Environment

Government of Yukon

Former Clinton Creek Asbestos Mine
2009 Site Inspection

Prepared by:

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Project Number:

6029 015 00 (4.6.1)

Date:

March, 2010

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This Statement of Qualifications and Limitations is attached to and forms part of the Report.

March 26, 2010

Mr. Frank Patch
Government of Yukon
Assessment and Abandoned Mines
2C – 4114 – 4th Avenue
Whitehorse, Yukon
Y1A 2C6

Dear Frank:

Project: **6029 015 00 (4.6.1)**
Regarding: **Former Clinton Creek Asbestos Mine – 2009 Site Inspection**

AECOM Canada Ltd. (AECOM) is pleased to submit our Final Report for the above referenced project.

Should you have any questions or require any additional information, please contact either Gil Robinson or Ken Skaftfeld directly.

Sincerely,
AECOM Canada Ltd.

Ron Typliski, P.Eng.
Vice-President, Manitoba District
Canada West Region

KS:dh
Encl.
cc: G. Robinson

Distribution List

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	K.Skaftfeld	February/2010	Draft
2	K.Skaftfeld	March/2010	Final

AECOM Signatures

PROFESSIONAL ENGINEER
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PERMIT TO PRACTICE
Signature
Date 2010/03/26
PERMIT NUMBER: PP066
Association of Professional Engineers of Yukon

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1. Introduction

1.1 Terms of Reference

The terms of reference for this report are outlined in AECOM's letter proposal to the Yukon Government dated June 5, 2009. Work was carried out under AECOM's Standing Offer AMB-08-001 for Engineering and Consulting Services related to Operating and Abandoned Mines in the Yukon.

1.2 Scope of Work

The scope of work was based on the recommendations in the Long Term Performance Monitoring Program Report (UMA 2006) to conduct a bi-annual site inspection as part of the management of physical hazards identified at the mine site and until such time that a closure plan is developed for the site. Not all mine site features were inspected with most of the effort placed on evaluating the condition of critical features such as the Clinton Creek gabion drop structures at the Hudgeon Lake outlet, the rock lined channel in Wolverine Creek downstream of the tailings pile and the Porcupine Pit.

2. Site Description

2.1 Location and Environment

The former Clinton Creek Asbestos Mine is located about 100 km northwest of Dawson City, Yukon, and 19 km from the Alaska border as shown on Figure 01. The mine site is situated within a triangle bounded by the Yukon River, the Forty Mile River and the International (Yukon-Alaska) border at approximately UTM coordinates 7 147 500 N, 613 000 E (UTM Zone 7 NAD83). Access to the mine is from the Top of the World Highway connecting Dawson City and the border crossing into Alaska. The mine is situated along Clinton Creek about 9 km upstream of the confluence with the Forty Mile River. The Forty Mile River flows into the Yukon River about 5 km downstream from the mouth of Clinton Creek. The former Clinton Creek Town Site, built to support the mine, is located on the west side of the bridge crossing at the Forty Mile River.

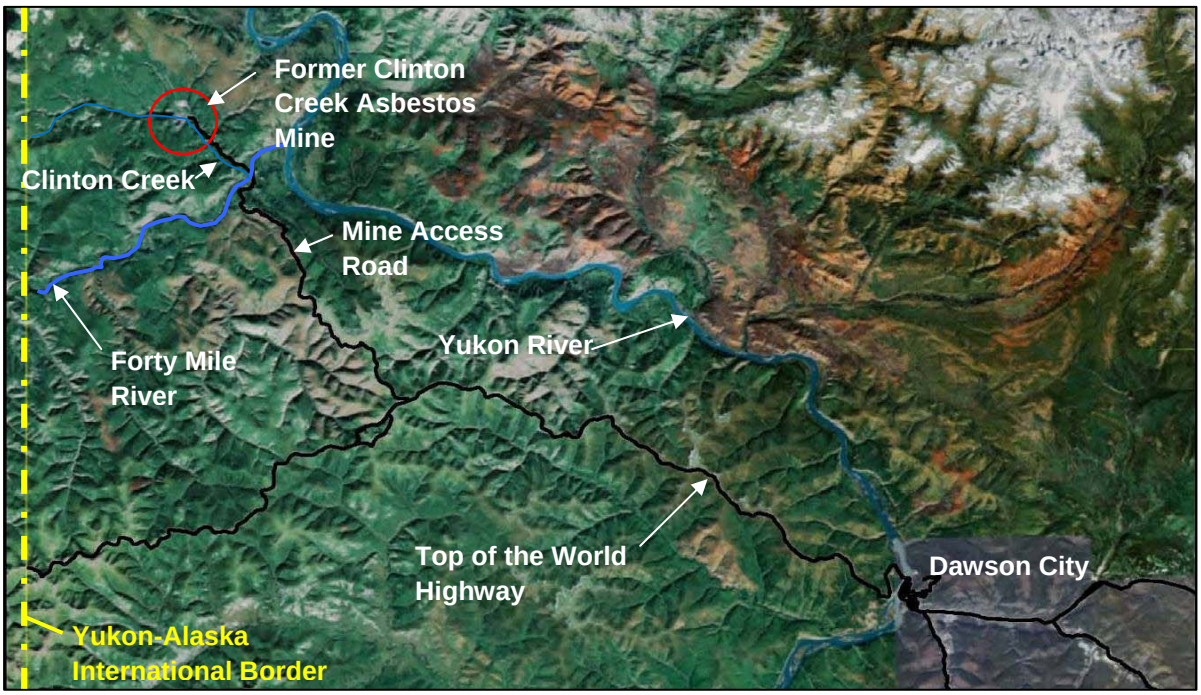


Figure 01 Key Plan (Source – Google Maps)

The former mine is located between approximately elevations 375 m above sea level (ASL) at the Clinton Creek valley floor and 590 m ASL at the former mill site. Local relief in the area is in the order of 215 m. The site is within the unglaciated Yukon-Tanana Upland in widespread discontinuous permafrost distribution. The maximum permafrost depth in the area is estimated to be in the order of 60 m (EBA 2004, Golder 1978). The presence of permafrost is evidenced by reports of segregated ice, in the form of large crystals and thick lenses being encountered in alluvial valley deposits and near surface bedrock in undisturbed ground (Stepanek and McAlpine, 1992). Records kept during active mining (1968-1978) indicate an annual mean temperature of approximately -2.5 degrees C with an average annual precipitation of 360 mm/yr (Golder, 1978).

2.2 Mine Site

The mine layout is shown on Figure 02. The Porcupine and Snowshoe Pits are located along the top of a hillside on the south side of Clinton Creek. The Creek pit is located along the original alignment of Porcupine Creek. The former mill site is located on a plateau along the west side of the Wolverine Creek valley about 150 m higher than the mine site area. A crusher building was formerly located on the high ground between the Porcupine and Creek Pits. Ore was transported from the crusher to the mill site by way of an overhead tram line. An airstrip is located about 1.5 km north of the mill site.

Waste rock from the three open pits was deposited along the valley slopes immediately adjacent to the pits. The Porcupine and Clinton Creek are the largest of the waste rock dumps. Hudgeon Lake was formed in the 1970s due to a landslide of the Clinton Creek Waste Rock Dump across the valley floor. The lake is presently about 30 m deep with creek channel flow now over the leading edge of the waste rock dump along the north valley slope. Gabion drop structures were constructed at the Hudgeon Lake outlet from 2002 to 2004 to reduce the potential for a breach of the waste rock plug and consequential rapid lowering of the lake. Tailings from the milling operation were deposited onto the Wolverine Creek valley slope in the north and south lobes which subsequently advanced down the valley slope blocking flow along the natural creek alignment. Flow in this section of Wolverine Creek is now along the leading edge of the tailings at the east valley slope. Readers are referred to the Former Clinton Creek Asbestos Mine Overview Report (AECOM 2009a)for a more detailed description of the mine site.

