WFff 816 001

Fairmont Creek 2022 Annual Dike Inspection Report

Background

2012

Fairmont Creek experienced a significant debris flow event on July 15, 2012 which deposited approximately 65,000 m^3 of debris in the creek channel, over the debris fan and along subdivision roadways and drainage ditches. Disaster Financial Assistance funds were used to reconstruct the previously existing section of dike and protected bank just below Marble Canyon. This work was completed by April 2013. In addition to reconstructing the creek channel and protecting the bank, a series of nine grade controls were constructed along this section. The engineering consultant for this work was Kerr Wood Leidal and the contractor was Max Helmer Construction.

After the 2012 debris flow, Emergency Management BC (EMBC) funds were obtained to have a debris flow hazard and risk assessment completed on Fairmont Creek. Clarke Geoscience was retained for the assessment. It was completed in January 2013 and included a series of recommendations that could be implemented to help mitigate debris flow risk.

2013

On June 20, 2013, Fairmont Creek experienced another debris flow event caused by a significant rain event on saturated soils. The magnitude of this event was approximately 6,000 m^3 and the material was mostly contained in the channel and the golf course pond. The golf course pond, a few sites along the creek channel and material impacting the time share condominiums were cleaned out and repaired through EMBC Emergency Response funding. The newly constructed bank protection was not damaged in the event but six of the nine grade controls were significantly damaged or completely destroyed.

The RDEK commissioned an overview inspection of Fairmont Creek following the 2013 event. The inspection and report were funded through EMBC, and completed by Clarke Geoscience. The inspection occurred on July 29, 2013 and confirmed the findings of the January 2013 Debris Flow Hazard and Risk Assessment, which states that unlimited material available for mobilization exists in the Fairmont Creek watershed and can mobilize given the right conditions.

2014 - 2015

In 2014, the RDEK was awarded funding through the Building Canada Fund Flood Protection Program for Phase 1 of the Fairmont Creek Debris Flow Mitigation Project. Engineering for this work was completed in Fall of 2014 and construction was completed in early May 2015. The project included widening the

creek through the golf course to the pond in order to increase storage capacity. The banks were sloped appropriately and armoured and berms were constructed on both sides of the creek to further contain material in the event of a debris flow. The engineering consultant for this work was Urban Systems and the contractor was Max Helmer Construction.

2016

In 2016, the RDEK was awarded additional funding through the EMBC Flood Protection Program in order to complete Phases 2 and 3 of the Fairmont Creek Debris Flow Mitigation Project. Phase 3 consists of the installation of a weather station at the ski hill and was completed in November 2016. The weather station will be used to develop an early warning system for the community.

2017-2018

On May 12, 2017, a small amount of debris came down Fairmont Creek to the debris trap pond. An estimated 1,200 m^3 of debris material was deposited in the pond and additional debris was deposited upstream along the creek bed. Removal of the debris was planned for 2019 following completion of the Fairmont Creek Debris Flow Project Phase 2 works. This was not completed because of the costs associated with the August 12, 2019 event (see below). It will be completed when funding permits. The extensive debris storage that was constructed upstream on Fairmont Creek makes this work less urgent.

Phase 2 of the Fairmont Creek Debris Flow Mitigation Project involved the construction of two large sediment basins containing three large riprap weirs upstream of the Fairmont Hot Springs Resort. Construction was started in September 2017 and was completed Fall 2018 and has added approximately 17,000 cubic metres of debris capture and storage capacity.

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 Fairmont Creek and the uppermost of the three newly constructed debris traps was filled to capacity (1,225 cubic metres). Minor erosion between the first and second weir deposited a small amount of material in front of weir #2. There was moderate erosion in the channel below the second weir with material being deposited between the area of erosion and the third weir. The weirs successfully contained the debris flood material originating from above the project area and prevented it from being transported downstream.

2020

On May 20, 2020 there was a small debris flood event that filled the Wier 1 basin with material. 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 three containment basins to capacity, deposited a significant amount of material in the channel through the golf course and filled the pond on Hole 12 to capacity. There was damage in a few locations along the infrastructure that will be described in detail and two of the downstream culverts were blocked causing the water to flow over the roads and outside of the channel causing minor property damage. 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 35 year return period. Upon review and with the information from this event, the 2012 event was reclassified from a 500 year event to a 165 year event.

