

Coats Marsh Weir Assessment



View of Coats Marsh and long beaver dam from weir location

Prepared for:

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Report Limitations

The author of this report is a professional mechanical engineer and is qualified, through a combination of training and experience, to complete the scope of work summarized in this report. None of the observations, conclusions or recommendations herein are to be construed as professional civil engineering, structural engineering or biology advice.

Acknowledgements

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Chris van Ossenbruggen (RDN Parks Operations Coordinator), *Nick Doe* (Gabriola Island resident and member of the Gabriola Streamkeepers), *Guy Mireau* (Gabriola Island resident at Coats Marsh)

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Executive Summary

Coats Marsh Weir is a 3.3 meter high concrete dam structure, of undetermined age, located on Coats Marsh Creek at the west end of Coats Marsh on Gabriola Island. The design water storage of the weir is approximately 22,000 cubic meters.

Because the weir is located on a stream, the government of BC will likely require it to be licensed under the BC Water Sustainability Act and, if so, will require it to be registered under the BC Dam Safety Regulation (DSR). Further, if registered under the BC DSR, the weir will require operation, maintenance and surveillance activities according to its dam failure consequences classification, which we view as “significant”.

The weir was inspected on May 1, 2020 and found to have notable deterioration. Inspection of the conditions upstream and downstream of the weir carried out on the same date identified a number of risk management issues that need to be considered by the Regional District of Nanaimo.

Priority recommendations for action include:

- Immediately investigate lowering the greater Coats Marsh pond level to the “design” weir spill level through installation of an appropriately sized Clemson pond leveller through the beaver dam and, if feasible, install the pond leveller before the fall 2020 rains.
- Immediately remove the beaver debris piled in front of the Coats Marsh Weir and footbridge, as well as the vegetation buildup.
- Investigate raising the park pathway footbridge adjacent to Coats Marsh Weir and, if feasible, complete this work before the fall 2020 rains.
- Engage with the government of BC to determine if they require the Coats Marsh Weir to be licensed under the Water Sustainability Act and if so proceed with registering the weir under the Dam Safety Regulation.

Please refer to the following report and appendices for complete details, including conclusions and other recommendations.

1. Introduction

1.1. Study Background

Coats Marsh Regional Park is located on Gabriola Island and managed by the Regional District of Nanaimo (RDN). A large beaver dam, a pond leveller and a concrete weir structure constructed on the marsh discharge currently work in combination to control the water level in Coats Marsh.

In early 2020, SRM Projects Ltd. (SRM Projects) was retained by the RDN to complete a field inspection/assessment of the weir, to determine if the weir is or should be regulated under the BC Dam Safety Regulation and to assess the risk consequence classification of the structure. The field inspection was completed by Scot Merriam of SRM Projects, with RDN liaison Chris van Ossensbruggen, on May 1, 2020. This report summarizes the findings of the three tasks.

1.2. Park Overview, History, Features and Values

The following excerpts are from the Coats Marsh Regional Park 2011-2021 Management Plan¹:

From 1.1 Park Overview

“Coats Marsh Regional Park (Coats Marsh RP) is located on Gabriola Island in the traditional territory of the Snuneymuxw First Nation. The park lies entirely within the Hoggan Lake watershed, in the southwestern portion of the island, and consists of two endangered ecosystems: a dry sub-maritime Coastal Douglas-fir forest in the north, and a rare Gulf Island freshwater wetland in south. The 707 Community Park, the largest park on Gabriola Island and the second largest park in the Regional District of Nanaimo, is located diagonally across from the northeast corner of Coats Marsh RP.

Prior to its designation as a Regional Park, Coats Marsh RP was a parcel of farmland owned by the Coats family and known locally as the “Stump Farm”. Recognizing the significant conservation value of the property, Clyde Coats donated half the value of the current Coats Marsh RP parcel to The Nature Trust of BC (TNT) through the Environment Canada Ecological Gifts program. In 2008, TNT assumed ownership by purchasing the remaining value of the property; the Regional District of Nanaimo (RDN), in turn, agreed to purchase 50% of the property interest from TNT over a five year period. The Coats Marsh RP property is owned by both RDN and TNT, and managed by the RDN as a Regional Park through a 99-year lease agreement.

Although Coats Marsh Regional Park is largely undeveloped with no formal trail system, signage or amenities, evidence of the park’s history and former uses are found

throughout the site. An old abandoned barn and a small log cabin located in the northeast corner of the park (the "Stump Farm") are remembered by local residents as the site of a commune in the 1960s and 1970s, and concrete foundations for both a radio tower and electrical shed in the south end of the park are remnants of a radio station that was operated by the previous owner in the 1970s and 1980s. The Coats Marsh property has recovered from a series of human activities including logging, burning, draining and flooding; it is now a peaceful place where indigenous plants and wildlife thrive and where local residents come to appreciate the park's natural beauty and to remember with affection its endearing and eclectic past.

As a Regional Park, Coats Marsh is funded by the entire Regional District: seven electoral area and the four municipalities of Nanaimo, Lantzville, Parksville and Qualicum Beach. The Regional Park function was established in 1989 in order to finance and protect larger areas of ecologically and culturally significant land for the benefit all RDN residents. As with other regional parks and trails, **environmental protection** (and the associated opportunity for outdoor education and recreation), is the underlying management guideline for Coats Marsh Regional Park."

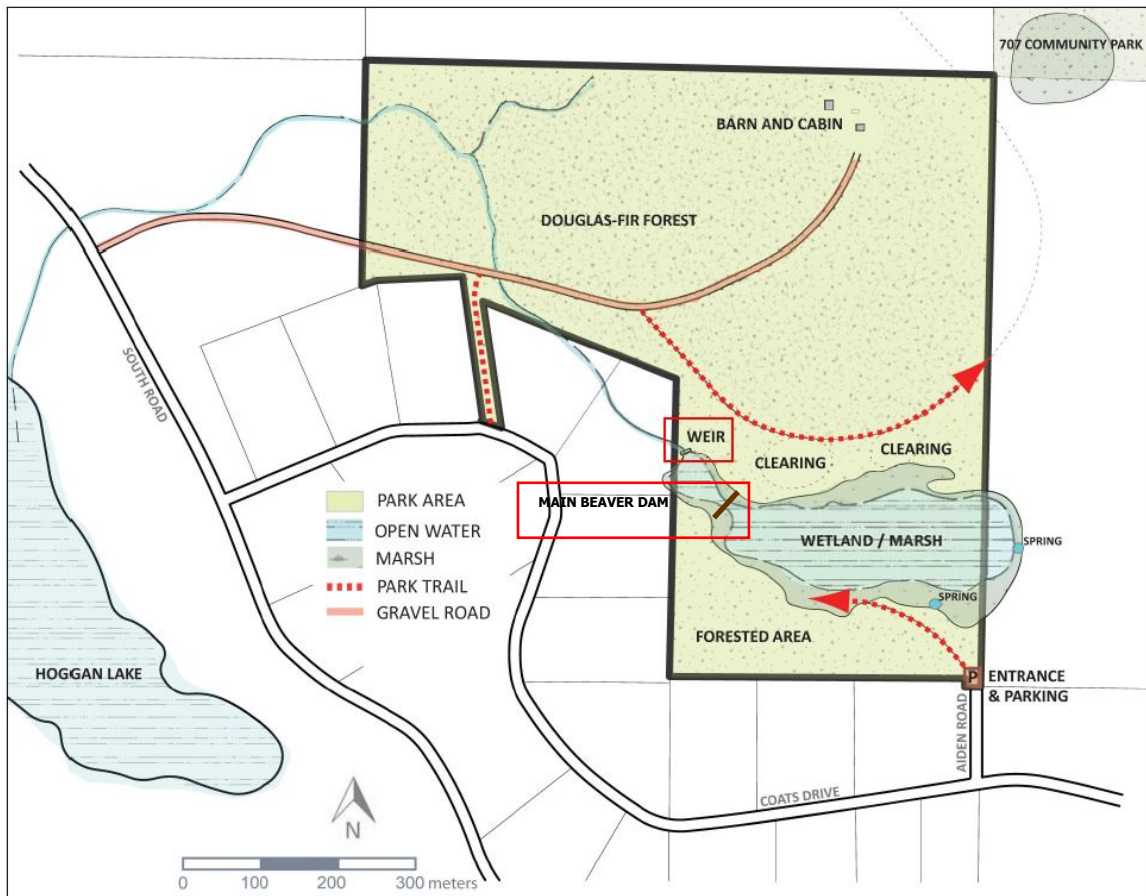


Figure 1-1: Coats Marsh Regional Park map¹

From 2.2 Legal Status and Encumbrances

“Concerns around seasonal water level fluctuation and flooding have been relayed to RDN and TNT staff by a neighbouring residential land owner.”

