherent in public competitions, is lacking. In this instance the proponent was selected through an RFP competition which included proposed contract pricing. This resulted in a lower contract baseline than had been forecast in the pre-procurement plan (expected) amounts.

Schedule Risk – A year of schedule contingency was included on the Project to treat the risk of an extra placement year being required due to unfavorable reservoir levels. During the planning phases of this Project, inclusion of schedule contingency was not part of BC Hydro's Project and Portfolio Management (**PPM**) practice. However, this is now part of the documented scheduling practice.

Reservoir Operation Risk on Dam Safety Projects – During the planning stages of the Project, it was assumed that placement would take place underwater. However, a quality-assurance-driven design change late in the Definition phase required placement in the dry. Fortunately, the work was implemented during low reservoir years so only minor modifications to reservoir operations were required to accommodate the project. Had this not been the case, there could have been significant Project delays and associated increased costs. On Projects requiring work on an operating dam, dam safety and quality assurance requirements must be anticipated in earlier (Identification) Phase, and planning with GSO should occur even if it is believed that reservoir restrictions may not be required. This way, a plan

is in place and GSO is engaged if it turns out to be required later, as occurred on this Project.

Indigenous Relations (IR) Distribution of Work – Through the ECI process, the Project was able to establish First Nations terms of engagement. However, it would have been useful to have clearly defined contract weighting criteria for items such as cost, proximity to the Project, impact from the Project, experience, etc. The Project was able to achieve the overall targets but our intended distribution across various First Nations was not achieved. BC Hydro has implemented regular IR/Supply Chain meetings so that Procurement, IR and the Project Team can work collaboratively during the early procurement planning stages to determine on a case-by-case basis the approach to providing subcontracting opportunities, if any, to First Nations' designated businesses, as appropriate.

Late Requests for Tradition Use Studies (TUSs) Delayed the Application Process – At the time the BCUC Application was filed, BC Hydro considered that consultation on the Project was adequate. However, during the Application process, some First Nations raised concerns about the sufficiency of the environmental mitigation measures. BC Hydro undertook additional consultation to better understand and address First Nations' and the BCUC's concerns. BC Hydro should have proactively canvassed First Nations' interests in undertaking TUSs and followed up to ensure studies were completed prior to the BCUC Application submission. The IR and Environment groups are currently working together to refine our traditional use practice, including initiating traditional use studies earlier in the project lifecycle where possible.

TUS Scope – If, when the TUSs were done, BC Hydro had known that much of the First Nations concerns would be addressed by shifting the work to the winter, the scope of the TUSs could have been reduced. Consideration of these impacts should be part of the early consultation with First Nations.

Cost Management Process Efficiencies – The Project experienced inefficiencies in cost reporting because the system, contract, and BCUC cost breakdown and cost management processes were not aligned. The Commercial Management team will be engaging the Project Scheduling and the Construction and Contract Management teams to find a way to ensure alignment on large contracts going forward and to embed this as appropriate in PPM Practices.

2 BCUC Application, Decision and Progress Reporting

On November 13, 2015, BC Hydro filed the Project application and statement of capital expenditures with the BCUC under section 44.2(1)(b) of the *Utilities Commission Act* (**UCA**), requesting acceptance pursuant to section 44.2(3)(a) of the UCA (the Application) that the expenditures associated with the Project are in the public interest. The BCUC also has a duty to determine whether the Crown's consultation and, if required, accommodation with First Nations has been adequate up to the point of the BCUC's decision.

On November 24, 2015, the BCUC issued Order No. G-182-15 establishing the preliminary Regulatory Timetable for the review of the Application, and included one round of written information requests and a procedural conference.

The Commercial Energy Consumers Association of British Columbia, the British Columbia Old Age Pensioners Organization et al., McLeod Lake Indian Band and Saulteau First Nation registered as interveners and participated in the hearing. The Association of Major Power Customers of BC also registered as an intervener but did not actively participate.

By Order Nos. G-15-16, G-31-16 and G-54-16, the Regulatory Timetable was amended to include the following:

1. a second round of information requests of limited scope;

2. a submission by the Saulteau First Nation of their Traditional Use Study and a joint First Nations' Independent Technical Report;
3. a third round of information requests limited in scope to BC Hydro's Duty to Consult and the First Nations Consultation Process;
4. a second procedural conference; and
5. a written argument phase.

BC Hydro's written final submission was filed on May 6, 2016, Intervener final submissions were filed by May 16, 2016, and the written hearing concluded with the filing of BC Hydro's reply submission on May 17, 2016.

On May 27, 2016, the BCUC issued Order No. G-78-16 stating that the BCUC concluded that BC Hydro's consultation with First Nations was adequate and that the part of the Project expenditure schedule, excluding the part relating to the MES, was in the public interest. The part of the Expenditure Schedule related to the MES for potential future maintenance and emergency use was rejected with direction to include a statement in future revenue requirement applications confirming that no expenditures relating to the MES were included or to explain otherwise.

An updated Project cost estimate and schedule was filed with the BCUC, in August 2016. This was followed by annual Progress reports that were filed in February of 2017, 2018 and 2019.

This PCER is expected to be the final report to the BCUC on the Project.

3 Procurement Approach and Outcomes

The procurement strategy was a staged process. The first stage was to secure a single highly qualified contractor, and baseline construction pricing, through a competitive Request for Proposal (**RFP**) process. The second stage was the ECI process with the successful proponent, PKS. The ECI process enabled BC Hydro and PKS to identify, analyze, and quantify potential Project risks, to collaboratively

develop mitigation strategies to best manage those risks, and to include pre-negotiated Provisional Sum prices in the Contract to cover those risks, if they occurred. This process also allowed BC Hydro and PKS to jointly design and implement First Nations subcontractor procurement plans, which ultimately achieved BC Hydro targets for First Nations business and direct employment opportunities for the Project.