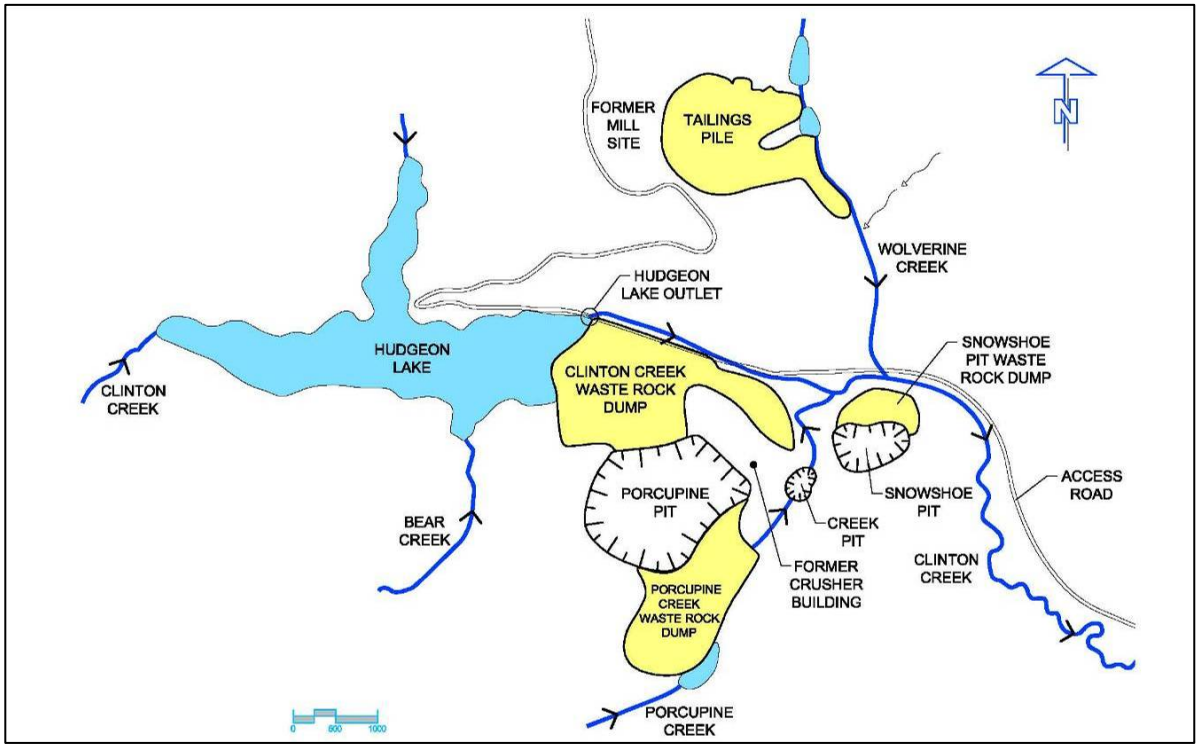


Figure 02 Mine Site Layout

2.3 Local Geology

Local geology consists of a complex assemblage of rocks that include ultramafic, igneous and metamorphic rocks such as serpentinite, diorite, amphibolite, schist, shale, siltstone and limestone (Stepanek and McAlpine, 1992). The ore body mined consists of chrysotile asbestos veinlets embedded in jade green serpentine. Of relevance to the current mine site condition are argillite bedrock outcroppings visible along the Clinton Creek channel through the waste rock dump that is highly susceptible to mechanical weathering from creek channel flow and freeze-thaw action. An orange coloured quartz-carbonate alteration is visible along the Porcupine Pit wall and an outcropping along the mine access road at the confluence of Wolverine Creek and Clinton Creek. The rock is hard and durable compared to the sedimentary rocks and schists that commonly occur on the site and for this reason, was quarried for use as fill in the gabion baskets constructed to stabilize the outlet of Hudgeon Lake.

3. Site Inspection

The site inspection was carried out on July 16, 2009 by Mr. Ken Skaftfeld, P.Eng. of AECOM in the company of Ms. Rachel Pugh, the Yukon Government's Project Manager for this site. Logistical support was provided by Mr. Glenn Ford of the Government of Yukon Water Board who was at the site to inspect the Clinton Creek stream gauge downstream of the mine site. Specific objectives of the inspection outlined in the Long Term Performance Monitoring Report for 2008 (UMA 2009) are as follows:

- Visually inspect the gabion drop structures at the Hudgeon Lake outlet for general performance and to confirm deformations observed in the baseline cross-section surveys,
- Measure the horizontal distances across each drop structure,
- Verify localized down-cutting of the Clinton Creek channel through the waste rock dump just downstream of Drop Structure #4,
- Visually inspect the rock lined channel and weirs on Wolverine Creek,
- As time permits, inspect the Porcupine Creek open pit and waste rock dump.

Photographs and video clips were taken during the inspection; these have been included on a DVD attached to this report in Appendix A. Select photographs from the photo set have been used throughout the report. The photo locations and features of note are cross-referenced with GPS waypoints throughout the report. The waypoints are also shown on the Drawings. These locations are approximate only, based on the accuracy of the hand held GPS unit used. Where possible, the approximate location of previous photographs, in particular from the 2007 Long Term Performance Monitoring Report (UMA 2008) were targeted for the 2009 photographs. It is anticipated that future photographs will be taken from the way points established in this (2009) inspection. To help illustrate any physical changes over time, photo-identifiable points have been highlighted on Figures throughout the report where applicable.

Descriptions along creek channels in this report may use abbreviations referring to the right hand side (RHS) and left hand side (LHS) of the channel. These abbreviations are with respect to looking in a downstream direction along the channels. The abbreviations U/S and D/S refer to upstream and downstream directions respectively.

3.1 Clinton Creek Waste Rock Dump and Channel

The Clinton Creek channel was inspected starting from the downstream end of the waste rock dump at Station 0+800 proceeding in an upstream direction to the Hudgeon lake outlet at Station 0+000 (Drawing 01).

3.1.1 Clinton Creek Channel

No significant changes are apparent along the creek channel between the channel outlet at the east end of the Clinton Creek Waste Rock Dump (Station 0+800) and the gabion drop structures at the Hudgeon Lake outlet at Station 0+000. Although a channel profile survey was not done as part of this year's inspection, a comparison of conditions with those visible in photographs from 2007 suggest that overall, very little channel erosion (down-cutting) or bank erosion has recently occurred. The bedrock channel bottom and outcrop visible on the LHS of the channel from approximately Station 0+600 (Drawing 01) in 2007 compare well with what was observed in 2009 from Waypoints 339 and 340 (Figures 03 and 04, respectively).