From 2.3 Property History

“The Coats Marsh Regional Park is part of the traditional territory of the Snuneymuxw First Nation, and although there are no archeological sites currently recorded within the Coats Marsh RP property, a site walk-through and assessment with a representative of the Snuneymuxw First Nation would be extremely valuable in terms of identifying pre-contact cultural artifacts and sites.

The title to the Coats Marsh RP property has been held privately since the late 19th Century. The first owner of the property was William Hoggan from 1883 - 1923, and the last private owner, after four subsequent title transfers, was Clyde Coats, from 1963-2008.

An examination of historic air photos indicates that the northern half of the park was logged approximately 60 years ago and has been steadily regenerating since. The barn and log cabin currently located in the northeast clearing were built shortly after logging. A small commune was established here in the 1960s - 1970s, referred to locally as the “Stump Farm”.

Although the wetland complex in the southern half of the park property is a naturally occurring feature based on topography and soil composition, its properties have been manipulated over the course of private ownership by way of draining (beaver dam removal and ditching) and flooding (dam construction). Four radio transmitting towers were built in the drained wetland area for a radio station that was operated by Clyde Coats in the 1970s and 1980s. After the removal of the radio towers and associated structures, the area was again flooded by Clyde Coats with the construction of a concrete dam, and with the intent of establishing a cranberry farm. The cranberry farm, however, was never developed.

For approximately 20 years prior to park designation, woody debris was stockpiled on the northern margins of the wetland in the Coats Marsh RP property and burned annually in the autumn under permit from the BC Ministry of Environment. There are no known incidents of wildfire on the property.”

From 2.4 Current Conditions and Features

“The 47.5 ha Coats Marsh Regional Park property consists of more than 30 ha of second growth Douglas-fir forest in the northern portion, 10 ha of wetland in the southern portion, a 1 ha clearing containing an abandoned barn and vertical log cabin (caretaker’s

residence), and two smaller clearings on the north side of the wetland where tree stumps were once dumped and burned.

The topography of the park ranges from flat to gently rolling and there are two permanent creeks and two ephemeral creeks that flow westward from the marsh beyond park boundaries to Hoggan Lake. The park is situated entirely within the Hoggan Lake watershed."

From 2.4.5 Natural Values – Wildlife Habitat

"The Conservation Data Centre (CDC 2010) publishes a list of species with designated protected status. Several amphibian, reptile, bird and mammal species, listed either federally (COSIWIC) or provincially (Red, Blue, or Yellow list) are potentially found within Coats Marsh Regional Park or have some aspect of their life cycle supported by the park habitat."

"Although no systematic wildlife inventory has been completed for Coat Marsh RP the following list of twenty-three bird species were recorded by Foul Bay Ecological Research Ltd. as encountered during a site visit to the park on December 1st and 2nd, 2010: Trumpeter swan, Mallard, Bufflehead, Bald Eagle, Sharp-shinned Hawk, Belted Kingfisher, Red-breasted Sapsucker, Downy Woodpecker, Hairy Woodpecker, Northern Flicker, Pileated Woodpecker, Steller's Jay, Common Raven, Chestnut-backed Chickadee, Red-breasted Nuthatch, Pacific Wren, Golden-crowned Kinglet, American Robin, Varied Thrush, Grosbeak, Rufous-sided Towhee, Song Sparrow and Dark-Eyed Junco."

We note there is an apparent disagreement regarding the assertion in the above paragraph in RDN 2.4 regarding the reported "two permanent creeks" that flow westward from the marsh beyond park boundaries to Hoggan Lake. Assuming the two creeks referred to are Coats Marsh Creek and Stump Farm Number 1 Stream, both of these are reported by Nick Doe², a local resident and member of the [Gabriola Streamkeepers](#), to be dry for all or part of the summer (ephemeral).

1.3. Weir History

Based on information in the RDN management plan, the concrete weir at the Coats Marsh outflow was installed around or before 1990 by the original property owner (Clyde Coats), for the purpose of establishing a cranberry farm (that was never developed). Local resident Guy Mireau (1040 Coats Drive) claims that the weir was installed by Clyde Coats father Bill much earlier than 1990, possibly in the mid-1900's, to store water for the Hoggan Lake hydroelectric facility. The [Gabriola Land and Trails Trust website](#) suggests the Hoggan Lake hydroelectric facility was installed in the 1970's. [BC Hydro records](#)³ confirm that a grid connected hydroelectric facility at Hoggan Lake was awarded a power purchase agreement

in 1985. Whenever it was built and whatever for, the weir was left in place and remains, substantially unchanged, as it was originally constructed.



Figure 1-2: Coats Marsh weir downstream side view

No design documents are available for the weir. In addition, Clyde Coats passed away in 2017 so we were unable to acquire any further design information.

According to the RDN management plan, the eight inch (200mm) diameter Clemson Pond Leveller shown in the site visit photos was installed through the weir in October 2009 to mitigate beaver damming activities and ensure drainage of the Coats Marsh pond.

1.4. Weir Area Hydrology

1.4.1. Watercourses

As mentioned in the RDN management plan in section 1.2 above, Coats Marsh and the watercourses that flow into and out of the marsh are part of the 10.5 sq.km Hoggan Lake watershed. The inflow watercourse to the east end of the marsh is known by the Gabriola Streamkeepers as "East Path Creek". The outflow watercourse from the west end of the marsh is known by the Gabriola Streamkeepers as "Coats Marsh Creek".

The following excerpt is from Coats Marsh Regional Park 2011-2021 Management Plan¹:

From 2.4.5 Natural Values – Wetland/Marsh

“Coats Marsh evolved out of local geological conditions as a shallow palustrine basin wetland. Over the past century it was drained, farmed, and then re-flooded. It appears that for the past 15-20 years it has been allowed to naturally redevelop wetland characteristics. Because Hoggan Lake is known to contain fish, both Coats Marsh and the watercourse flowing from the marsh into Hoggan Lake would be defined as a “stream” under the Riparian Area Regulation (RAR) because of the connection to Hoggan Lake by surface water flow.

The water depth over the majority of the marsh area averages approximately 1m in the summer and 1.5m in the winter and is controlled by a pond leveller installed in 2009 by RDN and TNT staff to mitigate flooding caused by a resident beaver. The leveller and concrete weir are located at the outflow of the marsh at the west end of the property. Beyond the weir, water flows into a watercourse that has been trenched by digging or blasting and then joins a second watercourse at the northwest corner of the park that eventually empties into Hoggan Lake. Considering the underlying sandstone bedrock and the topography of surrounding lands, the water source in Coats Marsh RP is likely subsurface flow that has ponded in the marsh area. The location of two springs on the east end of the wetland were identified by planning consultants Bufo Inc, and are shown on Figure 2.1.”

We note that more recent field reconnaissance performed by Nick Doe², a local resident and member of the Gabriola Streamkeepers, suggests there are no true springs in the marsh and that the “two springs” observed by Bufo Inc. and noted above in RDN 2.4.5 are up-wellings from ephemeral (seasonal) subsurface water flows.

Foul Bay Ecological Research Limited⁴ and Madrone Environmental Services Ltd.⁵ both refer to Coats Marsh Creek as a “stream” as defined by the BC Riparian Area Regulation.

1.4.2. Water Bodies

Coats Marsh pond was created when the concrete weir was installed. The pond is relatively shallow, with seasonal fluctuations in level as noted in RDN 2.4.5 above.

While the weir top elevation has traditionally been the limiting factor in the depth of the pond, multi-year field reconnaissance completed by Nick Doe² of the Gabriola Streamkeepers confirms the beaver dam, which has apparently increased in height annually, has become the determining factor in greater pond depth (the pond leveller was installed across the weir, not the beaver dam). Please see section 2 Upstream Conditions for further information about the beaver dam and pond levels.



Figure 1-3: View of significant beaver dam (red arrows) at Coats Marsh

Foul Bay Ecological Research Limited⁴ completed soundings of Coats Marsh pond in December of 2010 and the results (meters depth) are shown in Figure 1-4 below.

