Project: 20019

July 3, 2020

North Okanagan Regional District
9848 Aberdeen Road
Coldstream, BC V1B 2K9

Attention: Alastair Crick, Manager Protective Services

Re: Hansen Park (Cherryville Park) on Cherry Creek, 127 North Fork Road – Flood Protection and Damage Assessment

The following report has been prepared at the request of the Regional District of North Okanagan.

1. Scope of Work

The scope of work for this flood damage assessment includes the following:

- Provide preliminary recommendations on protective options for park infrastructure
- Complete a field assessment of Hansen Park and the impacts of the recent flooding.
- Confirm the flood risks to the RDNO infrastructure.
- Assess the temporary flood protection works constructed during the recent flooding and determine if they are acceptable to DFO and FLNRORD and their regulations, e.g. Fisheries Act, Water Sustainability Act etc.
- Recommend an appropriate restoration plan to address the temporary works.
- Provide an estimate of the 200-year flood discharge in Cherry Creek.
- Provide preliminary recommendations on protective options for park infrastructure.

2. Background

The Regional District of North Okanagan owns the Hansen Park located at 127 North Fork Road in Cherryville, that is situated on Cherry Creek (Figure 1). The legal description of the property is Lot B, Plan KAP18806, Sec 28, Twp 57, ODYD.

During a high flow event in Cherry Creek in late May 2020 some emergency flood protection works were undertaken by the local community to protect vulnerable infrastructure in the park near Cherry Creek (Photos 1&2). The emergency works were not designed or authorized prior to installation and were installed within a highwater channel and also on the floodplain within the riparian area.

The area of concern is the lower floodplain adjacent to Cherry Creek (Figure 2). The park is situated on the south side of Cherry Creek and includes a lower floodplain that is highly susceptible to flooding during high flows in the creek and also an upper older floodplain terrace that is not susceptible to flooding. There are several buildings and a campground located on the lower floodplain that are vulnerable to flooding and were the focus of the flood protection efforts by the community that are subject of this assessment. There are also other park improvements on the upper terrace that were not impacted by the recent flooding.

3. Summary of Field Review

A field review was completed on June 5, 2020 with the RDNO Manager of Protective Services. Cherry Creek had overflowed its banks near the upstream end of the park and flowed across the lower

floodplain as illustrated in Figure 2. The area within the dashed blue line is the lower floodplain that was inundated by the floodwaters. The blue arrows illustrate the main overflow paths. The upstream flow path includes a defined highwater channel that concentrated flows towards the stage and adjacent concession. The downstream flow path, downstream of the well, is also an old highwater channel but less well defined and conveyed overflow through the campground area.

The emergency works undertaken by the community during the flood event included placement of logs along the left bank of the upstream highwater channel (Photos 3&4) and large riprap along a section of the left bank behind the two structures (Photo 1). Overflow from the upstream highwater channel flowed across the floodplain surrounding the structures and the well (Photos 5&6). Shallow diversion ditches with low berms, (Photo 2 and red lines on Figure 2), were constructed across the floodplain to divert floodwaters away from the structures and back to the creek.

The emergency works constructed in May are not considered to be permanent works. The riprap that was placed behind the two structures during the high flows in the highwater channel is not keyed-in to the channel bed or the banks (Photo 1). Although it did prevent the loss of the structures, if it was to be used for permanent protection, it would have to be removed and reinstalled properly.

The logs that were placed along the left bank of the highwater channel, upstream of the riprap, may have diverted some flows back towards the main channel but at very high flows, as were experienced in May, they would have been overwhelmed and had little effect.

The ditching done across the floodplain, west of the highwater channel, (shown in Photo 7 and as red lines in Figure 2), had little to no effect on reducing the overland flow towards the campground.

4. Flood Risks

The lower floodplain, adjacent to the left bank of Cherry Creek, as outlined in Figure 2, is highly susceptible to flooding during high flows in the creek.

The elements at risk on the floodplain include the stage and adjacent concession buildings that are situated on the left bank of the highwater channel, a picnic area, a toilet building, an open, covered dining building, a closed concession building, a well and water intake and the campground. Other than the closed concession and the well the other structures do not suffer much damage from floodwaters. The exception is the bandstand and adjacent concession that are impacted by erosion in the highwater channel that undermines their foundations.

Any improvements on the lower floodplain are at high risk from flooding. The extent of potential damages from flooding ranges from low for most structures to high for the closed concession and the well and water intake works.

5. Impacts from Flooding

The flooding in May inundated most of the lower floodplain along the creek upstream of the campground and flooded through the campground (Photo 8). The central portion of the lower floodplain has been developed for recreation use and includes a stage, some concession stands, a covered, open dining area, a toilet and a picnic area. The high flows in the highwater channel that is immediately east of the stage and a concession stand, eroded the channel bank and was undermining the footings of the stage and the concession before the riprap was placed. There is damage to the foundations of both structures. There is also a well and water intake works west of the closed concession building that flooded but did not appear to have been damaged by the recent flooding.