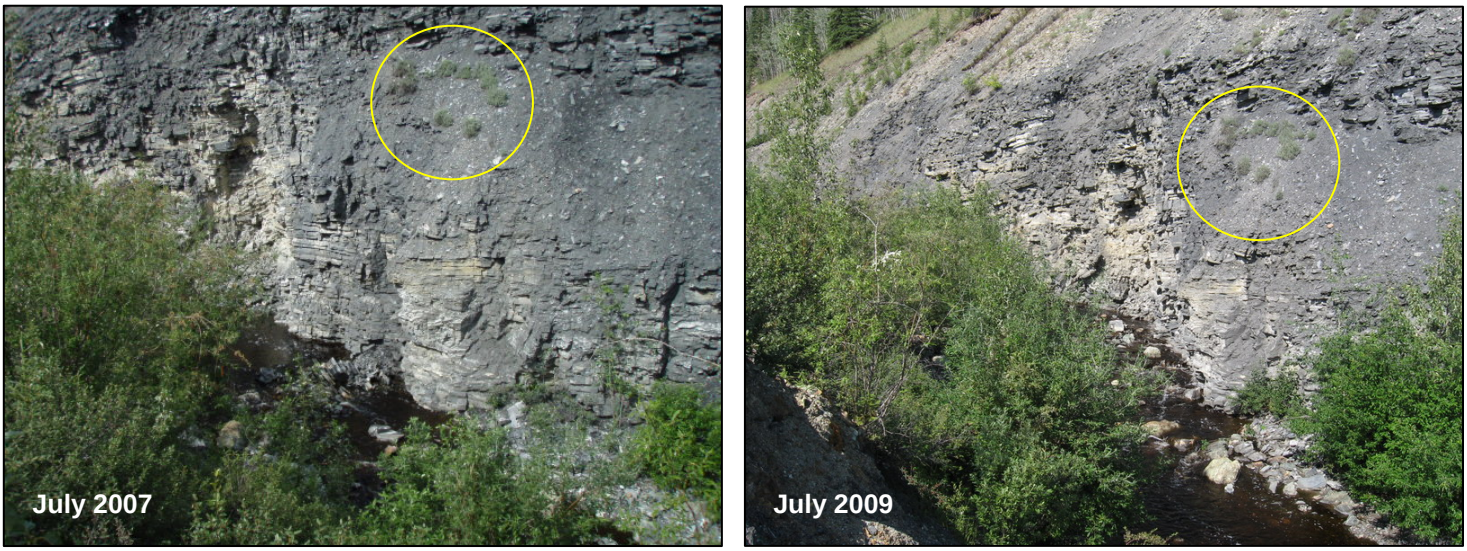


Figure 03 Station 0+600 in 2007 (left) and at WP 339 in 2009 (right), view U/S

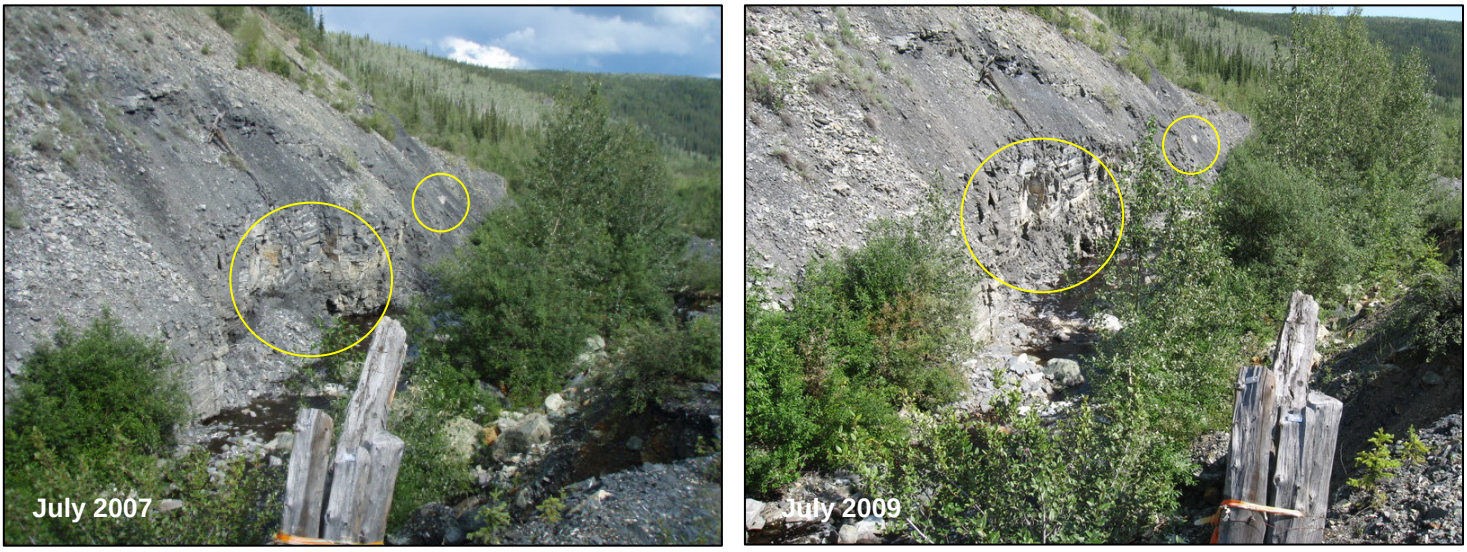


Figure 04 Station 0+600 in 2007 (left) and at WP 340 in 2009 (right), viewed D/S

Farther upstream, at approximately Station 0+560, the physical features and vegetation along the LHS and RHS of the channel, as well as the channel bottom do not appear to have significantly changed from 2007 to 2009 as seen on Figures 05, 06 and 07 taken from WP 341. A similar set of photos were taken at WP 342, located at approximately Station 0+470 in the 2007 and 2009 in an upstream direction (Figure 08), cross-channel (Figure 09) and downstream (Figure 10); No significant changes in the condition of the channel over this time period were noted.

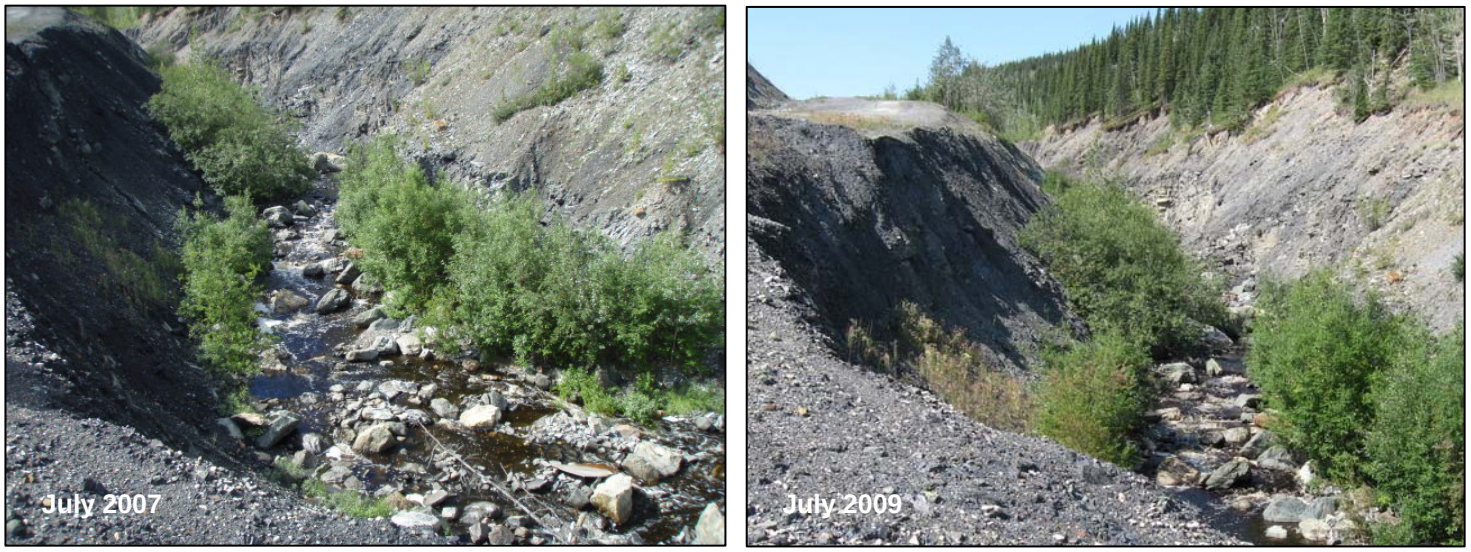


Figure 05 Station 0+560 in 2007 (left) and at WP 341 in 2009 (right), viewed U/S

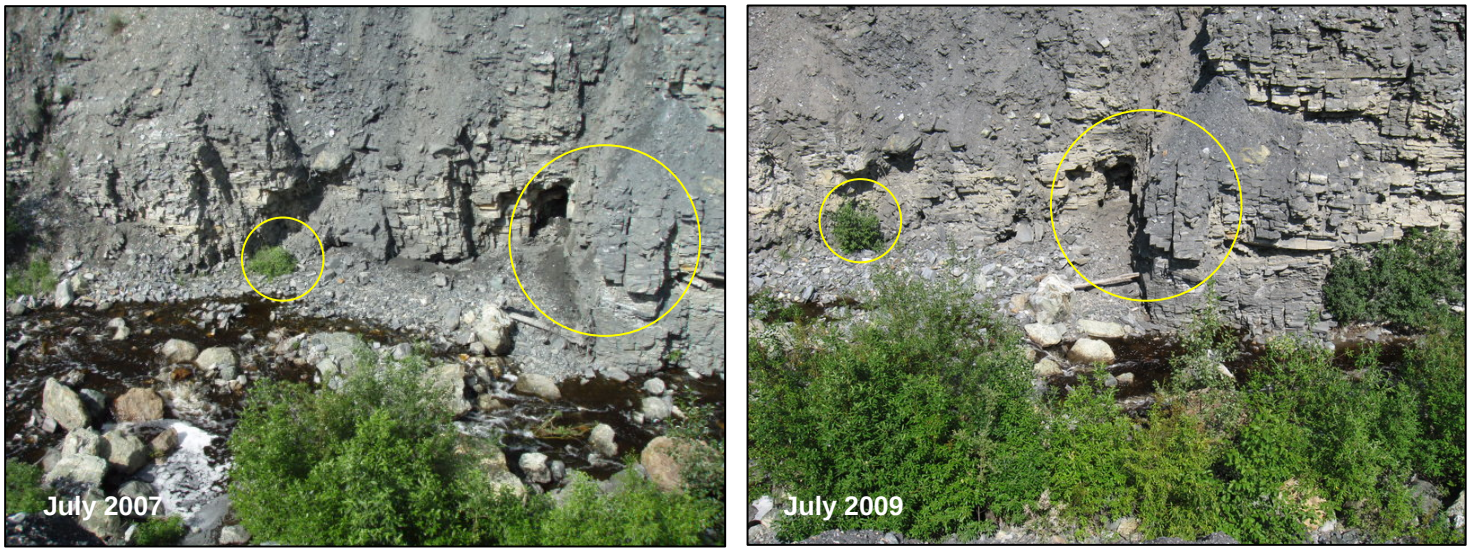


Figure 06 Station 0+560 in 2007 (left) and at WP 341 in 2009 (right), viewed cross-channel