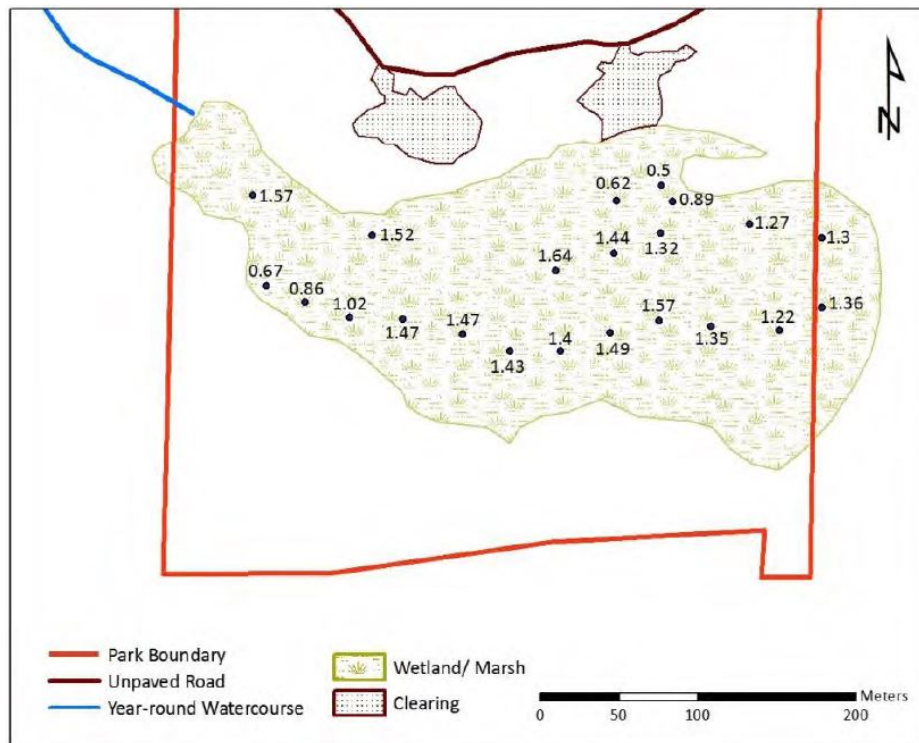


Figure 1-4: Coats Marsh pond depth soundings

Based on Foul Bay’s depth measurements and the satellite imagery interpreted pond surface area at the same time, we estimate the normal, weir controlled pond volume to be approximately 22,000 cubic meters. Part of this volume might remain in the marsh,

even if there was a weir failure, because of the amount of sediment in the marsh, which could limit draining of the basin. More detailed field assessment would be required to confirm this.

1.5. BC Dam Safety Registration Status

According to John Baldwin, BC Dam Safety Officer, the Coats Marsh Weir is not currently on the provincial dam safety dam registry and no water license has been issued for the structure “works” (see Appendix A for correspondence record).

John Baldwin clarifies that the Province understands that the Coats Marsh Weir is not on a stream and as such would not be regulated under the BC Water Sustainability Act nor would it be regulated under the BC Dam Safety Regulation.

2. Upstream Conditions

Coats Marsh was visited on May 1, 2020. Please refer to the sections below, the attached dam inspection report (Appendix B) and the dam inspection photos (Appendix C) for complete field observation details.

2.1. General

The marsh area was visited and circumnavigated by truck via service roads on May 1, 2020, with several stops around the pond. Canada geese and other birds were observed, along with a steady symphony of bird calls. No other wildlife was observed.

RDN liaison Chris van Ossenbruggen pointed out that there is little remaining deciduous forest around the marsh to sustain beaver activity.

Significant Watershield and other unknown aquatic plant growth were observed at all stopping points. The abundance of this growth is easily visible on satellite imagery.

2.2. Beaver Activity

There is a long, actively maintained beaver dam at the west end of the marsh pond, which has increased the greater pond elevation by approximately 1 meter over the normal weir spill elevation.

Beaver debris has also been piled up against the park pathway foot bridge at the weir, which is limiting spill flow through/over the weir.

According to residential neighbour Guy Mireau (1040 Coats Drive), the beaver dam suffered a minor (~100 mm deep) breach about one year ago; however, the beaver repaired the dam in relatively short order.

2.3. Marsh Water Level

The water level in the marsh pond was high and up/in to the line of trees around the greater pond at time of the site inspection.

Based on the observed approximate 1 meter difference in elevation between the greater pond (beaver dammed section) and the weir pond spill elevation, we estimate an additional 54,000 cubic meters of water are impounded by the beaver dam, bringing the total pond storage to approximately 76,000 cubic meters at time of the site visit.

Historical March 6, 2014 photos below provided by residential neighbour Guy Mireau (1040 Coats Drive) show views of the weir and adjacent foot bridge along with simultaneous Coats Marsh Creek downstream conditions during a weir overtopping event.



Figure 2-1: Overflow at Coats Marsh weir March 6, 2014



Figure 2-2: Flow over ornamental rock dam at 1040 Coats Drive March 6, 2014
(uninhabited recreational cabin in background)

2.4. Walkway Foot Bridge

As mentioned in section 2.2 above, a park pathway foot bridge exists immediately adjacent to the concrete weir structure on its east side. The deck elevation is very close to the weir spill elevation; consequently, in combination with the noted beaver debris, it limits spill flow over the weir and is, according to the above photos and field reports by Nick Doe², occasionally overtopped by water flow from the pond.

3. Weir Inspection

The Coats Marsh weir was inspected on May 1, 2020. Please refer to the sections below, the attached dam inspection report (Appendix B) and the dam inspection photos (Appendix C) for complete detail. The following abbreviations are used in these reference documents:

Abbreviation	Meaning
U/S	Upstream
D/S	Downstream

Table 3-1: Report abbreviations

By convention, “left” and “right” are used in the above mentioned reference documents and this report to mean left or right looking *downstream*.

The weir is a relatively thick, concrete retaining wall with a notch in the middle where stop-logs are inserted to allow for control of the water level in the marsh pond. It is located at 49.1525 Lat/-123.8155 Long and the crest runs approximately NNE to SSW. Please refer to the photos in Appendix C for approximate dimensions.

The weir structure is founded in a channel in sandstone bedrock. Based on the history of the structure, and the claim of neighbour Guy Mireau (1040 Coats Drive) that blasting holes have been observed in the surrounding bedrock, it is likely that the channel was excavated by blasting.

3.1. Upstream Face

The upstream face of the concrete weir could not be inspected primarily because visibility was obscured by the foot bridge. Even if the foot bridge was removed, only the top section of the face could be viewed due to the pond water level.

3.2. Crest

The crest concrete was visually and hammer test inspected. Cracking and two significant areas of spalling were identified. Please refer to the dam inspection report and photos for detail.

3.3. Downstream Face

The downstream face concrete was visually and hammer test inspected from the abutment areas only for safety reasons (the spill channel there is very deep and confined – should a

sudden release of water occur, a person could be engulfed and washed down the rocky channel). Many cracks and some spalled areas were observed. One "crack" in the left weir wall looks very much like a cold joint in the concrete and has a honeycomb appearance at one place. This fissure appears to go all the way through the weir wall to the upstream face. Some of the other fissures below the water line may also go all the way through the weir wall based on observed fissure width/prominence. Obvious water seepage was only observed at one location near the right abutment. Please refer to the dam inspection report and photos for detail.

3.4. Spillway

The spillway consists of a simple rectangular notch in the concrete weir with wooden stop-logs (planks) installed. The immediate upstream marsh level (not the level behind the beaver dam) is controlled by adding or subtracting stop-logs. The stop-logs appeared well wetted (likely water logged) and the ones that could be reached from the abutments were sound when probed with a screwdriver.

The 200 mm pond leveller pipe referred to in section 1 has been routed through the weir spill notch. During seasonal high water level in the marsh, water will spill over the stop-logs and through the pond leveller pipe simultaneously. The pond leveller pipe will tend to impede spill flow to some degree due to hydraulic friction through the pipe and 90 degree discharge fitting.

3.5. Spillway Channel

The channel immediately downstream of the weir spillway is the start of Coats Marsh Creek and it is deeply incised in the sandstone bedrock. As explained above, it is likely this initial section was excavated by blasting. The depth of the channel reduces further downstream of the weir until the excavation substantially disappears and the channel appears more like a "natural" stream bed.

The channel features change significantly as the stream makes its way past the residential properties at 1040 and 1034 Coats Drive. Please refer to section 4 for details.

4. Downstream Conditions

The area downstream of Coats Marsh weir was visited on May 1, 2020. Please refer to the sections below, the attached dam inspection report (Appendix B) and the dam inspection photos (Appendix C) for complete detail.

Coats Marsh Creek runs through two residential properties on Coats Drive before veering away from Coats Drive and dropping down and passing below South Road. The stream then enters a broad, level, largely grassy area with a few residential and outbuildings before emptying into Hoggan Lake.