The collaborative relationship developed during the ECI process was maintained throughout construction, which facilitated ongoing reviews and improvements to construction plans to improve quality, reduce cost, improve safety, and to reduce environmental impacts.

The PKS contract was the only contract greater than $3 million on the Project.

4 Engineering and Construction Management

Engineering and construction means and methods were adapted throughout construction to minimize cost and/or to improve safety and quality outcomes on the Project. Some key examples are listed below.

1. Design specifications required riprap to be placed in dry conditions at low reservoir periods instead of underwater in order to ensure quality placement of the bedding and riprap layers and to protect the dam during construction.
2. Limestone was chosen instead of the pre-existing sandstone because of its lower porosity and higher durability. The new riprap was also designed much larger and more narrowly graded than the original riprap. Bedding material was added between the riprap and underlying dam fill materials to prevent erosion of the finer dam fill materials.
3. The key cost risk on the Project was that the Yield would be less than plan, resulting in significant cost overruns and increased potential for disputes and delays. To treat this risk, pre-agreed pricing for lower-than-expected Yield

points was developed during the ECI process and Project contingency was included in the Project budget. This risk materialised and led to cost increases of over $15 million. If this was not anticipated and if PKS and BC Hydro had not proactively adjusted construction methods, these cost increases would have been even higher.

An optimisation example was a decision to strip and waste layers of non-productive rock instead of sorting this rock to extract very limited useful riprap. Another example was that quarry blasting plans were continuously discussed with blasting experts and adjusted to optimize the Yield.

4. A decision was made during the first season of construction to build a mid-slope berm above the waterline to improve access. The ability to use this berm to improve placement logistics meant smaller equipment could be used for placement. This resulted in cost reductions to BC Hydro.

5. A decision was made to reduce the size and volume of the MES rock to facilitate placement in future post-Project maintenance or emergency situations using smaller and more readily accessible equipment. This also meant that the MES could be produced using the 'waste' material from the production of the larger riprap, resulting in significant cost savings.

5 Cost Variance Explanations – Actuals Versus the Expected or BCUC Reference Amount

As noted in the Executive Summary, the Project was completed ahead of schedule and under budget.

Table 2 below shows the BCUC approved Reference Estimate Amounts in row 27. Row 28 shows the BC Hydro Expected Amount, and row 29 shows the BC Hydro Authorized Amount which includes Project Reserve. The plan amounts (the BCUC Reference Price and BC Hydro's Expected and Authorized breakdown and Amounts) are shown in column A, the current Project cost forecast is shown in

column B, and the actuals to-date and the remaining forecast amounts are shown in columns H and J respectively. Notes 1 and 2 referenced in to top left and right corners, and Notes 3 to 17 in column G, are explained below the table.

Table 2 Project Expenditure Summary – Comparison of the Revised Forecast and the Nominal Reference Estimate

$M (Nominal $ unless specified otherwise)	A	B	C	D	E	F	G	H	I	J	
Row # (See Note 1)	Description	Nominal $ Reference Estimate Amount (BC Hydro Expected and Authorised Amounts)	PKS Amount following Contract Signing	Change from Reference Price [Column B - Column A]	Revised Forecast Amount	Change from Reference Estimate [Column D - Column A]	% Variance [Column E / ColumnA]	See Notes 3 - 17	Actual Cost to-End-Mar-2019	% of Revised Cost Forecast [Column H / Column D]	Remaining Forecast Amount [Column D - Column H]	Row # as Provided in the BCUC Aug 2016 Update
1	Direct Construction Costs											1
[redacted]												
25	BCUC Reference Amount	132.9			118.8	(14.1)	-11%		118.4	100%	0.4	
26	MES *(includes BC Hydro IDC, work is part of the PKS contract)*	4.3			0.7	(3.6)	-84%	16	0.7	100%	-	24
27	BC Hydro Expected Amount	137.1			119.5	(17.6)	-13%	16	119.1	100%	0.4	
28	Project Reserve	34.3			-	(34.3)	-100%	17				
29	BC Hydro Authorised Amount	171.4			119.5	(51.9)	-30%	17				

Minor addition errors are due to rounding.

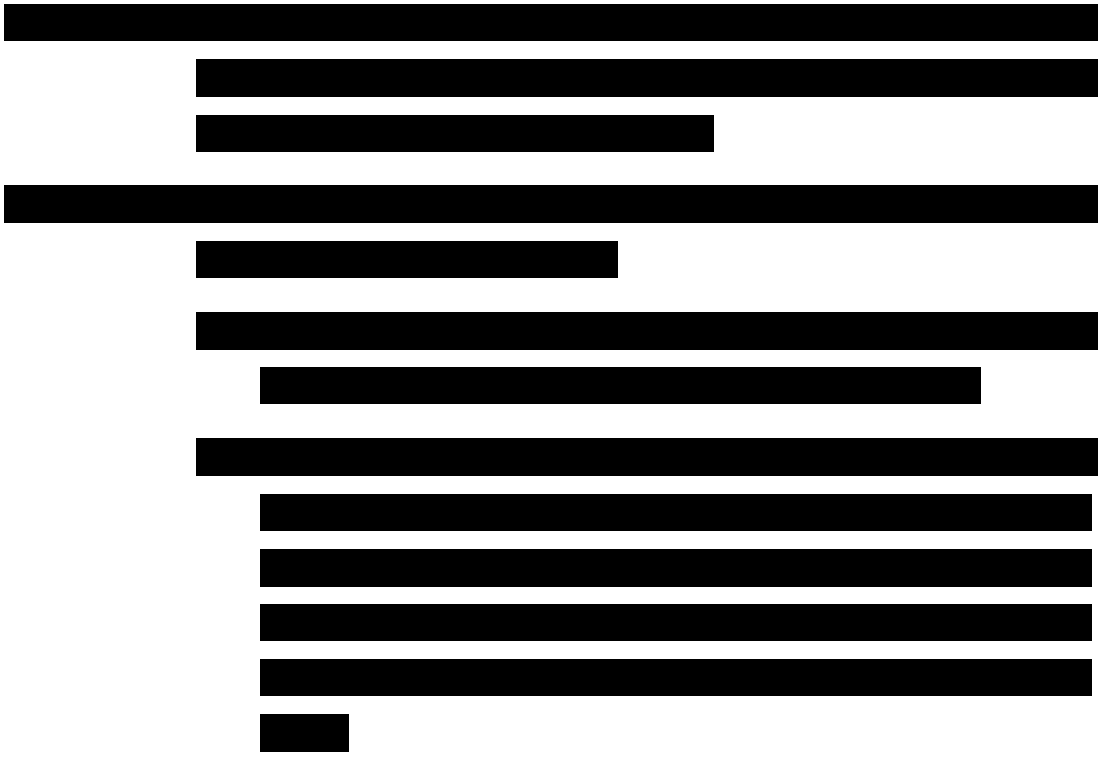
The MES cost in columns D and H has not been put in service pending a determination on the MES cost in the next revenue requirements proceeding.