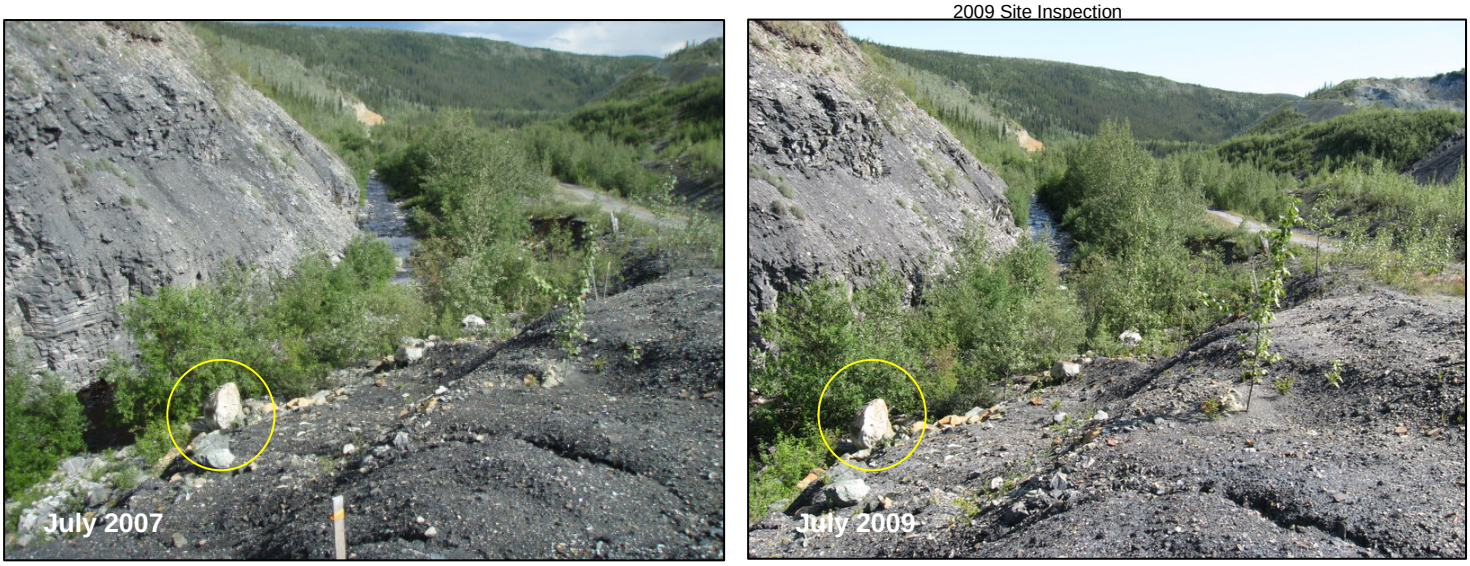


Figure 07 Station 0+560 in 2007 (left) and at WP 341 in 2009 (right), view D/S

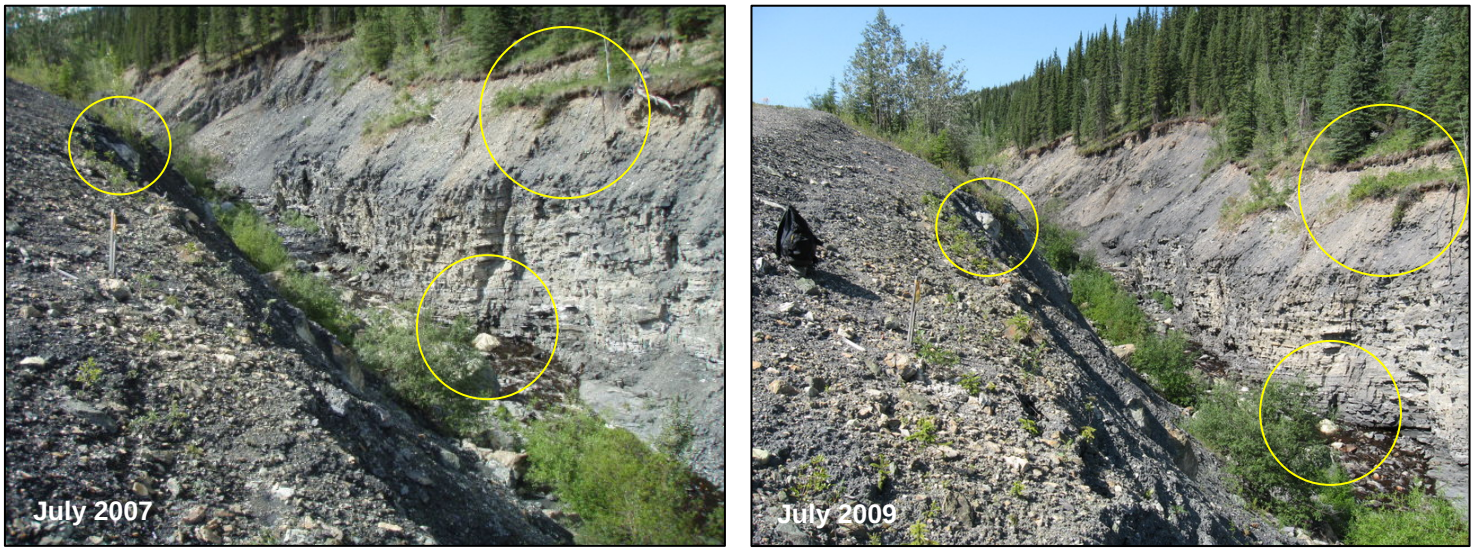


Figure 08 Station 0+470 in 2007 (left) and at WP 342 in 2009 (right), view U/S

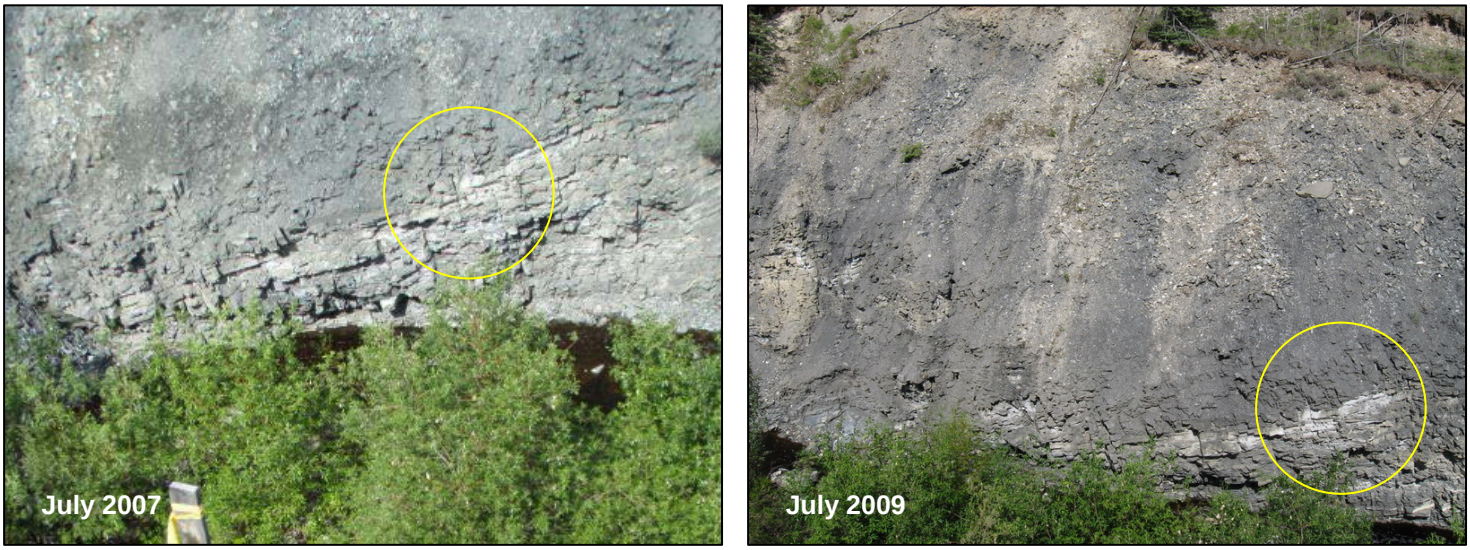


Figure 09 Station 0+470 in 2007 (left) and at WP 342 in 2009 (right), view cross-channel

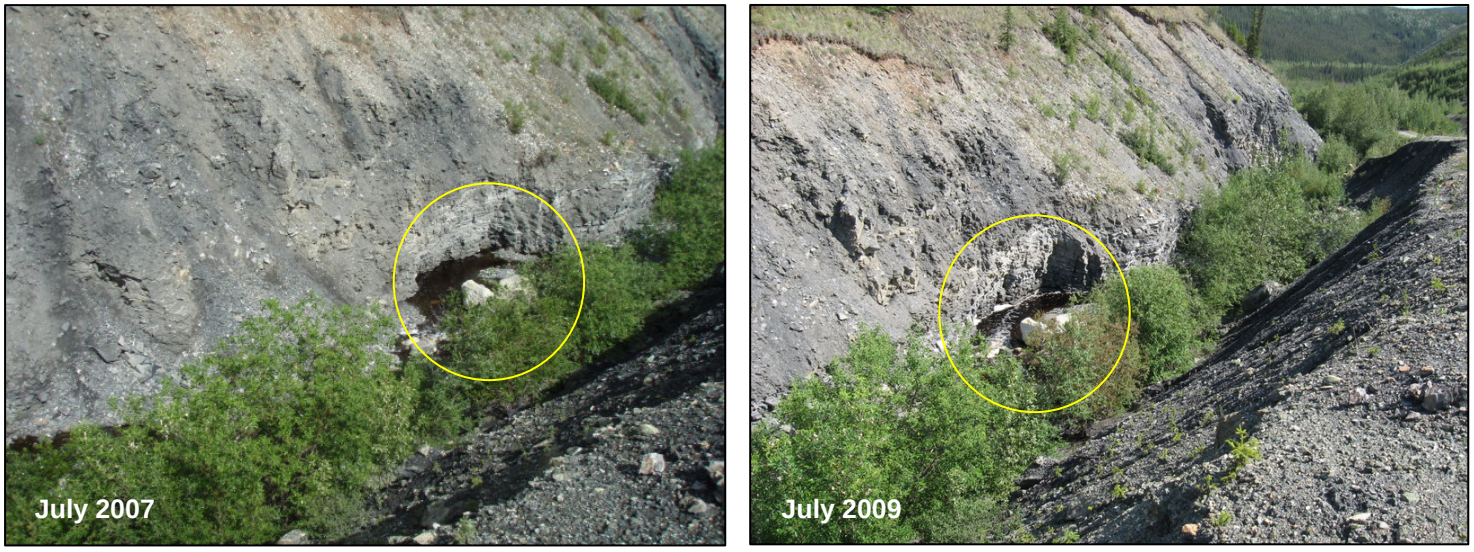


Figure 10 Station 0+470 in 2007 (left) and at WP 342 in 2009 (right), view D/S

The last set of photos was taken 170 m downstream of the gabion drop inlet structures at about Station 0+370. The photos in Figures 11 and 12 were taken from the same location (WP 344) but at a different magnification. This is the portion of the channel where down-cutting could impact on the stabilization works (drop structures) and is therefore considered a critical component of the performance monitoring program. Examination of the photos from 2007 and 2009 does not reveal any significant changes in the channel over that time period which is consistent with the 2008 creek channel profile survey (AECOM, 2009). Several boulders and other channel features do not appear to have changed.