4.1. Residential Property at 1040 Coats Drive

The residential property at 1040 Coats Drive encompasses land on both sides of Coats Marsh Creek. The residence itself is on relatively high ground near the weir on the left side of the creek (the current property owner Guy Mireau asked that no photos of the residence be taken). The population at risk is temporary only. Human-made infrastructure features near or in the channel in this property include:

- Four bridge/culvert crossings – some for vehicles and some pedestrian only;
- One ornamental rock dam and associated pond;
- One small, uninhabited recreational cabin

The land profile on both sides of the creek is broad and the banks gently slope up or are flat in places. The channel slopes consistently downstream until near the property line with 1034 Coats Drive, where it levels out. The land is full of trees, bushes and grasses of all sorts.

4.2. Residential Property at 1034 Coats Drive

The residential property at 1034 Coats Drive also encompasses some land on both sides of Coats Marsh Creek. The residence is on high ground a substantial distance away from the creek, on the left side. The population at risk is temporary only. Human-made infrastructure features near or in the channel in this property include:

- Two wooden foot bridges;
- One small, apparently uninhabited storage shed/workshop on skids

The land on both sides of the creek is broad and mostly flat. There is almost no slope downstream in this section of the creek. The land is full of trees, bushes and grasses of all sorts.

4.3. South Road Crossing

Coats Marsh Creek flows underneath a low section of South Road in a 1.2 meter diameter culvert at location 49.1553 Lat/-123.8269 Long. There is good visibility of the crossing area driving either way on South Road. The low section of South Road is quite broad, with ample room for water flow over top of the road if the flow in the creek exceeds the capacity of the culvert.

4.4. Downstream of South Road Crossing

Due to the broad, flat and open terrain evident downstream of the South Road crossing of Coats Marsh Creek, a detailed assessment of the conditions in that area was not performed. Should a large volume of water be released from Coats Marsh pond, it will spread out and slow down significantly by the time it reaches that area.

According to the RDN Map, there are 3 residential buildings located on the land downstream of the South Road crossing – 901, 905 and 909 South Road. There also appear to be one or more outbuildings according to satellite imagery. Should it be confirmed that the Coats Marsh weir must be regulated under the Dam Safety Regulation, and more detail is required by BC Dam Safety, an additional field visit can be performed to further assess the conditions downstream of the South Road crossing.

5. Discussion

5.1. Regulatory Implications

Based on the reference information reviewed during this study, including the opinions of two biological consultants, it appears that Coats Marsh Weir is built on a “stream” as defined in the BC [Water Sustainability Act](#) (WSA). This is echoed in RDN 2012 email communications (see Appendix D). The implication of this is that the Coats Marsh Weir likely must be licensed under the WSA, for the purpose of providing water for the wetland/park.

If the Province determines that the weir must indeed be licensed under the WSA, then, because the weir structure does not meet the definition of a “minor dam”, it is regulated under the BC [Dam Safety Regulation](#) (DSR) and subject to the requirements therein, which depend on the dam failure consequences classification.

5.2. Dam Failure Consequences Classification

Schedule 1 of the DSR provides dam failure consequences classification (DFCC) criteria for loss of life, environmental and cultural values and infrastructure and economics (see Appendix E). Applying these criteria with the findings of this study and publicly available BC Conservation Data Center species at risk mapping (see Appendix F), a DFCC rating of “significant” would in our opinion be appropriate for the Coats Marsh Weir. While dam Owners/Consultants may propose a DFCC, the BC Dam Safety section makes the final determination.

Note that the determination of a DFCC for Coats Marsh Weir is more heavily dependent on environmental and cultural values, because there is limited (screening level only) environmental assessment information available. It is clear that the Coats Marsh wetland was to a large degree human-made, through installation of the weir. Nevertheless, there are reports by Gabriola Island resident Nick Doe^{6,7} of red and blue listed species being observed in the marsh. Confirmation of significant population(s) of these endangered species upstream or downstream of the weir, by a qualified professional biologist, could increase the recommended DFCC to “high”.

5.3. Weir Assessment

While the weir appears to be very old and displays a notable amount of deterioration, there is evidence that it has been capable of resisting the hydrostatic load of overtopping flows at least several times in recent history. This does not mean the weir will continue to successfully resist the loads placed on it. Several important aspects must be considered.

The first consideration is seismic forces. Combined hydrostatic loads from the “design” marsh pond level and a significant earthquake could result in failure of the weir and corresponding inundation flow downstream.

A second consideration is corrosion of reinforcing steel, if there is any, within the concrete weir structure. While the amount and rate of corrosion in the substantially well enclosed concrete (save for the cracks) would be difficult to determine, if there is reinforcing steel in the weir structure, and it is exposed to water, it will corrode to some degree over time and weaken.

Another important consideration is the potential for a sudden release of water upstream of the Coats Marsh Weir due to failure of the beaver dam. In the worst case, this could direct a volume of approximately 54,000 cubic meters of water toward the weir. The resulting wave force could result in partial or complete failure of the weir. Moreover, whether or not the weir failed, there would be a corresponding release of water down the spillway channel (Coats Marsh Creek) which would very likely result in damage to the downstream infrastructure identified in this report.

A detailed structural engineering review might identify other weir integrity considerations as well.

For the purposes of risk mitigation, the easiest risk to control is the risk of a release of water due to failure of the beaver dam. Lowering the greater pond (upstream of the beaver dam) level and installing an appropriately sized Clemson pond leveller across the beaver dam, to keep the greater pond level equal with the “design” weir spill level, is a straightforward solution. Note that lowering of the greater pond level would have to be done in a controlled way, through means such as a siphon(s) or pump(s), to avoid the potential for a sudden release of water from the beaver dam.

Another potential risk mitigation measure would be to raise the park pathway footbridge adjacent to the weir, so that there is ample clearance for water overflow from heavy rainfall/flood events. Done in combination with clearing away beaver debris piled in front of the weir and vegetation buildup, this might limit/prevent weir overtopping and so reduce hydrostatic loading on the weir.

A third potential method of mitigating the risk of weir failure, related to seismic or other threats, is to structurally reinforce the existing weir, through installation of new, reinforced concrete walls on the downstream side of the existing weir, or by other means. A qualified structural engineer would have to be retained to determine the feasibility of this approach.

6. Conclusions

Based on our investigation and analysis, we conclude:

- A. The Coats Marsh Weir is located on a stream, as defined in the BC Water Sustainability Act, and likely needs to be licensed.
- B. If the Province determines the Coats Marsh Weir must be licensed, then the weir must be registered under and is subject to the requirements of the BC Dam Safety Regulation.
- C. If Coats Marsh Weir must be registered under the BC Dam Safety Regulation, we believe, based on the available information, that an appropriate dam failure consequences classification is “significant”.
- D. Confirmation of significant population(s) of endangered species upstream or downstream of Coats Marsh Weir, by a qualified biologist, could increase the recommended dam failure consequences classification to “high”.
- E. The Coats Marsh Weir is displaying notable signs of deterioration, including cracks and spalling.
- F. The artificially high level of Coats Marsh pond, created by the beaver dam, may be a threat to the Coats Marsh Weir, to the downstream population at risk, to the downstream environment and to downstream infrastructure.
- G. The park pathway foot bridge adjacent to Coats Marsh Weir, in concert with beaver debris and vegetation, is impeding spill flow past the weir.
- H. Lowering the greater pond level, through installation of an appropriately sized Clemson pond leveller across the beaver dam, is a way to mitigate the threat to Coats Marsh Weir resulting from the artificially high level of the pond. This action will also mitigate the risk to infrastructure downstream of the weir.
- I. Raising the park pathway footbridge adjacent to Coats Marsh Weir, in combination with clearing away beaver debris piled in front of the weir and vegetation buildup, might limit/prevent weir overtopping and so reduce hydrostatic loading on the weir.
- J. Structurally reinforcing Coats Marsh Weir, through installation of new, reinforced concrete walls on the downstream side of the existing weir, or by other means, may be a viable way to mitigate the risk of weir failure related to seismic or other threats.