Note 1. The rows numbers that are referenced in this report are shown down the left side of the table above. This numbering is consistent with the numbering in BCUC Progress Reports on the Project.

Note 2. The row numbers as they were ordered in the August 2016 BCUC update are shown down the right side of the table. The current numbers on the left hand side (as referenced in Note 1) are different because a change was made in BCUC Progress Report No. 1 in order to group the PKS Contract costs together.

Notes 3 to 17 below explain the variances between the revised forecast amount in column D and the Reference (Plan) Estimates in column A.

PKS Cost Changes:



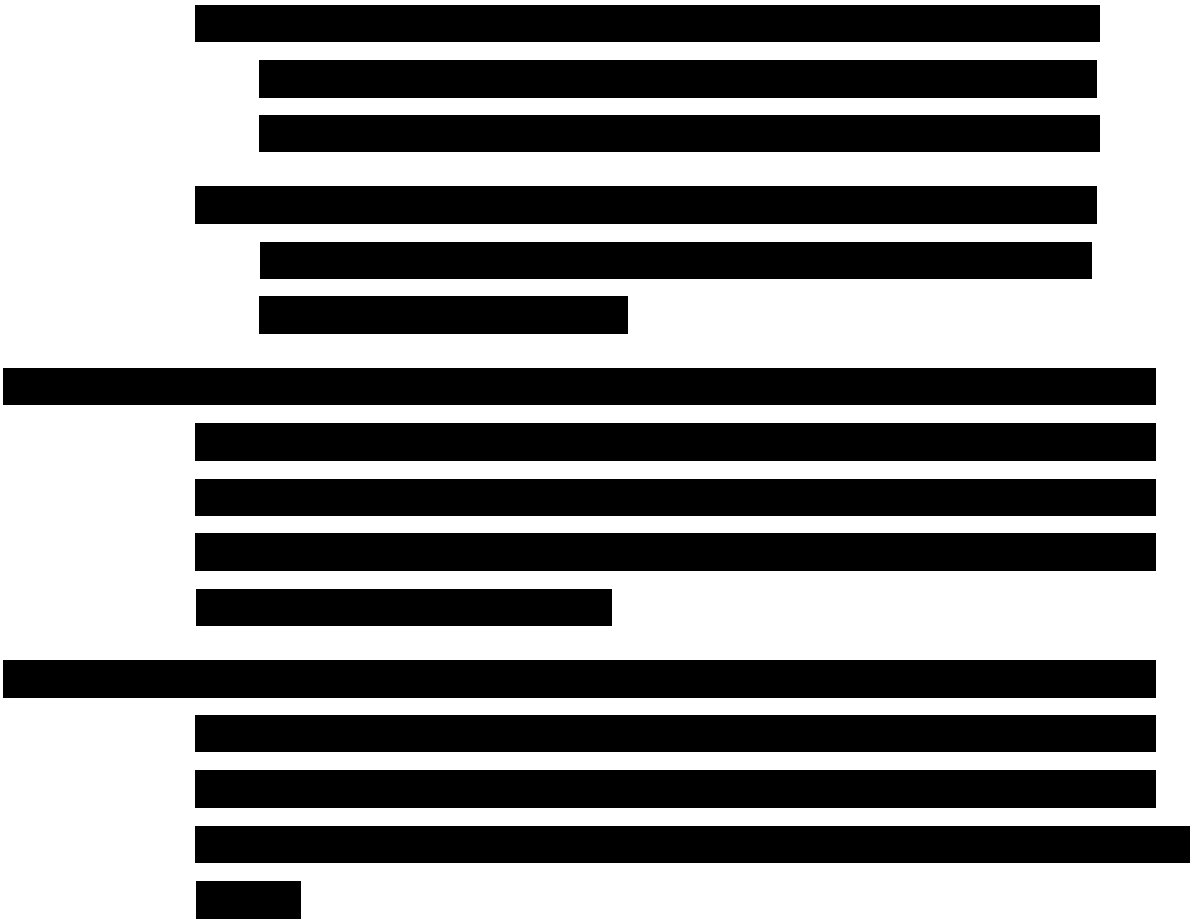
(c) The final quantities of rock produced for the Project were higher than plan (as reported in BC Hydro's responses to BCUC Staff IR 1.4.1 in July 2018) due primarily to uncertainties around freeze-thaw splitting and placement densities, and due to the addition of a small transition section. The estimated amounts that were included in the plan and the quantities produced are tabulated in columns A and B below. BC Hydro had to produce enough to cover the possible range of the final placement density and total breakage losses during transport and handling. The final amounts placed have been provided in column D. Note that the Class 2 amount placed is greater than that produced for the Project. This is because some of the Class 1 produced broke and was used as Class 2. Similarly, some of the Class 2 broke and became bedding. The leftover amounts at the MSA after placement and losses are shown in column H. Having some material left over is a normal part of civil projects like this one to mitigate cost risk of not having sufficient material in a timely way for the project. In this case, if contingent rock had not been quarried to cover the possible outcomes and if there was not enough rock for placement, the quarry would have had to be reopened, the contractor would have had to remobilise, and the schedule would have been extended by at least one more year. If there were not favourable reservoir levels, the schedule delay could have been a few years. The incremental cost of these possible outcomes would have been substantially higher than the cost of quarrying enough rock up front.

