



## **Cold Spring Creek 2022 Annual Dike Inspection Report**

### **Background**

#### **2013**

Cold Spring Creek experienced a debris flood event on June 20, 2013 that deposited material in the creek channel, the small mid-section debris trap and the lower debris trap. Debris material was also deposited behind the Cold Spring Creek Dam which is located upstream of the works. The Cold Spring Creek Dam is not part of the debris containment works and is not owned by the RDEK but debris is contained in the reservoir.

Material removals in 2013 were completed at the Cold Spring Creek Dam reservoir, small mid-section debris trap along the bank protection works, at the last culvert along the bank protected section and in the upstream half of the lower debris trap. All these locations were cleared of transported gravel from the debris flow and the front half of the lower debris trap was also cleared of material that had been deposited over several years. The funding for removal of the transported debris flow material was primarily from Emergency Management BC (EMBC) emergency response funds. The RDEK provided some funds for additional material removal on the lower debris trap.

#### **2015**

The July 15, 2012 Fairmont Creek debris flow and June 20, 2013 debris flow events on Fairmont Creek and Cold Spring Creek prompted the need to have a hazard and risk assessment completed for Cold Spring Creek. This assessment was completed by Clarke Geoscience in January 2015 and included some recommendations for debris flow mitigation along the channel.

#### **2016**

The downstream half of the lower debris trap and the culvert just upstream of the debris trap was cleared of sediment in August 2016 by the RDEK.

Some vegetation was removed around the debris pond in 2016 prior to the pond clean out to reduce the spread of noxious weeds.

#### **2017**

The Cold Spring Creek Dam reservoir was cleaned out again in May 2017 after a small debris flow event that completely filled the reservoir with debris flow material.

## **2018**

There were no events on Cold Spring Creek in 2018 and no maintenance was completed on the creek.

## **2019**

On August 10-12, 2019, a significant weather event (isolated heavy rain) occurred in the Fairmont area. As a result, a debris flood occurred on Cold Spring Creek. The Cold Spring Creek Dam reservoir was filled to capacity, the culverts at the crossings of Fairway Drive and Hot Spring Road were blocked by debris and the creek flowed over the roads and partially through private property before returning to the channel.

The lower debris trap was also filled with debris (gravels and fine grained material). The armouring along the creek channel was not damaged during the event.

## **2020**

On May 20, 2020 there was a small debris flood event that partially filled the reservoir with material. The lower channel was not impacted. On May 31, 2020 there was a significant debris flood event in response to heavy precipitation on snow following a few days of very warm weather. This event filled the upper reservoir to overflowing, caused some damage to the channel, blocked several culvert crossings and filled the lower debris trap. The precipitation event had a 10 year return period, the clear water flood event had a 10 to 20 year return period and the debris flood had a 5 year return period.

## **2021**

On May 24, 2021 there was a significant precipitation event. The event was less intense than the 2020 event but had a longer duration and resulted in sediment being deposited in the Cold Spring Creek Dam Reservoir. The material was removed as soon as practical to restore debris capacity. There was a small amount of material deposited in the lower pond by the maintenance shed. A second intense rain event occurred in mid July that resulted in a secondary cleanout of approximately 30% capacity of the dam reservoir.

In 2021, the RDEK was successful in obtaining fund to design and construct a large debris barrier and basin on Cold Spring Creek. This project will take place from 2021 to 2023.

## **2022 Cold Spring Creek Dike Inspections**

An inspection was completed on May 3, 2022 and was conducted by Jim Maletta, ASCT., RDEK acting Water Resources Project Supervisor. All sections of the dike were found to be in good condition at that time and ready for freshet.

The infrastructure will be described from upstream to downstream and will include photos for each site showing the condition of the infrastructure pre-freshet, post-event and after clean up (where appropriate).

### Upstream Conditions (Historical and Current)

The channel conditions as far upstream as the Cold Spring Creek Dam are monitored and inspected at the same time as the dike/bank protection works. The dam is owned and operated by the Fairmont Hot Springs Resort. A small amount of material was removed from the reservoir in late 2015/early 2016 by the contractor that was working just upstream of the dam. The dam was cleaned out again in May 2017 after a small debris flow event that completely filled the reservoir with debris flow material and again after the 2020 event.

