



April 29, 2015

File: 76915-20/D720001-00 & D720002-00

E.C. (Ted) Swabey
City Manager
City of Nanaimo
455 Wallace St
Nanaimo BC V9R 5J6

Dear Mr. Swabey:

Re: Middle Chase River Dam and Lower Chase River Dam – Replacement Order

On April 9, 2015, the City of Nanaimo (the City) was issued an order to correct the potential safety hazard of Lower Dam by selecting one of two remediation options acceptable to our office, by providing a plan for the selected option and by implementing that plan no later than the end of 2015, and, thereafter, to take actions to correct the potential safety hazard of Middle Dam.

At a meeting with this office on April 22, 2015, a third potential remediation option, which would involve an overtopping protection approach along with other features, was proposed to us by the City. On April 28, 2015 our office received a request from the City to amend the April 9, 2015 order to allow time for the City to further develop the proposal for a third option for the potential remediation of Lower Dam and to extend the timeframes in the April 9, 2015 order by 30 days.

Please find attached a new order, issued pursuant to Section 87 and Section 88(1)(d) of the *Water Act*, revoking my April 9, 2015 order and replacing it with the attached order directing the City of Nanaimo to correct the potential safety hazard of Middle Dam and Lower Dam by implementing an approach acceptable to this office. Please be reminded that should the proposed third option be the City's remediation option of choice, the City must retain an independent expert, satisfactory to the Comptroller, with qualifications and experience as described in the order, and provide their report on the issue to me in accordance with Section 12, BC Dam Safety Regulation, *Water Act*.

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Ministry of Forests, Lands &
Natural Resource Operations

Resource Stewardship
Division

Office of the Comptroller of
Water Rights
Water Management Branch

Dam Safety Section

Mailing Address:
PO Box 9340 Stn Prov Govt
Victoria BC V8W 9M1

Location:
3rd Floor, 395 Waterfront Cres
Victoria BC V8T 5K7



A right of appeal to my Order lies to the Environmental Appeal Board. Notice of any appeal must (1) be in writing, (2) include grounds for the appeal, (3) be directed by registered mail or personally delivered to the Chair, Environmental Appeal Board, 4th Floor, 747 Fort Street, PO Box 9425 Stn Prov Govt, Victoria, BC V8V 9V1, (4) be delivered within 30 days of receiving this Order; and (5) be accompanied by a fee of \$25, payable to the Minister of Finance.

You are also reminded that Section 92(9) of the *Water Act* states that: "An appeal does not act as a stay or suspend to operation of the Order being appealed unless the appeal board orders otherwise".

Yours truly,

A handwritten signature in black ink, appearing to read 'G. Davidson', with a long horizontal flourish extending to the right.

Glen Davidson, P.Eng.
Comptroller of Water Rights

pc: John Baldwin, Dam Safety Officer, Regional Operations, FLNR, Nanaimo
Toby Seward, A/City Manager, City of Nanaimo

ORDER

Sections 87 and 88

Water Act of British Columbia

Dam File No.: 76915-20/D720001-00 & D720002-00

Water Licence File No.: 0355097 & 0355174

IN THE MATTER OF Conditional Water Licences C061424 and C061423, held by the City of Nanaimo (the City), which authorize the storage of 75 acre feet of water behind the Middle Chase River Dam (Middle Dam) and 140 acre feet of water behind Lower Chase River Dam (Lower Dam), as part of the Colliery Dam system on Chase River.

WHEREAS engineering consultant, Golder Associates (Golder), was retained by the City to be technical advisor to the City's Colliery Dam Technical Committee (TC). The TC's mandate was to identify an environmentally minimally invasive, cost and time effective remediation solution for the Colliery (Middle and Lower) Dam system that meets safety standards, among other things. The mandate also included the development of a permanent solution to be put in place in 2014 if possible, but not later than 2015, with shorter term mitigation put in place, if required, in 2014;

WHEREAS the focus was primarily on the remediation of Lower Dam as Golder had determined that Middle and Lower Dams act together as a system, with Lower Dam largely controlling downstream consequences. For this reason, Golder determined that the remediation of Lower Dam would provide greatest reduction in risk to those living downstream of the dams, and remediation of this dam should be given highest priority. Golder indicated, in its report, Dam Remediation Options (August 29, 2014), that the remediation of the Middle Dam would be addressed separately at a later date;