It is recommended that future photographs be taken in a downstream direction from WP 345 at approximately Station 0+290 as this location provides a good vantage of the waste rock and bedrock contact located about 50 m downstream of the drop structures at Station 0+225 (Figure 13). The extent of the recent slide activity visible in the right hand photo on Figure 13 should also be monitored in future inspections.

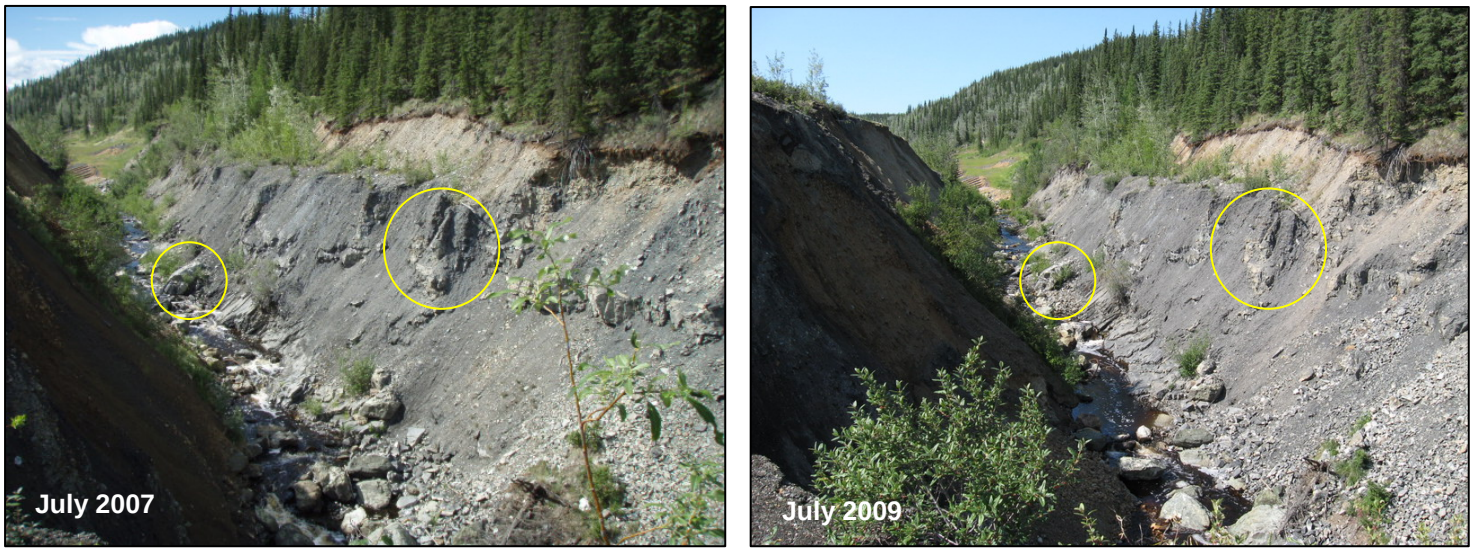


Figure 11 Station 0+360 in 2007 (left) and at WP 344 in 2009 (right), view U/S

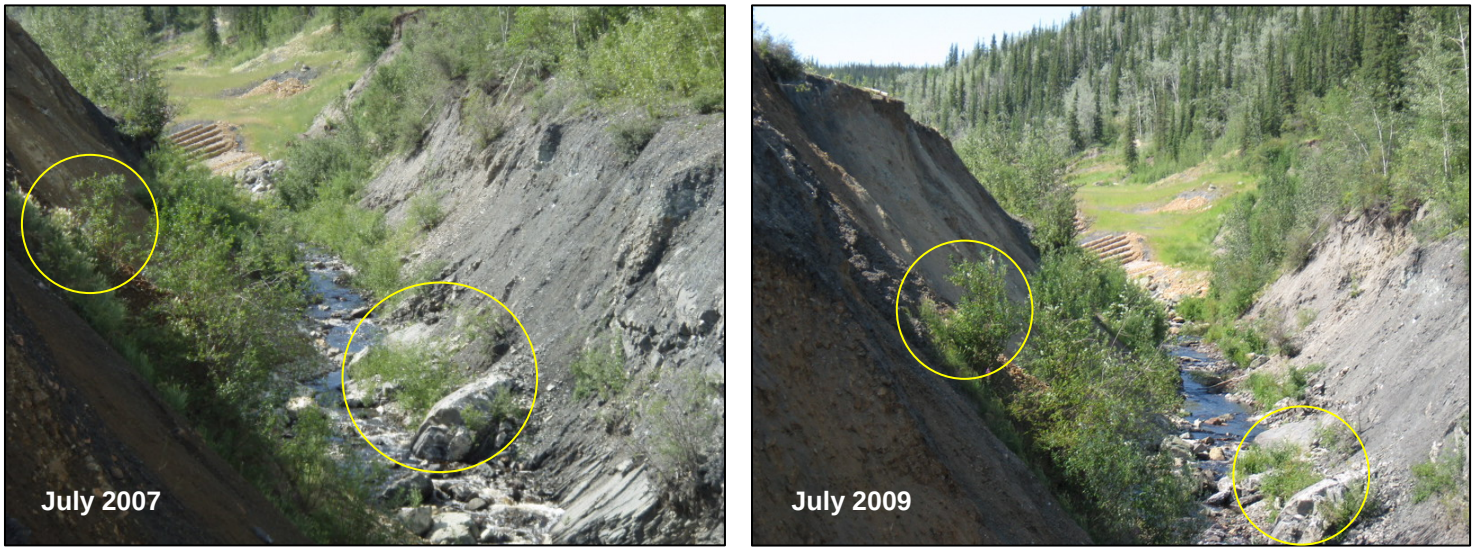


Figure 12 Clinton Creek Channel in 2007 (left) and at WP 344 in 2009 (right), view U/S at Hudgeon Lake Outlet

Figure 13 Clinton Creek Channel in 2007 (left) and at WP 345 in 2009 (right), view D/S

3.2 Gabion Drop Structures

The gabion drop structures at the Hudgeon lake outlet were photographed in 2007 and 2009 from WP 346 at approximately Station 0+230. From this vantage point, no significant change in the overall condition of the channel or structures located between the lake outlet (Station 0+000) and Station 0+184 could be observed (Figure 14). Upon closer inspection however, it was evident that damage to the structures occurred during the 2009 spring freshet. It is suspected that this damage had already occurred but was not obvious on May 6, 2009 when the structures were inspected by the Government of Yukon during high flows (Figure 15). While the damage was severe enough to warrant repair before the next spring freshet, it was concluded that overall, the structures were performing as intended; They continued to provide erosion protection immediately downstream of the lake outlet and mitigate the risk of a breach and rapid lowering of Hudgeon Lake. It should be noted that repairs were subsequently carried out in the fall of 2009. A separate report has been prepared to document the completed repair work.