As shown in Column I, the leftover Class 1 and 2 riprap was only 2 per cent and 1 per cent of the total respectively.

Table 3 Riprap and Rock Quantities by Rock Class (Tonnes)

	A	B	C	D	E	F	G	H	I
Description	**Original Estimated Amount for the Project**	**Final Quantities of Rock Delivered to the Main Stockpile Area (MSA)**	**Percent Change [(B-A)/A] (%)**	**Final Quantities of Rock Placed on the Dam**	**Percent Change [(D-A)/A] (%)**	**Bedding used for Road Works[1]**	**Losses net of Additions from Breakage of Larger Rock Classes**	**Remaining Amounts of Rock that was Produced for Placement that is Left Over at the MSA (after Placement and Losses)**	**Percentage of Total [H/B] (%)**
Class 1 riprap	140,000	163,231	17	147,777	6		11,766	3,688	2
Class 2 riprap	45,000	48,366	7	52,220	16		(4,558)	704	1
Bedding	80,000	85,133	6	75,595	-6	1,051	4,665	3,822	4
TOTAL	**265,000**	**296,730**	**12**	**275,592**	**4**	**1,051**	**11,873**	**8,214**	**3**

Note 1: Bedding was used to shore up the shoulder of the Dam Crest Road.



Changes in BC Hydro Costs:

Note 7. Pit royalty savings are largely due to the rate being lower than anticipated in the plan.

Note 8. BC Hydro construction management costs were lower than plan primarily due to early completion.

Note 9. Project management costs include BCUC Application and Reporting costs, Procurement, and Quality Assurance costs. Actual costs were higher than expected due to greater effort and time taken to complete the ECI and procurement process, including developing risk allocations between parties, and arranging First Nations subcontracts.

Note 10. Costs for engagement and capacity funding were higher than initially budgeted for due to the addition of TUS's late in the process and extended consultation through the ECI process as discussed in section 1.

Note 11. The Regulatory, Environment, Stakeholders and Properties budget was decreased because the planned amount for pit royalties was previously accidentally double counted in this budget and also due to the reduced schedule.

Note 12. The contingency included in the Expected Amount was $22.9 million. $5.3 million was used to cover the net cost increases noted above and the $17.6million remainder was unused and removed from the cost forecast since the Project is now substantially complete.

Note 13. Capital Overhead was higher than plan due to increased corporate rates.

Note 14. IDC costs were lower than plan due to the Project completing early.

Note 15. The reduction from the original Definition phase cost forecast is due to the fact that the Definition phase costs were put in-service in June 2017 instead of at the end of the Project as originally assumed. This reduced the final interest during construction on this portion of the cost.

Note 16. BC Hydro is reporting on the MES cost and is seeking to recover this cost in the Fiscal 2020 to Fiscal 2021 Revenue Requirements Application, as allowed for in Order No. G-78-16.

The MES estimate of $4.3 million in row 26 includes BC Hydro IDC. The final MES cost was $0.7 million. The MES costs were significantly lower than plan due to a decision to reduce the size and the volume of rock following the learnings from the first placement season, and due

to MES IDC savings which resulted from the Project completing ahead of schedule. The change in size had a significant cost impact because it meant that the rock could be obtained from waste rock on the Project. Therefore only sorting and transporting costs were incurred.

The final volume of the MES was 4,050 cubic meters (7,695 tonnes) of smaller rock as discussed in our response to BCUC Staff IR 1.4.4 submitted July 25, 2018. The original plan was for approximately 8,000 cubic meters (15,000 tonnes) of the larger riprap which was quarried on the Project for placement.

In BCUC correspondence to BC Hydro received on September 25, 2018, BCUC staff requested that additional detail regarding the MES be included in the Progress Report No. 3 in February 2019 as follows:

(a) A breakdown in table form of all shared costs (indirect construction costs) for the MES and whether or not the costs have been allocated to the MES; and

(b) For each shared cost identified in the table, an explanation as to why the costs have not been allocated to the MES.

The Project's indirect costs are BC Hydro Project Management; Engineering; Indigenous Relations; and Regulatory, Environment, Stakeholder and Properties staff time and costs. As explained in our response to BCUC Staff IR 1.4.5, the sorting and transportation of the MES was done in parallel with the production and transportation of rock for placement on the dam. This was therefore not a critical path activity and did not extend the Project schedule. Therefore, there was no measurable MES indirect cost. For this reason, BC Hydro has not allocated any indirect costs to the MES as noted in BC Hydro's response to BCUC Staff IR 1.4.7.

Note 17. No reserve draws were required on the Project.

6 Project Schedule Milestones

The table below shows the plan and actual dates for key Milestones on the Project.