7. Recommendations

Based on the above conclusions we recommend the following action:

- A. Engage with the government of BC to determine if they require the Coats Marsh Weir to be licensed under the Water Sustainability Act.
- B. If the Coats Marsh Weir must be licensed, engage with the Dam Safety section of the government of BC to confirm what dam failure consequences classification the weir must be registered under.
- C. If the Coats Marsh weir is registered under the Dam Safety Regulation, develop weir operation, maintenance and surveillance procedures as required by the regulation.
- D. Immediately investigate lowering the greater Coats Marsh pond level to the “design” weir spill level through installation of an appropriately sized Clemson pond leveller through the beaver dam and, if feasible, install the pond leveller before the fall 2020 rains.
- E. Immediately remove the beaver debris piled in front of the Coats Marsh Weir and footbridge, as well as the vegetation buildup.
- F. Investigate raising the park pathway footbridge adjacent to Coats Marsh Weir and, if feasible, complete this work before the fall 2020 rains.
- G. If RDN wishes to further mitigate the risk of Coats Marsh Weir failure, engage a structural engineer to develop alternatives to structurally reinforce the existing weir, evaluate these for feasibility and proceed with field construction of the best alternative.
- H. Reassess the environmental and cultural values criteria of the dam failure consequences classification when the next formal biological assessment of Coats Marsh is completed.

References

1. Regional District of Nanaimo – Recreation and Parks (August 29, 2011) [Coats Marsh Regional Park 2011-2021 Management Plan](#)
2. Nick Doe (2020) File 668 – [Hydrogeology of Coats Marsh, Gabriola Island](#)
3. BC Hydro (October 1, 2019) [Independent Power Producers Currently Supplying Power to BC Hydro](#)
4. Foul Bay Ecological Research Limited (December 30, 2010) [Ecological Features and Management Recommendations for Coats Marsh Regional Park – Gabriola Island](#)
5. Madrone Environmental Services Ltd. (December 30, 2012) [Gabriola Island Riparian Area Stream Identification](#)
6. Nick Doe (October 2, 2019) File 692 – [Flora of Coats Marsh Area, Gabriola Island, BC – A Summary](#)
7. Nick Doe (March 2019) File 693 – [Fauna of Coats Marsh Area, Gabriola Island, BC – A Summary](#)

Appendix A – BC Dam Safety Correspondence

Scot Merriam

From: Baldwin, John FLNR:EX <John.Baldwin@gov.bc.ca>
Sent: March 24, 2020 9:43 AM
To: Scot Merriam
Cc: Robinson, David FLNR:EX
Subject: RE: Coats Marsh Weir Inquiry

Scot – my understanding is that:

1. Coats Marsh on Gabriola Island is not on a stream as defined under the BC Water Sustainability Act (WSA), and thus can NOT be licenced under the WSA and the WSA Dam Safety Regulation does not apply. A WSA water licence has not been issued and this structure is not on the provincial dam safety dam registry.



Imapbc map snipped March 24 2020 – note that green dots are current water licences

2. Water was collected from local runoff or over land flow when the concrete structure was constructed.

I advice that you contact Dave Robertson at FLNRORD's West Coast Water Authorization for water licencing information.

I do advice owners of these types of water storage structures to follow the Dam Safety guide lines at provincial website at <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/dam-safety>

John Baldwin
Dam Safety Officer

From: Scot Merriam <smerriam@srmprojects.ca>
Sent: March 23, 2020 12:53 PM
To: Baldwin, John FLNR:EX <John.Baldwin@gov.bc.ca>
Subject: FW: Coats Marsh Weir Inquiry

Greetings John,

Long time no see – I hope you are doing well. It has been a long time since we corresponded about various dam safety jobs from my time at Harmac or others since then.

I haven't had a reply from the general dam safety inquiry address so I thought I would check and see if you are still covering small dams here on the Island?

See inquiry below.

Best Regards,

Scot Merriam, P.Eng.

SRM PROJECTS

SUSTAINABLE RESOURCE MECHANICAL ENGINEERING AND PROJECT MANAGEMENT

3555 Falcon Drive
Nanaimo, B.C. Canada V9T 4G7

work/cell: (250) 616-3422

fax: (250) 758-4153

tel: (250) 758-5352

www.srmprojects.ca

From: Scot Merriam [<mailto:smerriam@srmprojects.ca>]

Sent: March 16, 2020 12:50 PM

To: 'dam.safety@gov.bc.ca'

Subject: Coats Marsh Weir Inquiry

Greetings at BC Dam Safety,

Later this week I will be inspecting and assessing a very small concrete weir structure at the outlet of Coats Marsh on Gabriola Island at approximate location 49.152206°N, -123.815463°W. The structure is currently under the management of the Regional District of Nanaimo. Based on the information we have at hand regarding weir height, impounded volume in the marsh and downstream population/development, it appears to be an extremely low risk structure.

I checked the BC Dam Safety iMap and the weir structure is not listed, so is it safe to assume the structure is not currently registered with BC Dam Safety?

Many thanks,

Scot Merriam, P.Eng.

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Appendix B – Dam Inspection Report

Formal Annual Dam Inspection
Pre-Inspection Information



Name of Dam: **Coats Marsh Weir** Inspection Date: **May 1, 2020**
BC Dam File No: **n/a** Water Licence #: **n/a**
Current Weather: **Sunny/overcast** Weather During Last Week: **Mixed sun, clouds, showers**
Name of Creek, Stream, River: **Coats Marsh Creek**
Dam Owner: **Regional District of Nanaimo/The Nature Trust of BC**
Address: **1490 Springhill Road**
City, Province: **Parksville, BC** Postal Code: **V9P 2T2**
Name of Principal Contact Person: **Chris van Ossenbruggen**
Principal Contact's Bus Phone: **250-390-6772** Principal Contact's Cell Phone: **250-714-9935**
Principal Contact's Email: **cvanossenbruggen@rdn.bc.ca**

Person Completing This Formal Inspection: **Scot Merriam, P.Eng, SRM Projects 250-758-5352**
Other Person(s) In Attendance During Inspection: **Chris van Ossenbruggen**

Date of Last Annual Inspection: **n/a** Was last Annual Inspection Report reviewed?: **n/a**
Were dam deficiencies identified that required follow-up? **n/a**
Date of Last Dam Safety Review (DSR): **None** Was last DSR Report reviewed? **Not Applicable**
Were recommendations from the last DSR Report implemented? **Not Applicable**
Repairs or modifications since last formal inspection? **n/a**
Failures/Incidents/Breaches since last formal inspection? **n/a**
Has all the maintenance done in the last year been documented? **n/a**
Are the Works Currently Fully Operational? **Yes**

Dam Information

Type of Dam: **Concrete Weir** Max. Height of Dam: **3.3 m approx.**
Are dam materials well known? **Yes** Are foundation conditions well known? **Yes (bedrock)**
Are dam construction details well known? **No** Construction Date: **Unknown - possibly 1940's**

Failure Consequence Classification

Current Failure Consequence Classification (based on BC Dam Safety Regulation): **Assumed "Significant"**
(To be confirmed by BC Dam Safety)

Hydrology

Drainage Area Size: **Unknown** Reservoir Area: **~46,000 m2 (seasonal/beaver dependent)**
Inflow Design Flood (IDF): **Unknown** m³/s IDF Return Period: **Unknown**
1000 yr Flood: **Unknown** m³/s (If available):
Probable Maximum Flood: **Unknown** m³/s (If available):
Spillway Crest Elevation: **Unknown** Spillway Width: **0.635 m**
Spillway Capacity: **Unknown** Net Freeboard (while spillway passing IDF): **Unknown**
Gross Freeboard* (@ full supply level): **Unknown** Freeboard (at time of visit): **0.635 m (spillway flowing)**
* Concrete dam is designed to spill over stoplogs at dam mid-section; beaver dam is currently controlling reservoir level

Reservoir Storage Volume**: **22,000 m3 approx.** Licenced Storage Volume: **Not licenced**
** Weir elevation working volume; with extra elevation from adjacent beaver dam, reservoir volume has increased to about 76,000 m3

Emergency Preparedness Plan (EPP)

Has the emergency contact information in the EPP been updated this year and distributed as required? **n/a**

Other Key Information

Reference Dwgs: **None available see photos**

Inspector: Scot Merriam, P.Eng.

Report Issue Date: Issued for record June 1, 2020

None
Monitor
Maintenance
Repair
N/A

Concrete Dam

1. Upstream Side and Crest

ACCESS

Is there public access to the crest?
Is the crest marked or signed?
Is vehicle access to the crest restricted?

Note: Could not inspect U/S side due to footbridge and high water level

Yes - dam is immediately adjacent to trail footbridge

Not as per BC Dam Safety Act

Somewhat - but can easily get small vehicles in to dam

Photos 11 - 27

ALIGNMENT/OFFSETS

Movement at Joints?
Settlement?

JOINT FILLER

Any Loss?
Vegetation?

UNUSUAL CRACKS

New?
Efflorescence?
Displacement?

Cannot inspect due to footbridge and water level limiting access

DETERIORATION

Concrete Breakdown?
Erosion
Scour

Spalling 2 places

None

None

Diagnosis: **Visual and by hammer test**

22, 23, 25, 26

2. Downstream Side

ALIGNMENT/OFFSETS

Movement at Joints?
Settlement?