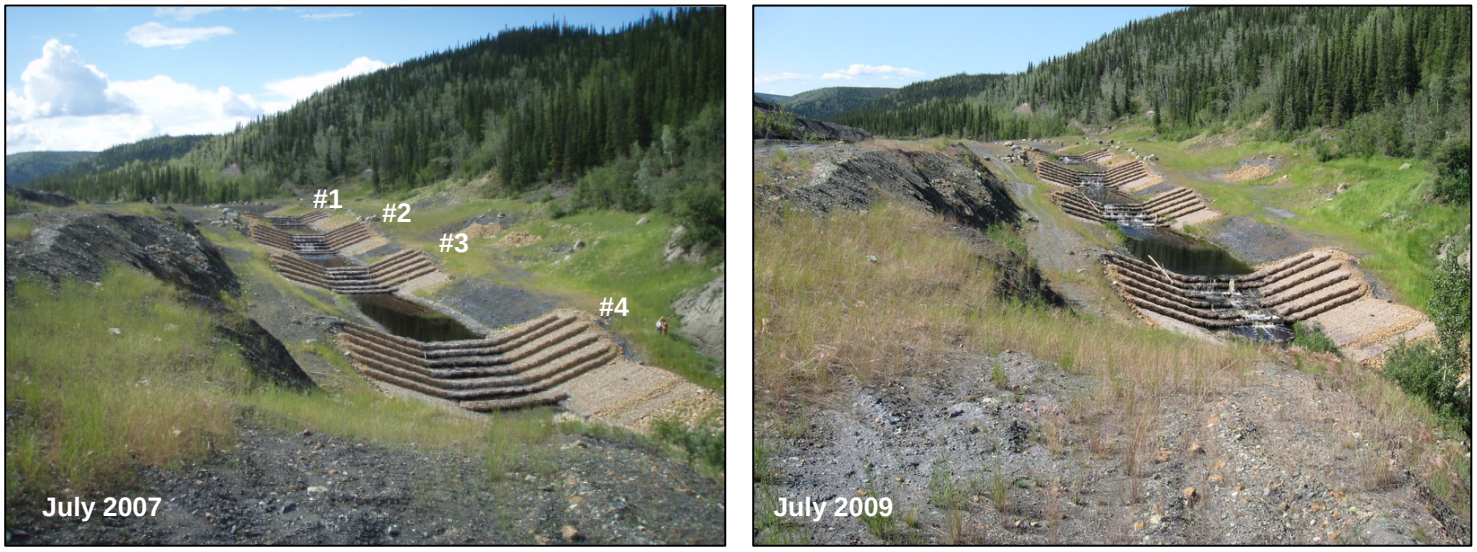


Figure 14 Gabion Drop Structures in 2007 (left) and From WP 346 in 2009 (right), view U/S

Figure 15 Gabion Drop Structures in May 2009 (DS # 2 on Right Hand Side Photo)

Overall, the damage to the gabion drop structures was more severe on the north side of the structures with the most significant damage occurring at Drop Structure #4 (DS #4). Less damage occurred at DS #2 and relatively minor damage occurred at DS #1 and DS #3. Photographs taken in May 2009 during the spring freshet suggest that the lower parts of the channel, which are shaded from direct sunlight due to the height of the waste rock pile to the south, may have been constricted by snow and ice build-up (Figure 15). The effect of the shading of the south side of the channel can be seen in the aerial photograph taken by the Department of Fisheries and Oceans in March 2008 (Figure 16). On Figure 15, erosion channels in the snow pack are visible on the south side of the channel at DS #3 and DS #4 indicating that the channel was not fully open at some point during the spring freshet and some water may have flowed around the snow and ice. This scenario is supported by reports that that the spring thaw in

2009 was delayed by unseasonably cold temperatures followed by a rapid rise in temperatures and prolonged rainfall. A potential consequence of concentrated flow on the north side of the channel would be a higher unit discharge (per metre width of channel) than the drop structures were designed for, in particular at DS #4 which is in the shadow of the waste rock dump (Figure 16).

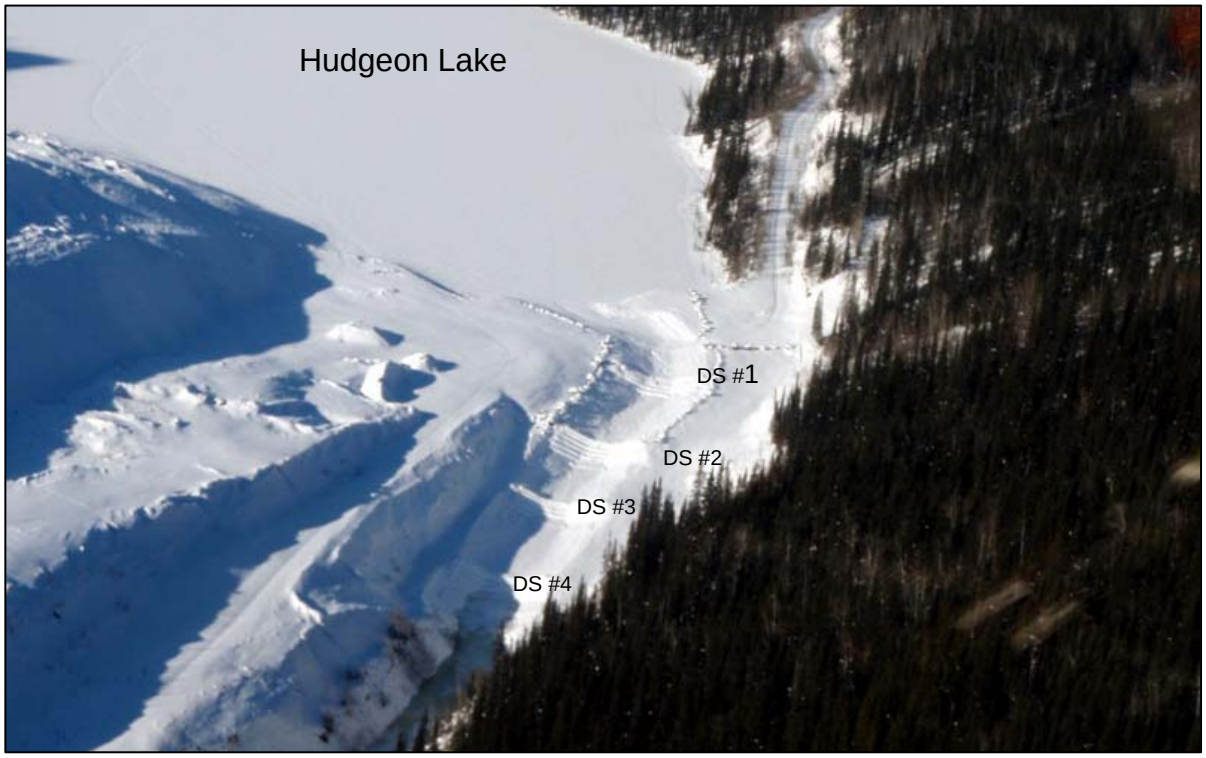


Figure 16 Hudgeon Lake Outlet in March 2008 (courtesy of DFO – Al von Finster)

3.2.1 Drop Structure #4

Drop Structure #4 consists of a drawdown weir with 6 tiers that provide a 2.5 m drop in channel grade and an end sill on the bottom tier. Figure 17 compares the overall condition of the structure in 2007 and the damage resulting from the spring freshet in 2009. Of the overall damage to the stabilized channel section, the most significant occurred to Drop Structure #4. Several of the wire baskets at the top of the structure including the drawdown weir and tiers 4, 5 and 6 were deformed with some of the baskets having been torn open with the rock fill partially or completely missing (Figures 18 and 19). In many cases, it appeared that some of the stainless steel retaining clips used to close the baskets failed allowing the seam along the downstream edge of the basket to open enough to allow the rocks to be pulled out by tractile forces during high flows.

The damage extends across Tiers 2 and 3 where several baskets were open with rock missing. A section in the middle of the end sill was missing and presumed to have washed downstream. The condition of the lower section of the drop structure (Tier 1) and end sill in 2007 and after the spring freshet in 2009 is illustrated on Figures 20 (2007) and 21 and 22 (2009).