Table 4 Project Milestones

No.	Description/ Status	Original Plan Date	Actual (A) or Forecast Date	Status and Comments
1.	Signing of the Interim Agreement with PKS to complete early construction work.	NA	Jul 2016 (A)	More time was taken with up-front planning through the ECI process in order to plan for future risks, and to work closely with the contractor on development of a good construction methodology. This supported the Project being delivered efficiently, early, and under budget.
2.	Completion of ECI process ahead of the main civil contract	Apr 2016	Aug 2016 (A)	
3.	Mobilization and Start of Construction Activities	Jun 2016	Sep 2016 (A)	
4.	Award of Main Civil Contract	Jun 2016	Aug 2016 (A)	
5.	Finalisation of Contract Terms and Contract Signing	NA	Sep 2016 (A)	
6.	Start of Quarry Operations	Jun 2016	Sep 2016 (A)	
7.	Completion of Quarry Access Road Upgrades	Aug 2016	Dec 2016 (A)	
8.	Start of Riprap Placement on Dam	Mar 2017	Mar 2017 (A)	
9.	Final-Placement-In-Service-Date	Nov 2019	Apr 2018 (A)	Completed 1.5 years early due to favourable water levels to support dry placement and no delays due to materialised risks
10.	Substantial Completion of Quarry Reclamation	Sep 2020	Sep 2018 (A)	Early
11.	Completion of deficiencies and remaining road work on Dam Crest Road	N/A	Jun 2019	N/A
12.	Project Completion	Jul 2021	July / August 2019	Expected Early

7 Individual Contracts Exceeding $3 million

The only individual contract exceeding $3 million on the Project is the contract with PKS for quarry development; supply, delivery and placement of riprap, access road upgrades and maintenance, and provision of the MES.

From March through August 2016, BC Hydro and PKS worked on and completed the Open Book ECI process as referenced in the Application. This was a longer process than planned (refer to the milestone summary in section 6). The final contract terms were substantially complete in July. At that time, schedule-critical early site works also needed to be advanced to support the first year's riprap placement in spring 2017. In order to mitigate this schedule risk, BC Hydro and PKS entered into an interim agreement in July 2016 covering these early works. These included contractor mobilization to site, access road upgrades and quarry site preparations. The value of the interim agreement was [redacted].

On August 31, 2016, BC Hydro filed an updated cost schedule with the BCUC which included a total contract estimate of [redacted][4] including the early works in the interim agreement and quarry reclamation work. This was the same as had been provided to the BCUC during the Application process because the procurement process was not yet complete. The MES amount was not included in the reported amount as the related expenditure was not approved by the BCUC. The estimate for the MES at that time was [redacted] bringing the total estimated amount for the contract to [redacted].

The estimate included an initial estimate of [redacted] for the Quarry Reclamation work.

[4] This is the amount included in the internal Expected and Authorized Amounts, which is referred to as the Reference Amount in BCUC documentation.

The final details of the contract were completed and the contract was signed on September 30, 2016. The final contract amount was [redacted] including the interim agreement amount plus [redacted] for the Quarry Reclamation work, plus [redacted] for the MES portion of the contracted work. The main reason that this price was lower than the PKS estimate included in the Application was that it was based on a target Yield of [redacted] whereas the Application estimate was based on a base Yield assumption of [redacted].

Subsequent to Award of the contract, the Quarry Reclamation work was removed from the contract and awarded to a First Nations contractor and the size and the volume of the MES rock was reduced. The revised forecast PKS contract amount is now [redacted] as shown in the table below.

Table 5 Summary of Contracts Exceeding $3.0 million[1]

	A	B	C	D
Description Supplier and Scope of Supply[1]	**Reference Expected (Plan) Amount ($ million)**	**Initial Contract Value[2] ($ million)**	**Forecast Contract Cost[3] ($ million)**	**Actuals to March 31, 2019[3] ($ million)**
PKS excluding the MES and the quarry reclamation work	[redacted]	[redacted]	[redacted]	[redacted]
quarry reclamation (estimated or contracted) amount removed from the contract	[redacted]	[redacted]	Removed from the contract	Removed from the contract
Subtotal	[redacted]	[redacted]	[redacted]	[redacted]
MES (excluding IDC)	[redacted]	[redacted]	[redacted]	[redacted]
PKS including the MES & quarry reclamation work	[redacted]	[redacted]	[redacted]	[redacted]

1 Addition errors may occur due to rounding.
2 Estimated value at the time the contract was signed, after removing the Quarry Reclamation amount and excluding the MES amount.
3 The forecast cost includes $54,000 in forecast remaining road works which is not included in the actuals. The first and third row numbers in the last two columns appear the same only due to rounding.

The table below shows a breakdown of the key cost variances from the original PKS base contract amount of [redacted] (excluding the MES work and including the quarry reclamation contracted amount) to the actual contract cost of [redacted]. The cost changes are grouped by the PKS cost categories shown in Table 2. The cost categories are: Quarry Reclamation; Quarry Development; Supply, Delivery and Placement; and Road Access Upgrades and Maintenance.

Note that the variance amounts and explanations in the table below are different from those provided for the PKS costs in Table 2; the table below compares the final costs to the signed contract value which was finalised in September 2017, and Table 2 compares the actuals to the First Full Funding (or the Expected Amount or the Reference Estimate) which was included in the BCUC Application. Table 6 below is based on the table filed with the BCUC in BCUC Staff Confidential IR 1.2.1 in July 2018.

