



March 14, 2016

File: 76975-35/Bridge

Maureen DeHaan
Water Resource Specialist
BC Hydro
9-6911 Southpoint Dr
Burnaby BC V3N 4X8

Via Email: Maureen.DeHaan@bchydro.com

Dear Ms. DeHaan:

Re: Section 93 Order – Terzaghi Target Flow Release and Annual Water Budget

British Columbia Hydro and Power Authority is the operator of the Terzaghi Dam. A Section 87 & 88 Order dated March 30, 2011 under the *Water Act* directs the implementation of the operating parameters and procedures of the Bridge River Water Use Plan.

Clause 8 of the Order reads as follow:

8. For the period between May 1, 2011 and April 1, 2015, the licensee shall discharge from Terzaghi Dam to the Bridge River the equivalent to an annual water budget of 6.0 cubic metres per second (cms) and target the following monthly flows:

<i>DATE</i>	<i>TARGET FLOW (CMS)*</i>	<i>DATE</i>	<i>TARGET FLOW (CMS)*</i>
<i>Jan 1</i>	<i>1.5</i>	<i>Aug 2</i>	<i>11.0</i>
<i>Feb 1</i>	<i>2.0</i>	<i>Aug 8</i>	<i>9.3</i>
<i>Mar 1</i>	<i>3.0</i>	<i>Aug 9</i>	<i>7.7</i>
<i>Apr 1</i>	<i>6.0</i>	<i>Aug 16</i>	<i>6.4</i>
<i>Apr 15</i>	<i>8.5</i>	<i>Aug 17</i>	<i>5.1</i>
<i>Apr 23</i>	<i>11.0</i>	<i>Aug 23</i>	<i>4.1</i>
<i>May 1</i>	<i>11.0</i>	<i>Aug 24</i>	<i>3.0</i>
<i>May 7</i>	<i>13.0</i>	<i>Sept 1</i>	<i>3.0</i>
<i>May 21</i>	<i>14.0</i>	<i>Oct 1</i>	<i>1.5</i>
<i>Jun 1</i>	<i>15.0</i>	<i>Nov 1</i>	<i>1.5</i>
<i>Jul 1</i>	<i>15.0</i>	<i>Dec 1</i>	<i>1.5</i>
<i>Aug 1</i>	<i>12.9</i>		

**The transition between target monthly flows may occur up to ±5 days of the beginning of each month. Target monthly flows less than 5.0 cms may vary instantaneously by ±0.25cms from the target flow. Target monthly flows greater than 5.0cms may vary instantaneously by ±5%. The total annual flow will be determined on a calendar year basis and may vary ±5%.*

.../2



A variance order was granted to BC Hydro on May 8, 2012, which gave BC Hydro the approval to implement the above target flow schedule at Terzaghi Dam, which has an annual water budget of 6.0cms. BC Hydro has been directed by the Comptroller of Water Rights, in a letter dated May 28, 2015, to operate under this annual water budget until a decision under Clause 9 of the Bridge WUP Section 87 & 88 Order dated March 30, 2011 under the *Water Act* is made. Clause 9 requires the determination of a long term flow release strategy for Terzaghi Dam

In a letter dated March 2, 2016, Ms. Maureen DeHaan requested a variance order to the Bridge WUP Order (March 30, 2011) Clause 8 to modify the discharge from Terzaghi Dam to the Bridge River outside the boundaries of an annual water budget of 6.0cms.

I understand that as per the BC Hydro's February 6, 2015 notification to our office, BC Hydro is modifying the operations at Downton Reservoir by lowering the maximum Normal Reservoir level from elevation 749.8m to elevation 734m. I recognize that this is being implemented as an interim dam safety risk reduction measure to address seismic and seepage deficiencies at La Joie Dam until capital improvements can be initiated in 10-15 years.

In addition, I understand that since February 2015 a number of Bridge 1 and 2 Generating Station units have been de-rated reducing the discharge capacity from 160cms to about 110cms. I acknowledge that upgrades to these units are planned to occur over the next 5-6 years. I recognize that due to the reduction in generating station discharge capacity and the higher than normal reservoir levels at Downton and Carpenter Reservoirs through the fall of 2015, increased discharges in 2016 at Terzaghi Dam and down the Lower Bridge River are required in order to move water out of Downton and Carpenter Reservoirs to maintain Downton Reservoir at or below 734 m.

Under the Bridge WUP Order signed March 30, 2011, Section 18 identifies the priorities that BC Hydro is to follow when implementing operations. Dam safety requirements are the first priority, followed by flood routing requirements, and thirdly the Terzaghi target flow schedule. I recognize that the proposed increase to the Terzaghi flow releases are different then described under Section 9 of the Bridge WUP order which contemplated a recommended long term flow release strategy from Terzaghi Dam to be not less than annual water budget of 3.0cms and not to exceed an annual water budget of 6.0cms. I note that due to the requirements to manage the dam safety risk at LaJoie Dam, the recommended flow strategy as required by Clause 9 of the Bridge WUP Order will need to be deferred.