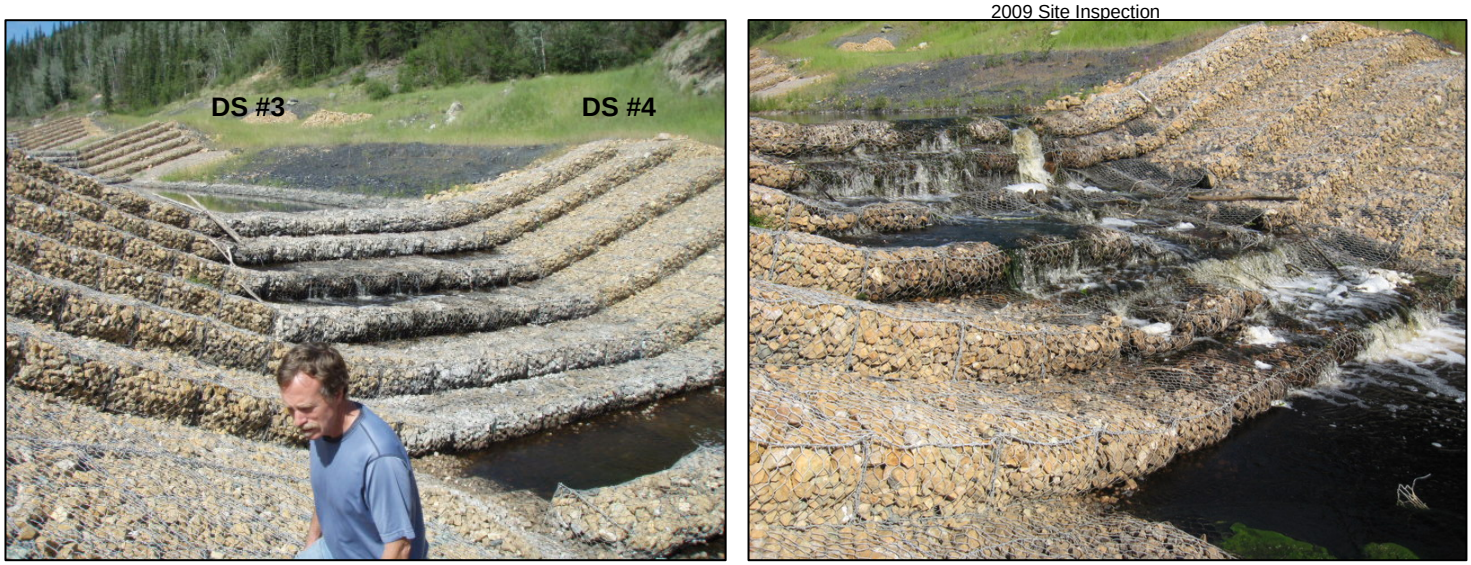


Figure 17 DS #4 in 2007 (left) and 2009 (right), view U/S

Figure 18 DS #4 Tier 5 and Tier 6 in 2009, view N

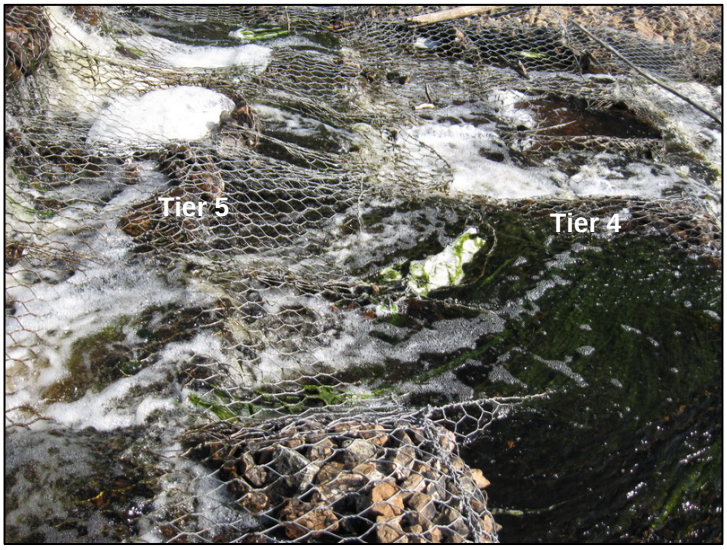


Figure 19 DS #4 Tier 4 and Tier 5 in 2009, view N

Figure 20 DS #4 Tier 2 and Tier 3 & End Sill in 2007, view N

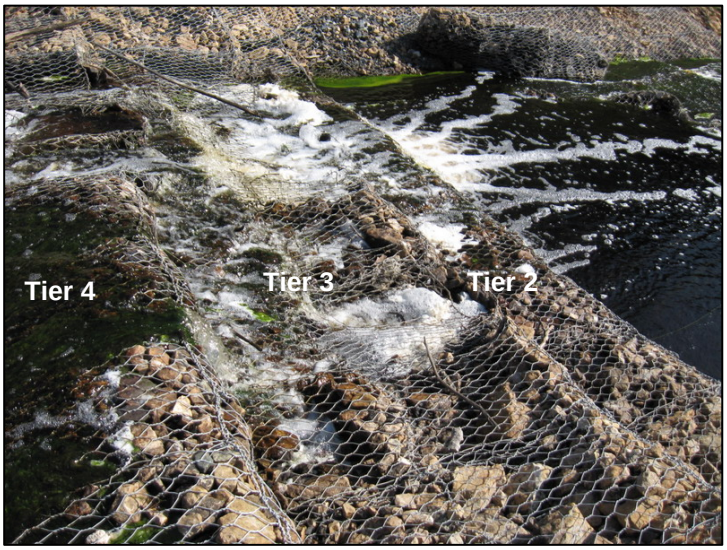


Figure 21 DS #4 Tier 2, 3 and 4 in 2009, view N

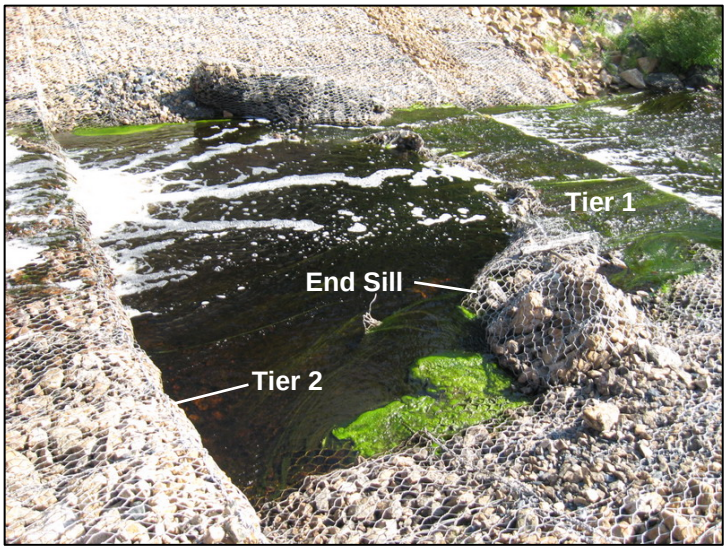


Figure 22 DS #4 Tier 2, End Sill & Tier 1 in 2009, view N

3.2.2 Drop Structure #3

Drop Structure #3 consists of a drawdown weir with 5 tiers that provide a 2 m drop in channel grade and an end sill on the bottom tier. Figure 23 illustrates the overall condition of the structure in 2007 and the damage resulting from the spring freshet in 2009. A cross-channel view of the structure is shown on Figure 24. Most of the damage to Drop Structure #3 involved deformation of the baskets including the drawdown weir which was leaning forward with the downstream edge about 300 mm lower than as-constructed (Figure 25). There were some small holes in the tops or downstream sides of individual baskets in Tiers 2, 3 and 4 although most of the rock was still inside of the baskets (Figure 26). The end sill was badly deformed but intact, having bulged at least 300 mm downstream as shown on Figure 27. The channel banks between DS#3 and #4 are in good condition. It appears that the high water mark on the channel side slope was about 1.5 m higher than observed at the time of the inspection (Figure 28).