Table 6 PKS Contract Cost Changes

	Description	July 2018 IR Response Forecast	Revised Actuals/ Forecast	Change	Reason for Change from the Base Contract [Change from July 2018 Forecast (**2018F**) BCUC IR Response in brackets.]
[redacted]					

	Description	July 2018 IR Response Forecast	Revised Actuals/ Forecast	Change	Reason for Change from the Base Contract [Change from July 2018 Forecast (**2018F**) BCUC IR Response in brackets.]
[redacted]					

	Description	July 2018 IR Response Forecast	Revised Actuals/ Forecast	Change	Reason for Change from the Base Contract [Change from July 2018 Forecast (**2018F**) BCUC IR Response in brackets.]
[redacted]					

In addition to the changes below, there was a change in the MES volume and size which reduced the cost. The direct estimate included in the signed contract was [redacted]. The final cost was [redacted].

8 Indigenous Relations Engagement Activities

A summary of the consultation and engagement activities that occurred up to the date of the filing of the BCUC Application for the Project is contained in the Application. On May 27, 2016, the BCUC issued Order No. G-78-16 stating that the BCUC concluded that BC Hydro's consultation with First Nations was adequate. A high level summary of consultation and engagement activities, including activities which took place after the BCUC issued Order No. G-78-16, is as follows:

1. BC Hydro notified Treaty 8 First Nations with initiation of the Project in December 2011. Engagement continued through the submission for a Temporary Use Permit (**TUP**) for the proposed the Quarry to the Ministry of Forests, Lands and Natural Resources Organisation. Site visits to the proposed Quarry and the Dam were arranged for Treaty 8 First Nations as part of the TUP application process.
2. All Treaty 8 First Nations were informed of the Archaeological Impact Assessment (**AIA**) at the Quarry, and individual members of the First Nations participated in the AIA.
3. During the Identification and Definition Phases of the Project, further site visits and regular engagement meetings occurred with Treaty 8 First Nations to provide updates on the Project's progression, answer questions about the Project, and address concerns regarding environmental impacts.
4. Treaty 8 First Nations were consulted during the process of submission of Licence of Occupation Permit applications for the Quarry and access to the Quarry. As well, two options for transporting riprap from the Quarry to the Dam (a land option and a marine option) were discussed with the Nations.
5. Capacity funding was provided to several of the Treaty 8 First Nations to undertake Traditional Use Studies (**TUS's**) and other studies to inform the Project and assist in Project planning.

6. During the ECI process, contract submission documents were sent to Treaty 8 First Nations for review and comment, and many of their concerns were addressed either prior to or during construction. The following improvements were made to the Project plan as a result of consultation and engagement with First Nations:

   (a) Construction work occurred primarily during winter which mitigated the impact of dust on areas that are adjacent to the Quarry and the roads;

   (b) The Project plan was modified so that water was sourced from Williston Lake rather than creeks located near the Quarry; and

   (c) The density of seeding and tree planting was increased above what was prescribed in the Project's original Quarry Reclamation Plan.

7. Where mitigation measures suggested by First Nations were not incorporated into the final construction plans, BC Hydro further consulted with First Nations and communicated the rationale for not doing so.

8. BC Hydro's independent environmental monitor hired environmental monitors from the First Nations. These monitors were hosted by BC Hydro's independent environmental monitor for on-site visits, and BC Hydro provided monthly updates on the construction and environmental activities to First Nations on an extranet website. Site visits were also scheduled with interested First Nations.

9. Construction and environmental updates were provided to First Nations monthly from the start of construction in summer 2016 to the completion of construction in fall 2018.

10. PKS, BC Hydro and First Nations worked together to identify contract, services and employment opportunities on the Project. As a result, five First Nations were contracted to work on the Project. The values of these items during the Implementation Phase are tabulated below.

Table 7 First Nations Sub-Contract Amounts

Items	Amounts ($ million)
FN Implementation Subcontracts	[redacted]
FN Quarry Reclamation Contract	[redacted]
FN Services	[redacted]
FN Direct Employment ([redacted] Hours Worked)	[redacted]
Final Total:	[redacted]

9 Key Areas of Environmental and Archaeological Management

Key areas of environmental management included dust management and monitoring, water quality measures including sediment and erosion control measures at watercourses, oil spill prevention measures, and wildlife management plans including migratory bird surveys. Archaeology assessments were also completed.

Environmental risks were managed through BC Hydro's Environment Management Plan (**EMP**) with support of the PKS Environmental Protection Plan (**EPP**). Key objectives of the BC Hydro's EMP were:

1. To identify any elements of the Project work that could present a risk to the environment;
2. Description of work procedures to be undertaken to minimize and mitigate adverse impacts to the environment; and,
3. Description of work procedures to be undertaken in the event of an incident to contain and limit impacts to the environment.

PKS' EPP described how they would meet the requirements of the EMP. The EPP identified PKS' approach to ensuring compliance with the regulatory obligation and BC Hydro's requirements for all activities conducted by PKS and their subcontractors. Key sections of the EPP included the following plans:

1. Air Quality and Dust Control;
2. Archaeological and Fossil Management;
3. Blast Management;
4. Contaminated Sites Management;
5. Environmental Training and Awareness;
6. Hazardous Waste Management;
7. Erosion and Sediment Control (including road access, quarry, stockpile, and dam face site plans);
8. Noise Management;
9. Spill Prevention and Emergency Response;
10. Waste Management (including a specific dam face water quality monitoring plan);
11. Water Quality Management;
12. Wildlife Management (including a Caribou Management Plan); and
13. Hazardous Materials.

Most of the quarry work and transport was conducted in the winter months which mitigated dust and watercourse sediment and erosion impacts as the ground was frozen and covered with compact snow.

Pre-construction wildlife features surveys were conducted at the Quarry and the MSA prior to construction. A caribou overview was completed prior to the start of the critical caribou timing window. No caribou were noted immediately south of the project and none were encountered during the Project.