Photos 28 - 36

JOINT FILLER

Any Loss?
Vegetation?

UNUSUAL CRACKS

New?
Efflorescence?
Displacement?

Many old looking fissures Type? **Spalling, shrinkage, cold joint(s), possibly hydraulic stress**

Yes - limited

Visual and hammer tested

No

31 - 36

DETERIORATION

Concrete Breakdown?
Erosion
Scour

Some spalling + original honeycomb

None

None

Diagnosis: **Visual and by hammer test**

Comment:

31 - 36

UNUSUAL LEAKAGE

Description
Increase?

Slight leakage at joint between right sandstone abutment and concrete dam - see SRM video

No (per neighbour G.Mireau) Clear? **Yes**

33, 36

Weir?

None

Flow Estimate?

Trickle

DRAINS

Description
Flow?
Notes

200mm dia. "Beaver Fooler" pond leveller discharges through top center of dam

Yes Calcite Build-up? **No**

Inspect quarterly to ensure pipe is not plugged

12, 27, 28

None Monitor Maintenance Repair N/A

Spillway

GENERAL CONDITIONS

Type **Stoplog controlled concrete weir, bedrock channel** Gated? **No** _____
 Notes **Water spills through stoplogs in concrete dam crest; footbridge & beaver debris limiting spill flow (photos 12 - 13)**

1. Spillway Crest or Control Section

OBSTRUCTION

Photos 37 - 39

Debris

Location **Beaver debris on U/S side of weir/spillway**
 Notes **Beaver debris piled against low footbridge must be removed**

Vegetation

Location **Tall grass at spillway entrance**
 Notes **Dig out grass to ensure no impediment to flow over weir**

Other

Low footbridge is an impediment to water flow - investigate raising bridge to resolve

LOG BOOM

None Required? **No** _____
 Condition: Logs **n/a** Connections **n/a** Anchors
 Notes **None**

SPILLWAY CREST MATERIALS

Wooden plank stoplogs **37 - 39**
 Condition **Good according to screwdriver probing**
 Notes **Check condition annually**

SPILLWAY GATES

None Type: **n/a** _____
 Condition **n/a**
 Notes **n/a**

OTHER SPILLWAY CREST PROBLEMS

Damage

Location **n/a** _____
 Notes/Cause **n/a**

2. Spillway Conveyance Section: Channel, Chute or Conduit

Photos 40 - 88

OPEN CHANNEL CROSS SECTION

Notes **Blasted bedrock channel opens up into natural, broad, gently sloping stream bed that meanders past two residential properties before dropping down into Hoggan Lake** _____

CHANNEL OBSTRUCTION

Notes **Significant natural and manmade obstructions: Trees, bushes, fallen logs, recreational rock dam, bridges, culverts etc** _____

SPILLWAY CONVEYANCE MATERIALS

Bedrock and gravel stream bed _____

OTHER SPILLWAY CONVEYANCE PROBLEMS

Damage

Location **n/a** _____
 Notes/Cause **No spillway damage per se - it is mostly a natural watercourse**

3. Energy-Dissipating or Terminal Section

EROSION CONTROL STRUCTURE

Type **None** _____
 Notes **Energy dissipation occurs throughout the length of the natural, gently sloping stream bed**

Low Level Outlet

GENERAL

Gate Type **None**

ACCESS TO VALVE/GATE Under all circumstances? **No**

Not accessible from shore Walkway By boat Other

Notes

Walkway Condition

LOW LEVEL OUTLET COMPONENTS

Valve Control Device

Yes None No Stem Damaged stem Other

Other/Notes

Operational under all conditions?

Yes No Poorly

Tested Annually?

Notes

Tested as per OMS manual?

Valve / Gate

Location

Condition

Leakage Yes No

Flow Rate

Outlet Pipe

Metal Plastic Concrete Other

Diameter

Condition

Outlet Obstruction (note vegetation, sediment blockage, etc.)

Notes

OUTLET EROSION CONTROL STRUCTURE

Type

Concrete Condition

Outlet Area Seepage

Description

Flow Estimate

Location

Undermining

Location

Notes/Cause:

Downstream Channel

Free Draining?

Blockages or Potential Blockages?

Erosion Control? Rip-Rap?

Required Action Photo #s

None Monitor Maintenance Repair N/A

Other Key Information

Is site access adequate for safe operation, maintenance and surveillance? **Yes**

Instrumentation adequate for site conditions? **n/a**

Are there concerns about reservoir slope stability? **No**

Any other concerns in the watershed that could impact the dam? **Yes, high beaver dam**

Operational Constraints that impact Dam Safety? **Some conflict between preservation of wetland and dam safety**

Are the required Public Safety signs in place (for dams on Crown land)? **Not as per Dam Safety Regulation**

Other comments on Public Safety: **None**

Should new development in the downstream inundation zone initiate a review of the Failure Consequence Classification?:
Yes/no? **Yes**

Has any new development been reported by the Principal Contact: **No**

Comments: **This structure appears to require water licensing and registration under the BC Dam Safety Regulation**

Maintenance

In the last year have the spillway gates been exercised and tested in accordance with the OMS? **n/a**

If so, when and by whom? **n/a**

In the last year has the low level outlet gate been exercised and tested in accordance with the OMS? **n/a**

If so, when and by whom? **Not applicable**

Is the instrumentation well maintained? **n/a**

NOTES:

Upstream Conditions

Birds (Canada geese and others), and evidence of birds (bird calls) were observed during the site inspection;

Actively maintained beaver dam has raised level of marsh pond approximately 1 meter above the weir spill elevation;

A sudden failure of the beaver dam would release a significant volume of water (approximately 54,000 cu.m) toward the weir and downstream areas;

It is recommended to investigate means of installing a "beaver fooler" pond leveler pipe across the beaver dam to prevent the marsh pond level from going any higher than the weir spill elevation;

Precautions must be taken to ensure a controlled reduction in marsh pond level behind the beaver dam before installation of a pond leveler, including but not limited to use of siphon pipe(s) and pump(s). It is not recommended to breach the beaver dam without dropping the pond elevation first;

Weir Considerations

Grass, beaver debris piled in front of the foot bridge, and the foot bridge itself, are limiting spill flow past the weir;

The debris and vegetation must be removed;

Raising the foot bridge to avoid impeding water flow should be investigated;

The concrete weir structure has many cracks - this deterioration must be monitored for progression;

Given the structural soundness of the weir may be in question, action listed in "Upstream Conditions" notes is high priority.

Downstream Considerations

Residential infrastructure downstream of the weir includes 6 foot bridges, one ornamental rock dam, one small, unoccupied recreational cabin and one shed;

While the financial value of this infrastructure does not appear to be high, action listed in "Upstream Conditions" will mitigate the risk of loss;

There appears to be no permanent occupancy in the anticipated inundation zone downstream of the weir, but temporary occupancy is expected.

SKETCH OF ISSUES:

No sketches - just photos

Appendix C – Dam Inspection Photos

UPSTREAM CONDITIONS



1. View of Coats Marsh looking north near end of Stanley Place – note high water level intruding into perimeter trees



2. View from SE end of Coats Marsh looking roughly west. Approximate beaver dam location shown by red arrow



3. View from old burn pile area at the north side of Coats Marsh, looking approximately south



4. View from RDN footbridge at weir, looking SE towards beaver dam (yellow arrows). Residential property protection dyke at right



5. View of beaver dam from footbridge at weir; looking approximately SE



6. Residential property protection dyke – willows planted on U/S side, visible geotextile covers entire berm (yellow arrow)



7. Residential property adjacent to dyke at 1040 Coats Drive – dyke D/S toe area is drained see photos 29/30



8. Looking roughly NE over beaver dam – note significant (~1 m) difference in water level upstream and downstream of dam



9. View of beaver dam looking NE; built against now dead and rotting trees



10. View from top of beaver dam looking toward weir pond at left – note significant (~1 m) difference in water level.

CONCRETE WEIR



11. U/S view of weir (yellow arrow) looking from beaver dam



12. U/S view of weir, which is at the downstream/right side of the footbridge (beaver debris and pond leveler pipe in foreground)