To manage the variation and uncertainty of inflows to the Downton and Carpenter Reservoirs, which determine the volume of water to be discharged downstream, BC Hydro is requesting a variance order to release between an operationally feasible target minimum of about 0.8cms and a target maximum of 55cms to the Lower Bridge River at all times. I note that these releases represent an annual average water budget range of between 6.0cms and 22cms (90th percentile of historical annual inflows). The table below outlines the requested Terzaghi hydrograph target flows for an annual budget of between 6.0cms and 22cms:

Date	Target Flows (cms): Annual Budget 6 cms	Date	Target Flows (cms): Annual Budget 22 cms
Jan 1-31	1.5	Jan 1-31	1.5
Feb 1-29	2	Feb 1-29	2
March 1-31	3	March 1-14	3
April 1-13	6	March 15-17	25
April 14-21	8.5	March 18-20	31
April 22- May 5	11	March 21-April 7	37
May 6-19	13	April 8- May 15	47
May 20-30	14	May 16- 31	53
May 31- July 30	15	Jun 1- July 9	55
July 31	12.9	July 10	48
Aug 1-6	11	July 11	41
Aug 7	9.3	July 12	35
Aug 8-14	7.7	July 13	29
Aug 15	6.4	July 14- Aug 9	24
Aug 16-21	5.1	Aug 10-18	20
Aug 22	4.1	Aug 19-23	18
Aug 23- Sept 29	3	Aug 24	15
Sept 30- Dec 31	1.5	Aug 25	13
		Aug 26	11
		Aug 27	9.3
		Aug 28	7.7
		Aug 29	6.4
		Aug 30	5.1
		Aug 31	4.1
		Sept 1-12	3.5
		Sept 13-26	2.8
		Sept 27	1.9
		Sept 28	1.2
		Sept 29- Dec 31	0.8

I understand that the total annual flow has been estimated in February 2016 and will be updated monthly until May 2016 to account for changes in the freshet inflows. I acknowledge that the current estimate based on February 2016 inflows is estimated to be a 14cms annual flow average. In any case I note that the preference is to reach a peak of up to 55cms starting June 1 for at least one week to conduct gravel movement testing.

I understand that BC Hydro will operate the Terzaghi flows between a 6.0cms and 22.0cms annual water budget. The transition between target flows will occur as outlined in the table above, in addition to meeting the ramping rates as outlined by Clause 10 of the Bridge Water Use Plan Order (March 31, 2011). The target monthly flows less than 5.0cms may vary instantaneously by ± 0.25 cms from the target flow. Target monthly flows greater than 5.0cms may vary instantaneously by $\pm 5\%$. BC Hydro will contact the Comptroller of Water Rights immediately for flow scenarios that fall outside of 6.0cms and 22.0cms and will notify and/or gain support, when required, from the Department of Oceans and Fisheries and the Ministry of Forest, Lands and Natural Resource Operations (fisheries).

I recognize that the Terzaghi flow range will be used to manage the upper reservoirs per the Dowton Interim Risk Management Plan and the Bridge WUP Order Clause 7 for Carpenter Reservoir. I understand that this Terzaghi flow range is not intended for meeting flood routing requirements per Bridge Water Use Plan Priority 2 under Clause 18. BC Hydro will still be required to meet the ramping rates as outlined by Clause 10 of the Bridge Water Use Plan Order (March 31, 2011).

I understand that the hydrographs have been developed with input from the Department of Fisheries and Oceans (DFO), Ministry of Forest, Lands and Natural Resource Operations (Fisheries), and the St'at'imc technicians through workshops held January 12, 2016, February 4, 2016, and February 16, 2016. I acknowledge that the St'at'imc have identified a number of concerns associated with the proposed higher flows and the term of the modified operations at LaJoie Dam. I note that Both Department of Fisheries and Oceans and the Ministry of Forest, Lands and Natural Resource Operations (Fisheries) endorse the variance order, but emphasize the need to ensure that the Bridge System infrastructure is returned to full functionality as soon as possible.

Under Section 93 of the *Water Sustainability Act*, I approve the increase in flows at Terzaghi Dam to be between 6.0cms and 22.0cms for the period of March 15, 2016 to April 1, 2017 as outlined above. The transition between target flows will occur as outlined in the table above, in addition to meeting the ramping rates as outlined by Clause 10 of the Bridge Water Use Plan Order (March 31, 2011). The target monthly flows less than 5.0cms may vary instantaneously by ± 0.25 cms from the target flow. Target monthly flows greater than 5.0cms may vary instantaneously by $\pm 5\%$. BC Hydro will contact the Comptroller of Water Rights immediately for flow scenarios that fall outside of 6.0cms and 22.0cms and will notify and/or gain support, when required, from the Department of Oceans and Fisheries and the Ministry of Forest, Lands and Natural Resource Operations (fisheries). BC Hydro is required to submit to the Comptroller of Water Rights office by September 30, 2016 an output of the actual flows released from the Terzaghi Dam for the period of January 1 to August 31, 2016. In addition, BC Hydro will be financially responsible for any Bridge Water Use Plan physical works monitoring that have been implemented and are affected by the increased flows at Terzaghi Dam.

Please keep me apprised of any changes as you progress through the above time period.

Yours truly,

A handwritten signature in black ink, appearing to read 'G. Davidson', written in a cursive style.

Glen Davidson, P.Eng.
Comptroller of Water Rights

pc: Ted Down, Manager, Conservation Science, Ecosystems Branch, MoE
Rich McCleary, Regional Aquatic Ecologist, Thompson-Okanagan Region, FLNR
Dan Sneep, Habitat Assessment Biologist, DFO
Chief Don Harris, Chair, St'at'imc Chiefs Council, Lillooet, BC