9.1 Environmental Monitoring

Environmental monitoring was undertaken throughout the Implementation Phase. PKS provided a full-time Environmental Monitor on-site for the majority of the Project. PKS produced monthly environmental monitoring reports as required by the BC Hydro EMP. BC Hydro conducted Environmental Auditing of the project with assistance of First Nations representatives. BC Hydro environmental observations were discussed with the PKS Environmental Monitor at the time of each audit visit, and this was followed by an audit report from PKS to BC Hydro.

9.2 Water Act Approval

BC Hydro obtained a Water Sustainability Act (**WSA**) Approval on June 8, 2015 for the placement of the riprap within the wetted portion of the Williston Reservoir. The WSA Approval included a number of conditions and a requirement that BC Hydro submit a post-construction completion report within 60 days of work completion as per Condition #16 of the WSA Approval. The WSA Approval completion report was submitted February 12, 2019. It detailed the sequence of work activities, work completed, and environmental monitoring reports.

9.3 Archaeological and Heritage Risk

An archaeological and fossil management plan was developed at the start of the Project that provided chance-find procedures for heritage or archaeological sites and fossil deposits. An Archaeological Impact Assessment indicated the Project area was low risk. No chance-finds were made during the execution of the Project.

10 Safety Activities

10.1 Safety Risk Management

Most of the safety measures for this project targeted completing the riprap replacement safely and without having any dam safety incidents. Another safety target was improving the safety of the dam crest road.

A Hazard Log was initially developed for the project in February 2014. The hazards were identified and addressed in the design of new riprap including engineering field investigations, material collection, transport and construction. A list of key safety hazards addressed in the preliminary design of the project is as follows:

1. **Slope instability near the crest of the dam.** Existing steep slopes on the upstream face of the dam were identified as a safety hazard for the vehicles on the dam crest roadway, as loading (e.g., traffic) could cause slope failure near the crest. The riprap upgrade has significantly reduced the risk of slope failure and consequent damage by improving slope stability of the upstream face of the dam.
2. **Inadequate barrier beside the dam crest roadway.** The existing dam crest roadway had undersized barriers on both sides to prevent vehicles driving-off the roadway. In order to improve safety for dam crest traffic, new standard road barriers were installed which meet the design requirements of the BC Ministry of Transportation.
3. **Subsidence of area near sinkhole #1.** Sinkhole #1 is a weak spot located on the dam crest. Any subsidence of the sinkhole area was identified as a severe safety hazard for the construction workers and for the public. During construction a bridge was installed over Sinkhole #1 which mitigated the risk of ground subsidence.
4. **Inadequate load capacity of the spillway bridge.** The existing spillway bridge was not designed to support the loading from haul trucks required for riprap

upgrade construction. Therefore, inadequate load capacity of the existing spillway bridge was identified as a safety hazard for construction traffic. During construction, a temporary upgrade of the spillway bridge was completed to reduce the risk of bridge failure.

5. **Collision of construction vehicle with public vehicle.** Collision of trucks carrying material for the riprap project with public vehicles on the road, especially on the steep and uneven roads to/from the quarry site, was identified as a safety hazard. Risk of collision on the road was mitigated though upgrade of the roads with adequate pull-outs and signage, and requirements for the contractor to use appropriate vehicles and radio communication. In addition the road across the dam was closed to the public during placement of the riprap on the dam.

6. **Theft of explosives from the quarry site.** A lot of explosives were stored near the quarry site during construction. It was identified that theft of explosives can pose a serious risk for public safety. During Construction unauthorized access to the quarry site was prohibited and mining acts and regulations governing explosives were strictly followed.

7. **Access to spillway log boom anchor.** The existing spillway log boom anchor block is located on a steep slope of the upstream face of the dam. Operations personnel periodically inspect the anchor block and disconnect the boom a number of times each year. It was identified that there was risk of slip and fall in the existing condition. Improved access by way of stairs and a ladder will be implemented as part of the Project.

10.2 Safety Inspections and Orders

10.2.1 WorkSafeBC Inspection

One WorkSafeBC (**WSBC**) Inspection was conducted for the Project. This occurred on May 12, 2017 during dam site activities for the debris boom anchor and equipment maintenance at the spillway laydown area. No orders resulted from this inspection.

10.2.2 Ministry of Energy and Mines Inspections

There were three inspections at the Sand Flats Quarry conducted by the Ministry of Energy and Mines and seven orders resulted from those inspections. Remedial actions were taken and all orders have been closed.

1. The first inspection was completed on November 6, 2016. The inspection consisted of a review of the traffic plan, Joint Occupational Health & Safety Committee (**JOHSC**) requirements, review of equipment logbooks, and discussions on emergency response requirements and access control. One order resulted in relation to use of electronic daily vehicle inspections as an equipment logbook system. PKS trained their workers on how to look up previous electronic daily vehicle inspections and submitted notification back to the Ministry.
2. The second inspection was completed on May 10, 2017. The areas inspected included the general pit, access, and the breaker screen deck (Lippmann Processing Plant). Two Orders resulted from the inspection. The first order related to deficient screen and breaker guarding on the head pulley. All accessible pulleys were to be guarded immediately and all other pulleys were to be guarded past the nip point. The second order was for a fire extinguisher that was not secured.
3. The final inspection was completed on September 12, 2017 at the Quarry. Four orders resulted from this inspection. The first order related to the access to

the lower Cougar Dump and dump procedures. The Cougar Dump lacked effective berms around the perimeter and the trucks were approaching the dumps on their blindside making it difficult to tell the distance to the berm. The second order related to deficient emergency lighting in the maintenance shop which was built at the quarry to maintain the large equipment. The third order related to the accessibility of the eyewash station in the shop. The eyewash station was located in a separate room from the shop which was deemed to possibly be difficult to find in an emergency. The fourth and final order related to the ventilation at the hose cutting station. The cutting area had an exhaust fan mounted in it about two meters from the cutter and did not provide effective ventilation for dust and gases.