WHEREAS Golder undertook a number of studies and produced several reports including their Hydrology, Hydraulics and Middle Dam Breach Analysis (July 25, 2014) which determined that Middle and Lower Dam's spillways both have inadequate flood routing capacity to pass the design flood event which could result in the dams overtopping. The report states (pg i, Executive Summary):

"These calculations have determined that the spillway for the Middle Dam has the capacity to convey the flows associated with approximately the 50-year (2% annual exceedance probability) rainfall event. Storms larger than the 50-year overtop the dam embankment. The spillway for the Lower Dam has the capacity to convey the flows associated with approximately the 25-year (4% annual exceedance probability) rainfall event. Storms larger than the 25-year overtop the dam embankment."

WHEREAS Golder calculated the existing flood routing capacity of Lower Dam to be 55.0 cubic meters per second (cms), equivalent to a 1 in 25 year flood event;

WHEREAS Golder reviewed the failure consequence classification for Lower Dam and concluded that a *very high* classification was appropriate;

WHEREAS in Canada, current practice for selection of the design flood event for dam safety is suggested in Table 6-1B in the Canadian Dam Association's (CDA) Dam Safety Guidelines (2013);

WHEREAS, with respect to flood routing capacity for Lower Dam, Golder states (pg. 17, Colliery Dams, Nanaimo, BC, Report on Dam Remediation Options, Golder, August 29, 2014):

"...the risk of dam collapse due to flood events is significant and must be addressed by dam remediation to improve flood routing characteristics of the dam. The required flood routing capacity is given by the Table 6.1 CDA Guidelines, and is based on the Consequence Classification of the dam. For a Very High consequence dam, the dam must be able to pass a flood at least the equivalent of 2/3 of the way between a 1000 year and a PMF flood..."

WHEREAS in accordance with CDA Table 6-1B Golder calculated the design flood event of Lower Dam, a *very high* consequence dam, to be a total peak outflow of 144.0 cms. A total peak outflow of 144.0 cms is 2.6 times greater than the calculated 55.0 cms flood routing capacity of Lower Dam's current spillway;

WHEREAS insufficient flood routing capacity is considered a *potential safety hazard* as it may lead to overtopping and possible failure of the dams;

WHEREAS the City has completed numerous studies and evaluated several options to address the dam safety issues at Lower Dam and Middle Dam, two of which options for Lower Dam are conceptually acceptable to this office: the (a) labyrinth spillway design and the (b) auxiliary spillway design;

WHEREAS on February 25, 2015, under Section 7.1 of the B.C. Dam Safety Regulation, the City was requested to undertake certain steps by no later than March 27, 2015 but did not comply with the requested steps and therefore is not in compliance with the B.C. Dam Safety Regulation, *Water Act*;

WHEREAS the City was issued an order on April 9, 2015 to correct the potential safety hazard of Middle Dam and Lower Dam by:

1. Immediately undertaking the necessary steps to increase the flood routing capacity of Lower Dam to 144.0 cms, as calculated by Golder, in order to meet an annual exceedance probability design flood event level that is 2/3 of the way between a 1 in 1000 year flood and the Probable Maximum Flood (PMF) in respect of Lower Dam, by:
 - a. Selecting one of the two following Lower Dam remediation options (as described by Golder) in order to address the potential safety hazard of Lower Dam:
 - i. the Labyrinth Spillway Design (Report on Dam Remediation Options, Golder, August 29, 2014); or
 - ii. the Auxiliary Spillway Design (Auxiliary Spillway - Conceptual Design, Golder, January 16, 2015);
 - b. Notifying this office of the selected option by **May 1, 2015**;
 - c. Preparing and submitting a design report and construction plans, for approval under Section 4 of the B.C. Dam Safety Regulation by **May 22, 2015**;
 - d. Substantially completing the chosen remediation option by **October 15, 2015**; and
2. Once the chosen remediation option for Lower Dam has been completed (as required by Section 1 of this Order), the City must undertake the following actions:
 - a. Prepare and submit to this office by **the end of 2015**, a revised conceptual plan that identifies and prioritizes any actions required to correct the potential safety hazard with Middle Dam, along with a timeline for taking those actions within a reasonably expeditious time frame, timed to follow after completion of actions to correct the potential safety hazard with Lower Dam; and,
 - b. Implement the revised plan, based on the priorities identified in the plan, within a reasonably expeditious time frame **but no later than the end of 2017**, and in accordance with Section 4 of the B.C. Dam Safety Regulation, as applicable to any alteration, improvement or replacement to all or any part of the dam intended to correct a potential safety hazard and which must be implemented in a timely manner.