There was general overland flooding of the areas shown in Figure 2 that threatened the covered dining area and the concession building to the west and the well. The floodwaters deposited a layer of mud wherever it flowed across the floodplain.

The impact of all the emergency protection works has been to disturb the site and contribute additional sediment to the creek during the flood event and post-flood during rainstorms. As indicated previously, the emergency works are not permanent works and will not prevent flooding of the site in the future.

6. Legal implications of Emergency Works

Work around water is regulated by the Water Sustainability Act and Regulations at the provincial level, and where there are fish, by the Fisheries Act at the federal level.

The placement of the riprap in the highwater channel would likely be deemed to cause harmful alteration, disruption or destruction of fish habitat, section 35(1) of the Fisheries Act [https://laws-lois.justice.gc.ca/eng/acts/f-14/FullText.html]. Similarly, the disturbances along the highwater channel where the logs were placed to divert flows would also likely be a contravention of Section 35(1) of the Act. The construction of the diversion ditches within 30m of the stream is considered to be within the riparian area that is considered to be fish habitat. Even though this is previously disturbed land, the ditching has contributed sediment to the creek and that may also be deemed a contravention of Section 35(1).

Disturbance in or about a stream is regulated by the province under the Water Sustainability Regulation [http://www.bclaws.ca/civix/document/id/complete/statreg/36_2016#part6], specifically Part 3 – Changes in or about a Stream - section 39 and 44. Part 6 - Section 54 addresses the matter of offences. It is likely that the emergency works could be considered as offences under Section 54 of the Act.

7. 1 in 200-year Flood for Cherry Creek

The 1 in 200-year flood, or Q_{200} for Cherry Creek is estimated to be approximately 85 cubic meters per second, based on the limited streamflow data from the Water Survey of Canada hydrometric station Cherry Creek near Cherryville (Stn# 08LC049). Assuming an average channel width of 20m, a flow of 85m^3/s would overflow where bank heights were 1m or less. The left bank of the channel within the park has low banks that would be overtopped by flows greater than about a 1 in 5-year return period, so the lower floodplain is very vulnerable to frequent flooding.

8. Conclusions

The lower floodplain within Hanse Park is highly vulnerable to frequent flooding from Cherry Creek. The cost to construct flood protection works designed to provide protection from floods up to a 1 in 200-year event would exceed the value of the present improvements. Infrastructure and uses on the lower floodplain should be restricted to those that can accommodate the passage of floodwaters with limited damage.

9. Recommended Restoration

Regardless of the decisions by the Regional District regarding flood protection within the Hansen Park, since the emergency works likely contravenes both the Fisheries Act and the Water Sustainability Act, it is recommended that qualified environmental professionals be engaged to prepare restoration plans to:

a. Remove the riprap and restore the disturbed bank and channel where the riprap was placed.
b. Remove the logs placed along the left bank of the highwater channel upstream of the riprap.
c. Restore the access trail constructed along the left bank of the highwater channel to prevent further sediment delivery to the stream.
d. Restore the diversion ditches across the floodplain west of the highwater channel to prevent further sediment delivery to Cherry Creek.

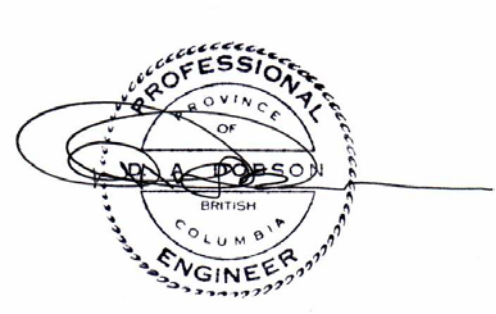
Timing of instream works on Cherry Creek is August 7-31. Work in the dry can be done at any time after receiving the required authorizations.

10. Recommended Park Uses on Lower Floodplain

- Based on the likely frequency of flooding on the lower floodplain, park uses should be limited to those that would have limited impact from flooding. Any structures on the floodplain should either be of a design that is not affected by flood waters or, elevated above the estimated Q_{200} flood water elevation or otherwise floodproofed.
- It is recommended that the stage and concession, situated on the bank of the highwater channel and damaged by the recent flooding, be either removed, or relocated to a safe site.
- The closed concession and the toilet should be removed from the lower floodplain.
- The well building should be elevated and floodproofed.
- The water intake works by the well should be floodproofed.
- The campground should be maintained as a primitive type campground that would have limited impacts from occasional flooding and only open for use after the spring freshet.
- It is recommended that the lower floodplain be left in a natural state with regards to flooding and allowed to flood on occasion as the costs to design and construct appropriate flood protection works that would prevent flooding on the lower floodplain would far exceed any benefits derived.