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 three upper sediment basins. Basin 1 was filled to capacity and Basins 2 and 3 experienced lesser amounts of infilling. The three basins were cleared of debris as soon as practical to restore storage capacity. A mid July intense rain event (25 – 30 mm in 1 hour) caused trap 1 to fully fill in and trap 2 and 3 had significant deposition. The contractor onsite was working on trap 3 material removal at the time and was retained to do a second cleanout of each debris trap. EMBC approved funding a second material removal effort as the first round of material cleanouts were well under budget from the approved amount. Each trap was returned to a state where material acceptance was maximized. There was some minor channel infilled in the golf course channel and minimal deposition in the Hole 12 pond from the May 24th event.

Fairmont Creek 2022 Dike Inspections

The 2022 Fairmont Creek Dike inspection was completed on May 3, 2022 by Acting Water Resources Project Supervisor, Jim Maletta, AScT. on May 3, 2022. Conditions at the time of the inspection were warm, mostly sunny and approximately 24 ^{o} C. Creek flow and water clarity were low and very clear, typical for pre-freshet flow volume and turbidity. The high elevation of the Fairmont Creek drainage still had snow from the mountain peak to above mid elevation levels.
The Fairmont Creek Dike inspection will be from highest creek debris trap to the confluence of Fairmont Creek and receiving waters at the Columbia River.

Debris Trap 1

Debris trap 1 was in excellent condition with a minor amount of granular sediment in the very upper section. The upstream and downstream slopes were in excellent condition with a small amount of woody debris present. The visible channel above debris trap 1 is in good condition. Debris trap 1 has almost 100% of design capacity available for debris containment at the time of the inspection. Photos below show debris trap 1 inlet, upstream weir slope and downstream weir slope.

Photo 1a: Debris Trap 1 Inlet of Fairmont Creek May 3, 2022

Photo 1b: Debris Trap 1 Inlet May 31, 2022

Photo comparison for sediment deposition between May 3 and May 31, 2022. Snow melt within the Fairmont Creek drainage area is still in process.

Photo 2: Debris Trap 1 Upstream slope of Weir 1

Photo 3: Debris Trap 1, Downstream Slope Looking Upstream

Channel Between Debris Trap 1 and Debris Trap 2

The channel between Debris Trap 1 and Debris Trap 2 is in good condition. Some minor indications of scour exist on the left bank looking downstream, likely from when the creek channel migrated to the left bank.

Photo 4: Channel between Debris Trap 1 and Debris Trap 2

Debris Trap 2

Debris Trap 2 is in good condition. Capacity for transmitted material is essentially 100% as minimal material has entered the Debris Trap 2. The upstream and downstream slopes of the weir are in excellent condition. The downstream slope of the weir has a small to moderate amount of smaller woody debris present.

Photo 5: Debris Trap 2 View from Upper Section & US Slope of Weir

Photo 6: Debris Trap 2 US Slope of Weir

Photo 7: Debris Trap 2 DS Slope

Channel Between Debris Trap 2 and Debris Trap 3

The channel between debris trap 2 and debris trap 3 has the following issues:

- Significant scour issues along the left bank. High water events could easily mobilize material along left bank and transmit it further down stream.
- Long logs or woody debris is present throughout the narrow long section of channel between debris trap 2 and debris trap 3. Water Stewardship has been advised through a request to buck up the logs into short lengths so they could flush through the Fairmont Creek channel. Water Stewardship should advise if this is water license maintenance, or if a Section 11 application is required
- Haul road tension crack. The haul Road just downhill of trap 2 entry road has a tension crack in it. The crack has increased in size since late July 2021. This may not currently be an issue but intense rain events prior to the next use could impact the integrity of the road. For safety reasons any contractor, consultant, or inspector using the debris trap haul road should know about the issue before driving the haul road.