13. U/S view of concrete weir (at red arrow), showing right abutment area



14. U/S view of concrete weir (red arrows) looking downstream past spillway gap (yellow arrow)



15. Weir crest approach viewed from right abutment side



16. Weir crest (red arrow) viewed from right abutment side



17. Weir crest approach viewed from dyke at left abutment side



18. Weir crest (yellow arrow) viewed from left abutment side



19. Concrete weir crest viewed from right abutment; residential property protection dyke in background (red arrow)



20. Concrete weir crest viewed from left abutment (crest measured to be level)



21. Close-up of right concrete weir crest viewed from spillway



22. Area of spalled concrete at right crest of weir (taped area below yellow arrow) – note top crack (red arrow)



23. Opposite view of area of spalled concrete on right crest of weir – note deep spall crack (yellow arrow)



24. Close-up of left concrete weir crest viewed from spillway



25. Area of spalled concrete at left crest of weir (taped area below yellow arrow)



26. Opposite view of area of spalled concrete on right crest of weir – note deep spall crack (red arrows)



27. View looking down on weir crest and stop-log controlled spillway; 200mm pond leveler pipe visible



28. D/S view of concrete weir from right abutment – weir is located in a channel blasted into the sandstone bedrock



29. D/S view of concrete weir from left abutment; white dyke downstream drain pipe in foreground (see photos 5/6/17 for dyke view)



30. Close-up of white dyke downstream drain pipe showing clear water flow



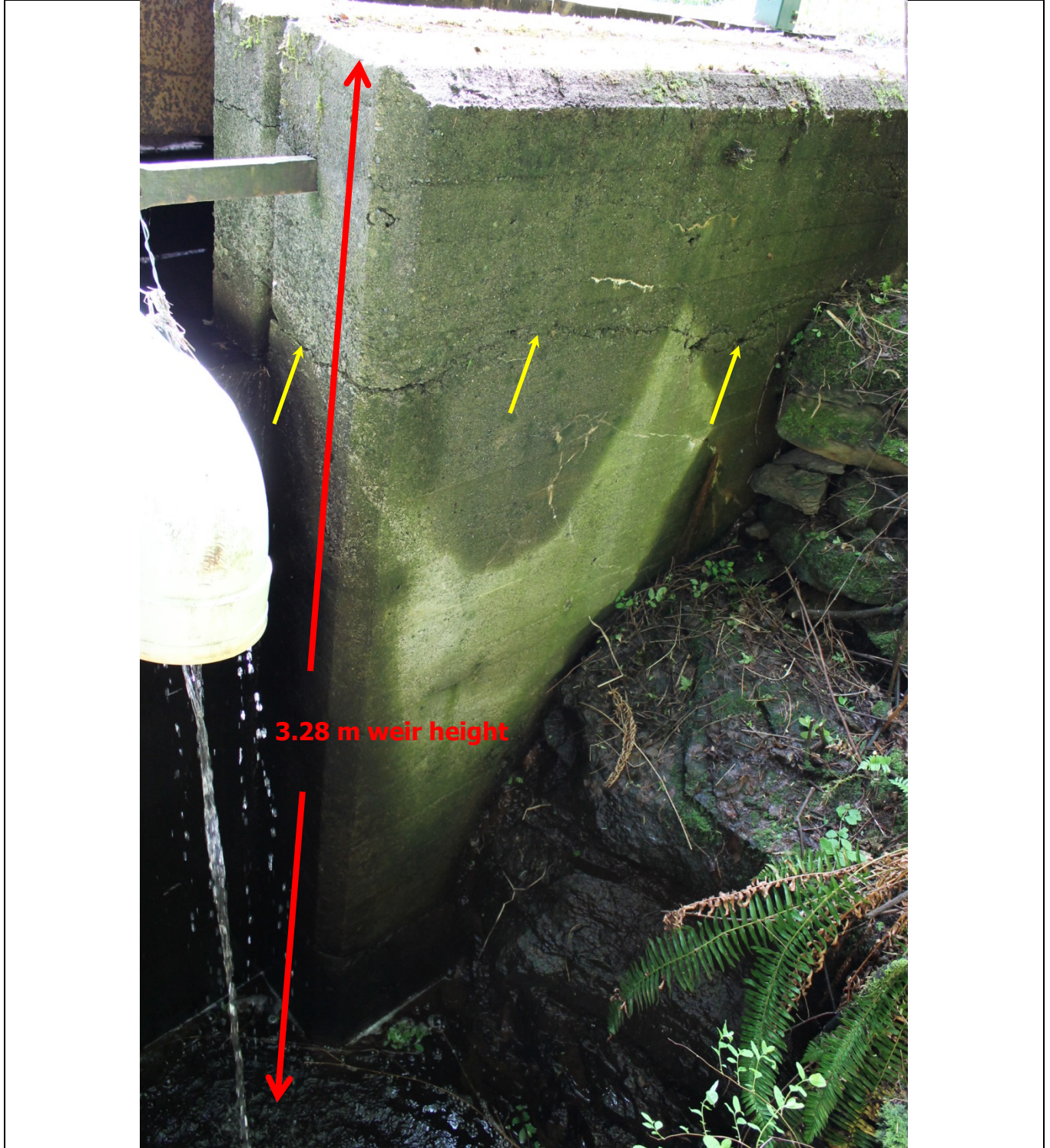
31. D/S face of concrete weir near right abutment – many cracks visible



32. Close-up of photo 21 showing length of most obvious crack near top of concrete weir (24" long spirit level on crest)



33. D/S right face of concrete weir beside spillway/stop-logs – many cracks and obvious seepage (red arrow) visible



34. D/S left face of concrete weir beside spillway/stop-logs – many cracks – one potential dry joint (yellow arrows)



35. D/S face of concrete weir looking toward left abutment



36. D/S face of concrete weir at left abutment & close-up of potential dry joint/honeycomb (yellow arrow) & minimal seepage (red arrow)



37. View of spillway in center of concrete weir, looking toward left abutment – stop-log gap in concrete



38. View of spillway, looking toward right abutment – stop-log gap in concrete and 200mm pond leveler pipe visible



39. View of 41.3 mm thick X 723.9 mm long stop-logs. Stop-logs appear to be sound based on screwdriver probing

DOWNSTREAM CONDITIONS



40. Concrete weir (red arrow), blasted spillway channel (blue arrow) and residential property owner bridge 1 (yellow arrow)



41. Spill path above blasted channel is broad and gently slopes D/S. Trees and bushes will impede overflow.



42. Close-up of 1040 Coats Drive residential property owner bridge 1, over blasted channel in sandstone



43. View U/S from bridge 1 towards concrete weir, looking at channel blasted in sandstone bedrock



44. Close-up of photo 43 channel blasted in sandstone bedrock



45. Spill channel (aka Coats Marsh Creek) looking D/S from bridge 1



46. Spill channel looking D/S cont'd – grass of residential property at 1040 Coats Drive visible at left



47. Looking from left bank to right bank of spillway channel from photo 46 vantage point – spill path remains broad and flat



48. Spill channel looking D/S towards in/near stream residential property pond features



49. Looking U/S from beginning of area of residential property pond features of 1040 Coats Drive – very flat terrain



50. Looking D/S at residential property pond features of 1040 Coats Drive



51. Looking downstream at fallen log and residential pond features – foot bridge 2 and cabin in left background



52. View of foot bridge 2 looking from left bank to right bank of spill channel – very flat terrain



53. Looking D/S at foot bridge 2 and cabin. Pond in foreground was created by hand placed rock dam near cabin



54. View across spill channel from left bank to right bank – drainage area is very broad and flat with many trees and bushes