The dam and reservoir were in good condition during the May 5, 2021 inspection. During the May 24, 2021 event it was approximately 75% filled with debris. The debris was removed from the reservoir immediately after the May 24 event. A second intense rain event in mid July filled approximately 30% of the reservoir capacity with debris. The second event material was cleaned out shortly after the deposition occurred leaving the reservoir completely empty of debris. The dam was in good condition on the May 3, 2002 inspection date with some scour along the left bank which was very noticeable at the face of the dam. Meters of material would have to scour out before any issues would surface. FHSR has been advised of the observed conditions.

The weather and creek flow conditions on May 3, 2022, were typical for pre-freshet conditions:

- Water clarity was excellent
- Flow rate was low and normal for this time of year
- Weather conditions were warm and clear (approximately 22 degrees C)
- The Cold Spring Creek wetted perimeter has snow in the upper area



Photo 1: The reservoir conditions on May 3, 202

### **Culvert Conditions**

All of the culverts between the dam and Highway 93/95 were functioning properly at the time of the May 3, 2022 inspection. Additional culvert capacity had been installed by MoTI through the installation of high water culverts at two road crossings.

The water level at the time of the inspection was low and contained in the creek channel however the channel is infilled with debris material and does not have much capacity. Creek avulsion is possible in a moderately high water situation. Some minor issues with and around culverts were observed above Highway 93/95:

- At the inlet along Resort Road some sediment is present
- At the outlet along Resort Road, scour from road drainage is occurring along the culvert edge reducing the road shoulder width.
- The main channel inlet at Fairmont Road has moderate sediment present
- MoTI Area Roads Manager has been advised (May 25, 2022) via email with photos

### **Channel Conditions Below Highway to Debris Trap**

The channel from Highway 93/95 to the debris trap (dike/bank protected area) was in good condition. The complete bank protection works were brushed in 2012 and is required again. Some rip rap is missing from the left bank of the bank protected section. This issue has been in existence for over 15 years and does not seem to impact the function of the bank protection.

The last culvert along Cold Spring Creek before the lower debris trap is experiencing some very minor underflow piping. Sediment deposition in this culvert is common as the grade at the culvert inlet flattens out and sediment collects at the inlet and along the invert of the culvert length. The current condition of this culvert may reduce capacity in a high flow situation. Clearing granular sediment above, within and below the culvert should occur prior to the 2023 freshet. The channel at the outlet of the last culvert also has gravel deposition within it and has deposited granular material from the culvert outlet and has created a small fan at the debris trap inlet. The last culvert along Cold Spring Creek is part of the flood control works. It would be prudent to remove some material from the creek channel and fan when the culvert is cleaned out

Brushing of the creek channel between the highway and debris trap should occur in a low traffic period, either mid fall or prior to the May long weekend.

### **Debris Trap Conditions**

The bottom Cold Spring Creek debris trap has signs of migrating deposition at the inlet and siltation deposition near the outlet. The build up at the inlet and near the outlet are not significant but increasing. Minor capacity reduction of the debris trap is the result of the upper gravel and lower silt depositions. Plans to dredge the sediment near the outlet should occur within the next 5 years or if deposition increases due to high fines carryover from high water events possibly sooner. The debris trap inlet deposition should be inspected regularly in 2022 after high water events. High water events could impact gravel deposition at the trap inlet and should be inspected after each highwater event. A Water Act Section 11 application is required for material removal for non-emergency maintenance. Non -

emergency maintenance occurs in the fish window in second half of August, so approvals need to be in place prior to the fish window maintenance period.



Photo 2: Lowest Cold Spring Creek Culvert Inlet with Sediment Build Up



Photo 3: Lowest Cold Spring Creek culvert outlet showing gravel deposition throughout the culvert



Photo 4: Cold Spring Creek debris trap showing gravel deposition at the inlet





Photo 5: Cold Spring Creek outlet of debris trap showing siltation buildup up stream of the culvert