Photo 8: Woody debris on DS Slope of Weir 2, Left bank scour

Photo 9: Left Bank Scour and Woody Debris within Fairmont Creek Channel

Photo 10a: Logs and Woody Debris within Fairmont Creek Channel

Photo 10b: Logs and Woody Debris within Fairmont Creek Channel

Photos 10a and 10b are both from the section of Fairmont Creek channel between debris trap 2 and debris trap 3. There is a large amount of logs and woody debris in this reach of Fairmont Creek.

Photo 11: Tension Crack on Fairmont Creek Debris Trap Access Road

The tension crack is located just above the wooded bank with pull out parking area as the road enters a fill section. The tension crack is near the road edge and should be inspected regularly. The crack should be inspected before driving along that section of haul road and definitely before any heavy equipment accesses the site and hauls material along the road.

Debris Trap 3

Debris trap 3 is in excellent condition. There is some siltation build up in the right portion of the trap which is typical for this area as water moves very slowly through the weir in this location. The silt based sediment can act as a seal for turbidity and cold water entering seams that feed the geothermally heated swimming pool vaults below debris trap weir.

Channel Downstream of Debris Trap 3 to Marble Canyon Bank Protected Works

The channel between the downstream slope of Debris Trap 3 and the Marble Canyon bank protection works is generally in good condition other than a significant scour point just downstream of the swimming pool discharge. The scour point has exposed a FHSR HDPE watermain for Mountainside Golf Course irrigation. The scour has eliminated the left bank access/recreation trail in this area and has left steep banks to the creek channel below. FHSR has tried to isolate access to this area and has plans to repair the cover over the HDPE watermain and reinstate the recreation trail. The pipe exposure and significant scour occurred as a result of the 2020 debris flood event.

Marble Canyon Bank Protection Works

The bank protection works in the Marble Canyon section of Fairmont Creek are in good condition. Some small amount of brush exists in a couple of locations but has no impact on the function of the revetment. Along the unprotected left bank of the creek in the lower portion of the Marble Canyon works bank scour is occurring. This does not affect the works, however, the scoured material would likely end up in the Hole 12 pond as sediment deposition from high water events.

Photo 12: Marble Canyon Works

Photo 12: Left Bank Scour Locations Along Lower Area of Marble Canyon Section

Marble Canyon to Hole 12 Debris Trap/Golf Course Pond

Fairmont Creek works between Marble Canyon and hole 12 debris trap/golf course pond is in very good condition. The tufa layer has re-established within the creek channel. Two small areas have reduced bank protection, possibly from clean up efforts. The upper location is on the left side just below the hole 16 golf cart bridge (possible equipment access point) and the lower bank exposure is on the right side just at the creek bend above the pond. Neither location is a current concern.

Photo 13: Left Bank Exposed Area Below Hole 16 Bridge. Possible equipment entry point

Photo 14: Exposed Bank Protection at Bend on Fairmont Creek Above Hole 12 Debris Trap

Hole 12 Debris Trap/Golf Course Pond

The hole 12 debris trap/golf course pond is generally in very good condition with some silt/sediment build up on the left side beginning at the inlet and heading downstream. FHSR and the RDEK have discussed removal of the silt sediment in the fall of 2022.

Photo 15a: Hole 12 Pond Inlet with Sediment Build Up (May 3, 2022)

Photo 15b: Hole 12 Pond With Underflow Discharge in Effect. Sediment Build Up Very Evident on Left Side of Pond Inlet

Fairmont Creek From Hole 12 Debris Trap/Golf Course Pond to Columbia River

The channel from the discharge at hole 12 debris trap/golf course pond to the Columbia River is generally in good condition apart from 2 culverts on FHSR Villas and golf course and 2 culverts on public roadways. The culverts have partially infilled, and a tufa layer has built up over the sediment within the culverts. The infilling has reduced transmittance capacity of the culverts. FHSR and MoTI has been made aware of the current condition of the culverts impacted by infilling.

Photo 16: First Culvert DS of Hole 12 Debris Trap/Pond Outlet, Inlet Obstruction Present FHSR Culvert

Photo 17: Second Culvert Downstream of Hole 12 Debris Trap/Pond, Inlet Obstruction Present FHSR Culvert

Photo 18: MoTI Culvert Infilling

Photo 18: MoTI Culvert Infilling, Last Culvert Along Fairmont Creek Before the Columbia River