If you have questions regarding any of the recommendations provided in this assessment, please contact me.

Sincerely,



D.A. Dobson, PEng.

Figure 1 – Cherryville Park – 127 North Fork Road, Cherryville, BC

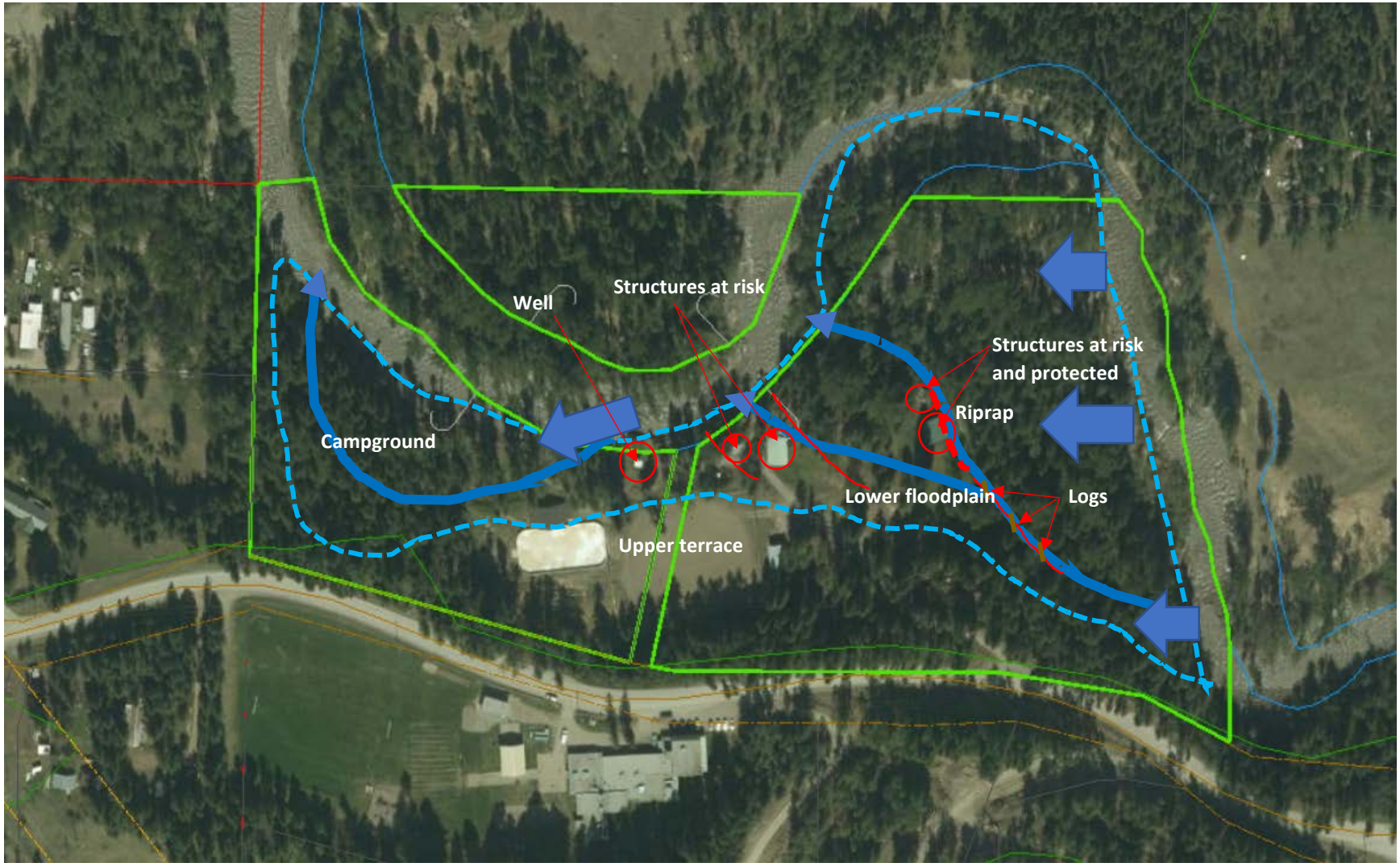


Figure 2 – Cherryville Park Flooding during May 2020 high flows in Cherry Creek. [Area within blue dashed polygon is lower floodplain]

Photo 1 – Emergency riprap in highwater channel behind stage and concession

Photo 2 – Emergency ditching and berms near closed concession building

Photo 3 – Logs placed in highwater channel to divert flows

Photo 4 – Logs placed in highwater channel to divert flows

Photo 5 – Floodwater impacts on lower floodplain

Photo 6 – Evidence of floodwaters surrounding well building

Photo 7 – Emergency ditching to divert flows away from buildings

Photo 8 – Evidence of flood flows through the campground