WHEREAS, at the request of the City, this office met with City officials on April 22, 2015 to discuss requirements for a proposal with respect to a possible third option;

WHEREAS, on April 28, 2015, the City requested an additional 30 days to retain professional engineering consultants to prepare a proposal with respect to a possible third option which would involve the installation of overtopping protection to these dams, as well as other features, to address the potential safety hazards;

WHEREAS, this office is prepared to accede to the request for additional time in order to allow the City to prepare such a proposal for submission to this office.

NOW THEREFORE, I, Glen Davidson, Comptroller of Water Rights, pursuant to Section 87 and Section 88(1)(d) of the *Water Act*, revoke my April 9, 2015 order and replace it with the following order to the City of Nanaimo, and hereby direct the City to correct the potential safety hazard of Middle Dam and Lower Dam:

1. By immediately undertaking the necessary steps to increase the flood routing capacity of Lower Dam to 144.0 cms, as calculated by Golder, in order to meet an annual exceedance probability design flood event level that is 2/3 of the way between a 1 in 1000 year flood and the Probable Maximum Flood (PMF) in respect of Lower Dam (the “flood routing capacity”), by:

a) selecting one of the following Lower Dam remediation options in order to address the potential safety hazard of Lower Dam:

- i. the labyrinth spillway design (Report on Dam Remediation Options, Golder, August 29, 2014),
- ii. the auxiliary spillway design (Auxiliary Spillway - Conceptual Design, Golder, January 16, 2015, or
- iii. an overtopping protection approach which, combined with other features as may be required (together the “overtopping protection approach”), would provide a level of protection comparable to that provided by the other two options, the technical details for which approach to be set out in an acceptable alternative proposal as described in paragraph b), below;

b) notifying this office of the selected remediation option by **June 1, 2015** and, if proceeding with the overtopping protection approach, the notification must be accompanied by a report from an independent expert, satisfactory to this office, with the following qualifications and experience, in accordance with Section 12 of the BC Dam Safety Regulation:

- i. in dam design, construction and analysis, and
- ii. in hydraulic, hydrological, geological, geotechnical and structural engineering, and
- iii. in the design, construction and performance of overtopping protection alternatives for embankment dams;

The report of the independent expert must confirm the technical feasibility of the proposal to meet the flood routing capacity at Lower Dam and that the proposal meets recognized dam safety guidelines (e.g. CDA Dam Safety Guidelines, 2013), as well as current best practice for the design and construction of overtopping protection for dams (e.g., US FEMA Technical Manual: Overtopping Protection for Dams, 2014);

c) preparing a design report and construction plans for the selected remediation option and submitting them to this office, for approval under Sections 4 and 7.1 of the BC Dam Safety Regulation by **June 22, 2015**;

d) substantially completing the selected remediation option by **November 15, 2015**; and

2. The City must undertake the following actions in relation to Middle Dam:

- a) Prepare and submit to this office **by the end of 2015**, a revised conceptual plan that identifies and prioritizes any actions required to correct the potential safety hazard with Middle Dam, along with a timeline for taking those actions within a reasonably expeditious time frame, timed to follow after completion of actions to correct the potential safety hazard with Lower Dam; and,
- b) Implement the revised plan for Middle Dam, based on the priorities identified in the plan, within a reasonably expeditious time frame but **no later than the end of 2017**, and in accordance with Section 4 and 7.1 of the B.C. Dam Safety Regulation, as applicable to any alteration, improvement or replacement to all or any part of the dam intended to correct a potential safety hazard and which must be implemented in a timely manner.

Dated at Victoria, British Columbia this 29th day of April, 2015.



Glen Davidson, P. Eng.
Comptroller of Water Rights