11 Risk Management

The key risks on the Project and their treatments are tabulated below. There were no known incremental risks that occurred during the Project implementation.

Risk Item #	Risk Event	Treatments	Residual Probability and Impact that had been reported during the Project	Outcome
Cost and Schedule Risk				
1.	Productivity or Yield at the quarry is less than expected	• Exploratory geological and blasting investigations of quarry prior to construction • Third party review of quarry Yield • Contingency added in approved budget • Rigorous RFP process for contractor selection ECI process to develop construction plans and competitive pricing for possible materialised risk • Specialist oversight used to optimize quarry operations • Transport route repair and potential upgrade • ECI process Contingency in estimate	• Probability – low • Impact – medium to high	Materialised risk. The Yield was lower than plan. Because this risk was anticipated, it was covered in contingency.
2.	MES Cost not recoverable in rates	• Explanation included in the 2020/21 RRA as allowed for in the BCUC Order.	• Active	BC Hydro is reporting on the MES cost and is seeking to recover this cost in the Fiscal 2020 to Fiscal 2021 Revenue Requirements Application, as allowed for in Order No. G-78-16.

Risk Item #	Risk Event	Treatments	Residual Probability and Impact that had been reported during the Project	Outcome
3.	Breakage of rock during transport more than expected (This name has been revised to clarify the risk.)	• Contingency in estimate • Rigorous RFP process for contractor selection • Access road repairs & upgrades • ECI process • Construction period maintenance of upgraded access roads • Construction management oversight Transfer risk (to the contractor) of losses during transport from the quarry to the MSA – Risk of losses during transport from the MSA to the dam retained • Contingent rock quarried to account for anticipated losses and to avoid reactivating quarry operations	• Probability – low • Impact – low	During implementation, BC Hydro and PKS realised it was very difficult to ascertain whether splitting was due to transport, weather, or rock quality. Therefore, the payment to PKS under the contract, for the transfer of this risk to PKS, was paid back to BC Hydro and BC Hydro took back this risk. The Yield % referenced in row 1 above includes losses during transport.
4.	Breakage of rock during placement more than expected	• Geotechnical investigations • Riprap placement test sections completed in definition • Contingency added in approved budget • RFP process • ECI process • Riprap placement test panel completed at the MSA • Material stockpile near Dam • Third party constructability review • Construction management oversight • Contingent rock quarried to account for anticipated losses and to avoid reactivating quarry operations	• Probability – low • Impact – low to medium	The methodology for loading and unloading of Class 1 riprap was finalized during the ECI process which determined that each Class 1 stone would be individually loaded / unloaded during transporting and placement on the dam to minimize breakage. Final breakage due to handling was insignificant (<1%).

Risk Item #	Risk Event	Treatments	Residual Probability and Impact that had been reported during the Project	Outcome
5.	Construction delays due to reservoir elevation	• Third party constructability review • ECI process • Contingency in estimate • Weekly updates of reservoir elevation forecasts • Construction management oversight	• Probability – very low • Impact – medium	No delays due to reservoir elevation. A treatment plan that was followed and should have been noted in the business case was early and ongoing regular engagement of Generation System Operations.
Construction Risk				
6.	Quality materials placement cannot be achieved at dam site	• Riprap placement test sections completed in definition • Test panel completed at MSA in implementation • Third party constructability review • Project Quality Plan • ECI process • Erosion zone placement in dry reservoir • Construction management oversight	• Probability – low • Impact – low to medium	Same as 4 above
7.	Construction activities impact dam slope or sinkhole stability	• ECI process - jointly developed response plans • Instrumentation and monitoring • Temporary bridge or bypass • Construction management oversight	• Probability – low • Impact – low to medium	During Construction a bridge was installed over Sinkhole #1 and monitoring was conducted along the upstream edge of the dam crest road and at Sinkhole #2, which mitigated these risks.

Risk Item #	Risk Event	Treatments	Residual Probability and Impact that had been reported during the Project	Outcome
Safety				
8.	Worker construction hazards	• Safety Management Plan • Emergency response plans • Adherence to Mines Act • Construction management oversight	• Probability – low • Impact – low to medium	There were no reportable safety incidents on the Project and no lost time injuries. There was one WorkSafeBC inspection in May 2017 with no Orders written. There were also three inspections by the Ministry of Energy, Mines and Petroleum Resources with seven Orders written. Corrective actions were completed within the timelines specified in the Orders and the seven Orders are closed.
9.	Public and Worker vehicle traffic safety hazards	• Communication plan • Traffic management plan • Traffic signals and speed control on transport route • Trained and experienced truck drivers • Construction management oversight	• Probability - low • Impact – low to medium	No significant issues. See also #8 above.

Risk Item #	Risk Event	Treatments	Residual Probability and Impact that had been reported during the Project	Outcome
Environmental				
10.	Contractor unable to meet conditions of the Environmental Management Plan	• Transferred to PKS through the Project Agreement • Measurement of turbidity levels in the fish bearing streams along Table Road in summer 2015 for baselining purposes • PKS's Environmental Protection Plan (**EPP**) which was based on BC Hydro's Environmental Management Plan requirements • Contractor-provision of an environmental monitor on site. • BC Hydro's environmental monitor at site regularly audited the site together with the First Nations environmental monitor.	• Probability – low • Impact – low to medium	No significant issues.

12 Photographs

Figure 1 WAC Bennett Dam Riprap Project Completion

Figure 2 Before and after Riprap Placement

Figure 3 Sandflat Quarry at the end of Quarrying before Reclamation

Figure 4 Top-Soil Distribution during Reclamation

Figure 5 Hydro-seeding after Filling and Smoothing of Topsoil