55. Side view of uninhabited recreational cabin – part of property at 1040 Coats Drive



56. Recreational cabin end view



57. Spill channel side view of recreational cabin – channel at left



58. Spill channel looking U/S toward recreational cabin – noticeable elevation change



59. Looking U/S at hand placed rock dam near recreational cabin



60. Close-up of rock dam in photo 59



61. Spill channel looking D/S toward 1040 Coats Drive residential property bridge 3 – noticeable elevation change



62. Looking D/S over bridge 3 – terrain is broad and very flat



63. Looking U/S over bridge 3



64. Looking D/S past bridge 3 – very flat terrain either side of channel



65. Looking D/S at 1040 Coats Drive residential property foot bridge 4



66. Looking from right bank to left bank over foot bridge 4



67. Looking D/S past foot bridge 4



68. Clearing past trees on left bank is the start of residential property at 1034 Coats Drive



69. Looking D/S toward residential property at 1034 Coats Drive – terrain is broad and flat on both sides of channel



70. Yellow rope is approximate location of property line between residential properties at 1040 and 1034 Coats Drive



71. Looking D/S at right bank – terrain is very flat with many trees and bushes



72. Spillway channel at foot of 1040 Coats Drive residential property looking D/S



73. Spillway channel looking D/S at foot of 1040 Coats Drive cont'd



74. Left bank view from photo 73 location showing residential property shed through trees (red arrow)



75. View from left bank of spill channel looking at 1034 Coats Drive grey shed and residence in background



76. View showing spill channel at left and grassy left bank – terrain gently slopes up to right



77. Spill channel looing D/S toward 1034 Coats Drive residential property foot bridge 5



78. Right bank of spill channel near foot bridge 5 – terrain is broad and flat with many trees and bushes



79. Spill channel looking D/S at foot of 1034 Coats Drive residential property



80. Spill channel looking D/S toward 1034 Coats Drive residential property foot bridge 6



81. Spill channel looking downstream past end of residential property at 1034 Coats Drive



82. Spill channel disappears into flat area of trees and dense undergrowth before dropping down again toward Hoggan Lake



83. Looking U/S at spill channel (aka Coats Marsh Creek) near South Road crossing



84. 1.22 m dia. Coats Marsh Creek culvert crossing under South Road



85. View of culvert in photo 84 (yellow arrow) showing South Road crossing



86. D/S end of South Road crossing culvert – culvert crosses at dip in road



87. Close-up of D/S end of South Road crossing culvert



88. Coats Marsh Creek looking D/S toward Hoggan Lake (lake past grassy area at red arrow)

Appendix D – RDN Correspondence

Scot Merriam

From: Palidwor, David <DPalidwor@rdn.bc.ca>
Sent: August 27, 2012 9:14 AM
To: van Ossenbruggen, Chris; Marquis, Paul J FLNR:EX
Cc: Baldwin, John FLNR:EX; Cramer, Kelsey
Subject: RE: Coats Marsh Regional Park
Attachments: Coats Marsh Ecological Features 30 Dec 2010 (1).pdf

Hi

Another report attached. *[SRM] "Ecological Features and Management Recommendations fo Coats Marsh Regional Park" by Foul Bay Ecological Research Limited 30 December 2010*

Thanks again for meeting us there. This will clarify that it is likely a stream.

Dave

From: van Ossenbruggen, Chris
Sent: Friday, August 24, 2012 2:19 PM
To: Marquis, Paul J FLNR:EX
Cc: Baldwin, John FLNR:EX; Palidwor, David; Cramer, Kelsey
Subject: RE: Coats Marsh Regional Park

Hi Paul,

Thanks for the information. Both Dave and our parks planner Kelsey are away today. I will ask them on Monday and pass any other information to you if available.

Have a good weekend,

Chris

Chris van Ossenbruggen

Regional Parks Operations Coordinator
Regional District of Nanaimo
(250) 248-4744

From: Marquis, Paul J FLNR:EX [<mailto:Paul.Marquis@gov.bc.ca>]
Sent: Friday, August 24, 2012 1:41 PM
To: van Ossenbruggen, Chris
Cc: Baldwin, John FLNR:EX
Subject: RE: Coats Marsh Regional Park

Chris, thanks for providing me with an excuse to get out of the office for half a day. I appreciated the break.

I have done some addition investigation into the status of Coats Marsh and there seems to be some question as to whether or not the water body meets the definition of a stream under the Water Act. In order for the Water Act to apply (i.e. in order for Coats Marsh to be eligible for licensing or require an approval for works in an about a stream) it has to meet this definition:

"stream" includes a natural watercourse or source of water supply, whether usually containing water or not, and a lake, river, creek, spring, ravine, swamp and gulch

Since Coats Marsh was originally a field and no watercourses have been identified as tributaries and there is no record of a stream leaving the vicinity of Coats Marsh before the construction of the dam, it may not meet the "natural" criteria of this definition (i.e. since it is manmade if there were no "streams" existing before the dam was built than it is unlikely to be a stream under the Water Act).

I have a copy of the Madrone report (dated 22 Nov 11) but it is a bit light on hydrology. If you have any additional documentation that would help shed some light on this issue I would appreciate it if you would send me a copy. If it is determined that Coats Marsh is not a stream as defined by the Water Act than no authorization would be required.

If you have any questions, give me a call.

Thanks,

Paul Marquis
Section Head
West Coast Region
Ministry of Natural Resource Operations

phone: 250 751 3239

From: van Ossenbruggen, Chris [<mailto:CvanOssenbruggen@rdn.bc.ca>]
Sent: Wednesday, August 15, 2012 11:46 AM
To: Johnson, David A FLNR:EX; Marquis, Paul J FLNR:EX
Subject: Coats Marsh Regional Park

Hello Dave and Paul

Thanks for coming to Moorecroft. I was wondering if it would be possible to conduct a site visit at Coats Marsh Regional Park on Gabriola Island. Currently there is a pond leveler and another unlicensed weir. The pond leveler was installed in 2009. We are planning on increasing the size as we want to maintain the water level and minimize flooding on an adjacent private property. Your expertise would be very beneficial on the direction we will take. Do you happen to go over to Gabriola? If so and a site visit can be arranged please let me know.

Thanks

Chris van Ossenbruggen

Regional Parks Operations Coordinator
Regional District of Nanaimo
(250) 248-4744

Appendix E – Dam Failure Consequences Classification

Schedule 1

05-May-20

DFCC = Dam failure consequences classification

Item	Column 1	Column 2	Column 3	Column 4	Column 5
	DFCC	Population at risk		Consequences of failure	
			Loss of life	Environmental and cultural values	Infrastructure and economics
1	low	none (1)	no possibility of loss of life other than through unforeseeable misadventure	minimal short-term loss or deterioration and no long-term loss or deterioration of: (a) fisheries habitat or wildlife habitat, (b) rare or endangered species, (c) unique landscapes, or (d) sites having significant cultural value	minimal economic losses mostly limited to the dam owner's property, with virtually no pre-existing potential for development within the dam inundation zone
2	significant	temporary only (2)	low potential for multiple loss of life	no significant loss or deterioration of: (a) important fisheries habitat or important wildlife habitat, (b) rare or endangered species, (c) unique landscapes, or (d) sites having significant cultural value, and restoration or compensation in kind is highly possible	low economic losses affecting limited infrastructure and residential buildings, public transportation or services or commercial facilities, or some destruction of or damage to locations used occasionally and irregularly for temporary purposes
3	high	permanent (3)	10 or fewer	significant loss or deterioration of: (a) important fisheries habitat or important wildlife habitat, (b) rare or endangered species, (c) unique landscapes, or (d) sites having significant cultural value, and restoration or compensation in kind is highly possible	high economic losses affecting infrastructure, public transportation or services or commercial facilities, or some destruction of or some severe damage to scattered residential buildings
4	very high	permanent (3)	100 or fewer	significant loss or deterioration of: (a) critical fisheries habitat or critical wildlife habitat, (b) rare or endangered species, (c) unique landscapes, or (d) sites having significant cultural value, and restoration or compensation in kind is possible but impractical	very high economic losses affecting important infrastructure, public transportation or services or commercial facilities, or some destruction of or some severe damage to residential areas
5	extreme	permanent (3)	more than 100	major loss or deterioration of: (a) critical fisheries habitat or critical wildlife habitat, (b) rare or endangered species, (c) unique landscapes, or (d) sites having significant cultural value, and restoration or compensation in kind is impossible.	extremely high economic losses affecting critical infrastructure, public transportation or services or commercial facilities, or some destruction of or some severe damage to residential areas

Footnotes:

(1) There is no identifiable population at risk.

(2) People are only occasionally and irregularly in the dam-breach inundation zone, for example stopping temporarily, passing through on transportation routes or participating in recreational activities.

(3) The population at risk is ordinarily or regularly located in the dam-breach inundation zone, whether to live, work or recreate.

Appendix F – BC Conservation Data Centre Map

Legend

Species and Ecosystems at Available Occurrences - CD

- FEATURE_CODE
- Animal - Vertebrate
 - Animal - Invertebrate
 - Plant - Vascular
 - Plant - Non-vascular
 - Ecological Community

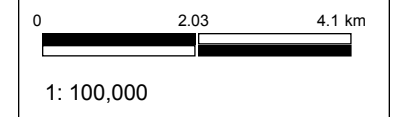
Species and Ecosystems at Secured) Publicly Available

Species and Ecosystems at and Historical) Publicly Avail CDC

- FEATURE_CODE
- Animal - Vertebrate
 - Animal - Invertebrate
 - Plant - Vascular
 - Plant - Non-vascular
 - Ecological Community

Water - Rivers, Creeks, Sho (1:20,000)

- FCODE
- Canal
 - Dam
 - Dam - Beaver
 - Ditch
 - Falls
 - Flume



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Datum: NAD83
Projection: WGS_1984_Web_Mercator_Auxiliary_Sp here

Key Map of British Columbia