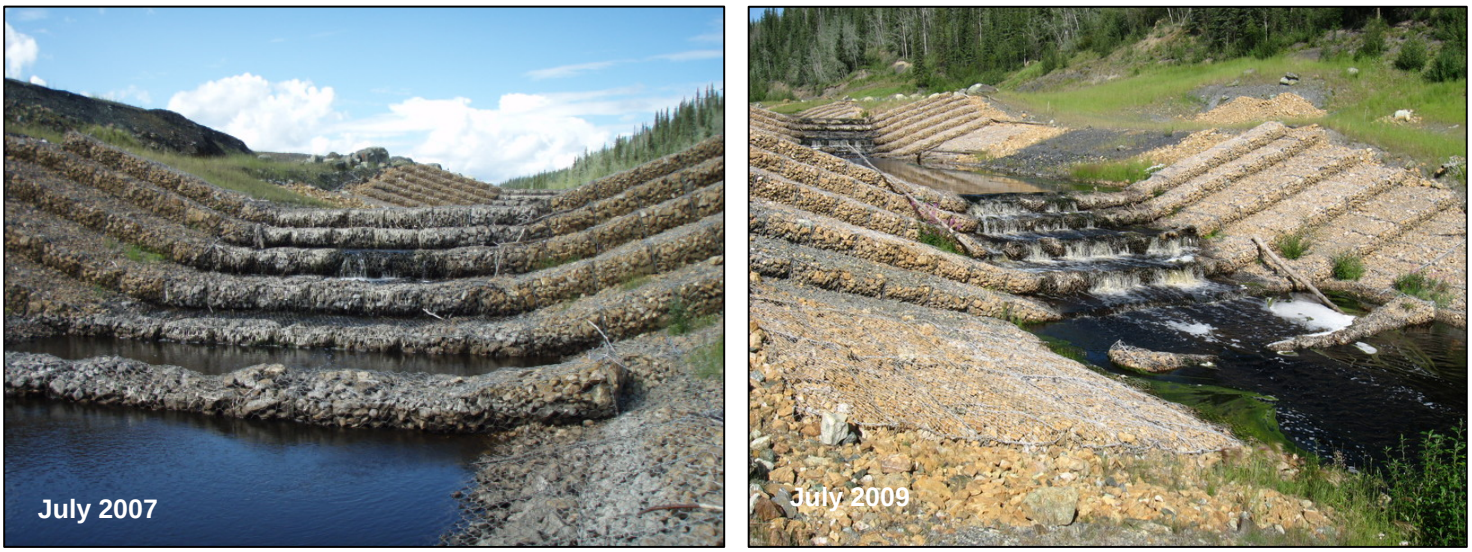


Figure 23 DS #3 in 2007 (left) and 2009 (right), view U/S

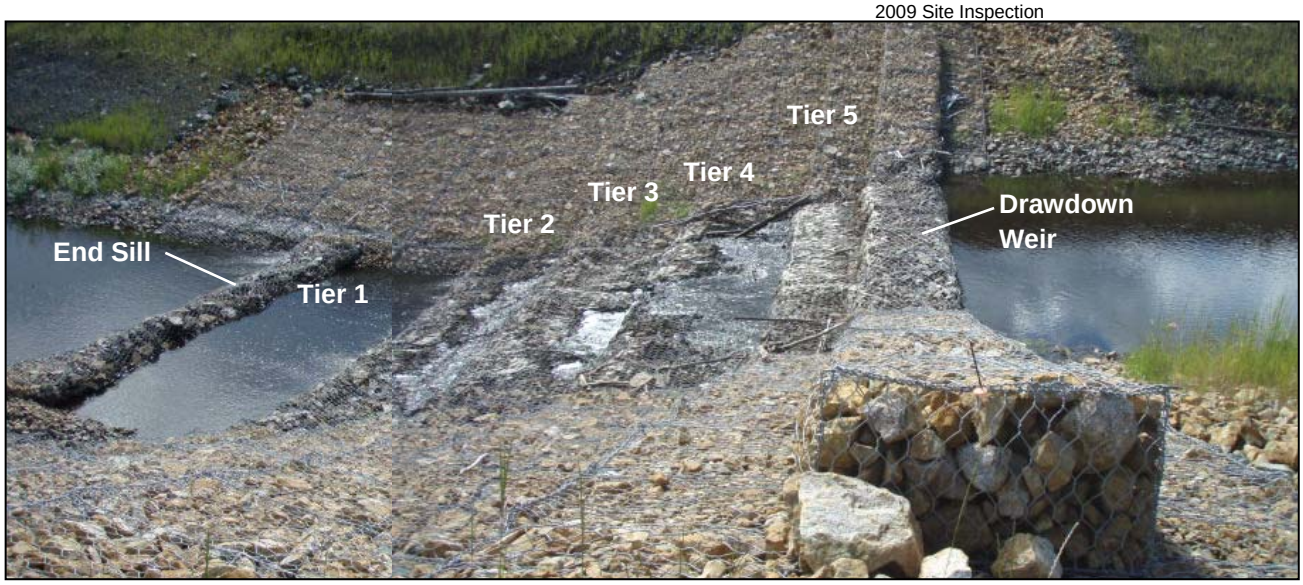


Figure 24 DS #3 in 2007, View Cross-Channel From LHS Bank

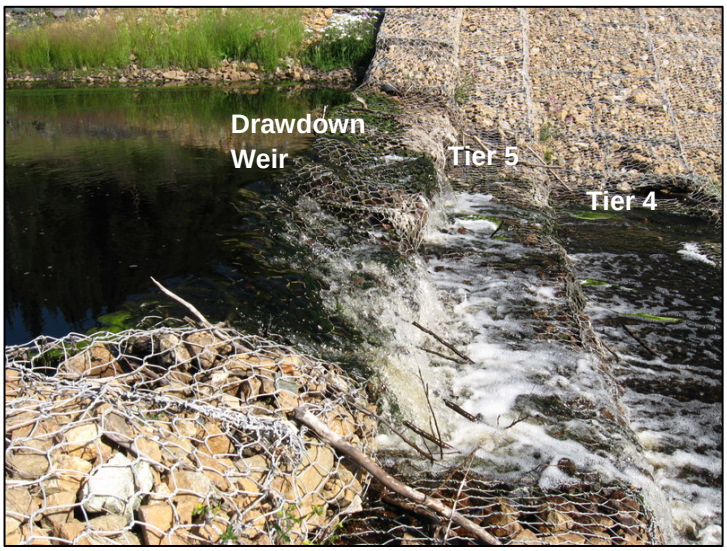


Figure 25 DS #3 Weir, Tier 4 and 5 in 2009, view N

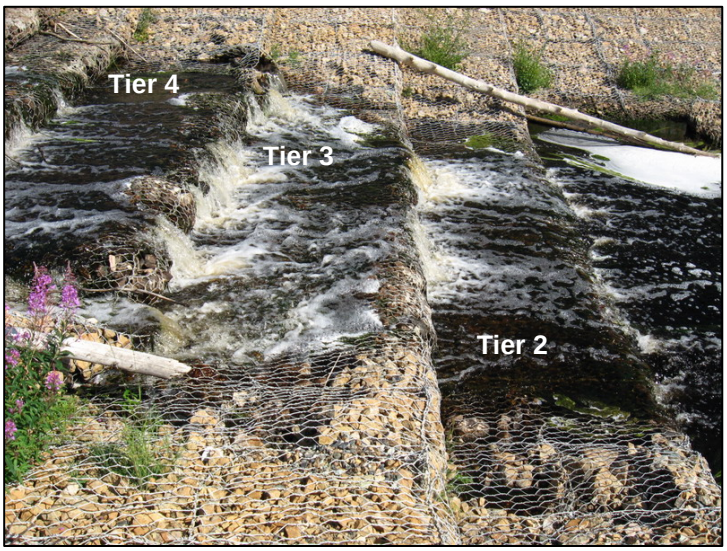


Figure 26 DS #3 Tier 4, Tier 2,3 and 4 in 2009, view N

Figure 27 DS #3 End Sill in 2009, view N

Figure 28 Pond Between DS #3 & #4 in 2009, view D/S

3.2.3 Drop Structure #2

Drop Structure #2 consists of a drawdown weir with 6 tiers that provide a 2.5 m drop in channel grade and an end sill on the bottom tier. A comparison of the structure in 2007 and 2009 is illustrated on Figure 29. The observed damage includes the drawdown weir which was leaning downstream by about 200 mm (Figure 30) and several of the baskets on Tiers 2, 3 and 5 which were opened up with some loss of the rock fill material (Figures 30, 31 and 32). The end sill was partially submerged but appeared to be deformed with considerable loss of rock fill (Figure 33).

Figure 29 DS #2 in 2007 (left) and 2009 (right), view U/S

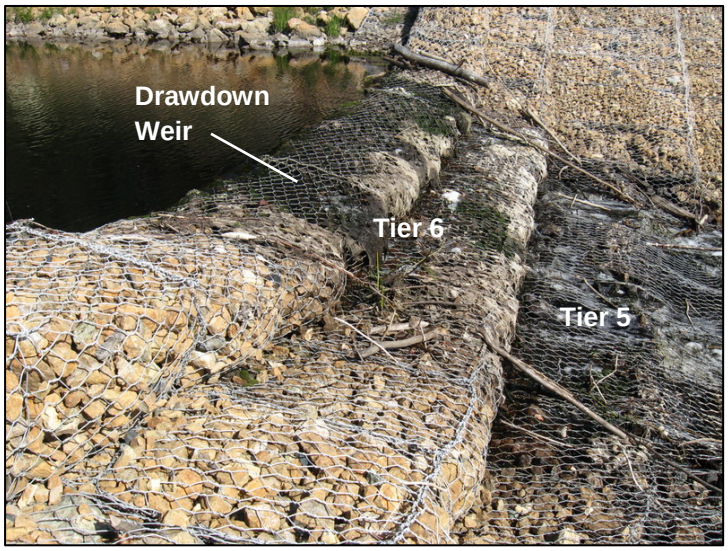


Figure 30 DS #2 Weir, Tier 5 and 6 in 2009, view N

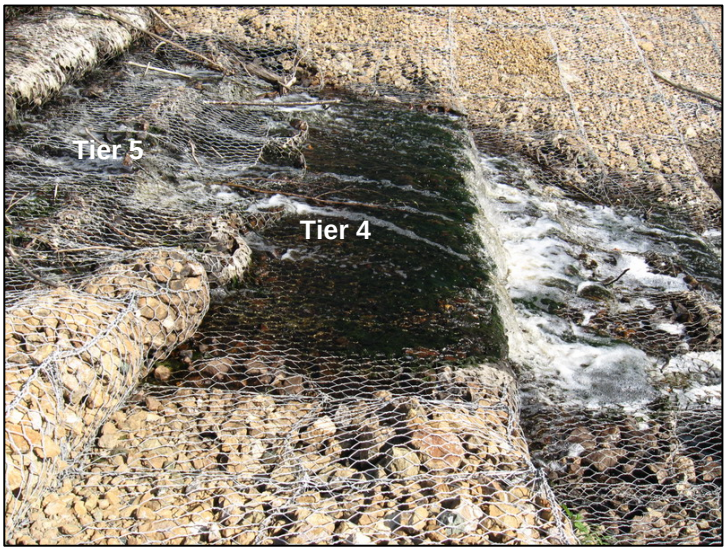


Figure 31 DS #2 Tier 4 and 5 in 2009, view N

Figure 32 DS #2 Tier 2 and 3 in 2009, view N

Figure 33 DS #2 End Sill in 2009, view N

3.2.4 Drop Structure #1

Drop Structure #1 consists of a drawdown weir with 4 tiers that provide a 1.5 m drop in channel grade and an end sill on the bottom tier. An upstream and cross-channel view of the structure in 2007 is illustrated on Figures 34 and 35, respectively. The drawdown weir was leaning downstream by about 200 mm and several of the baskets on Tiers 2, 3 and 4 had opened up with the baskets either empty or about half full (Figures 36 and 37). The end sill was partially submerged but appeared to be deformed with considerable loss of rock fill (Figure 38 and 39). The opening in the drawdown weir was created by design in 2007 to allow the elevation in Hudgeon Lake to drop during low flow periods and prior to freeze-up.

Figure 34 DS #1 in July 2007, view U/S

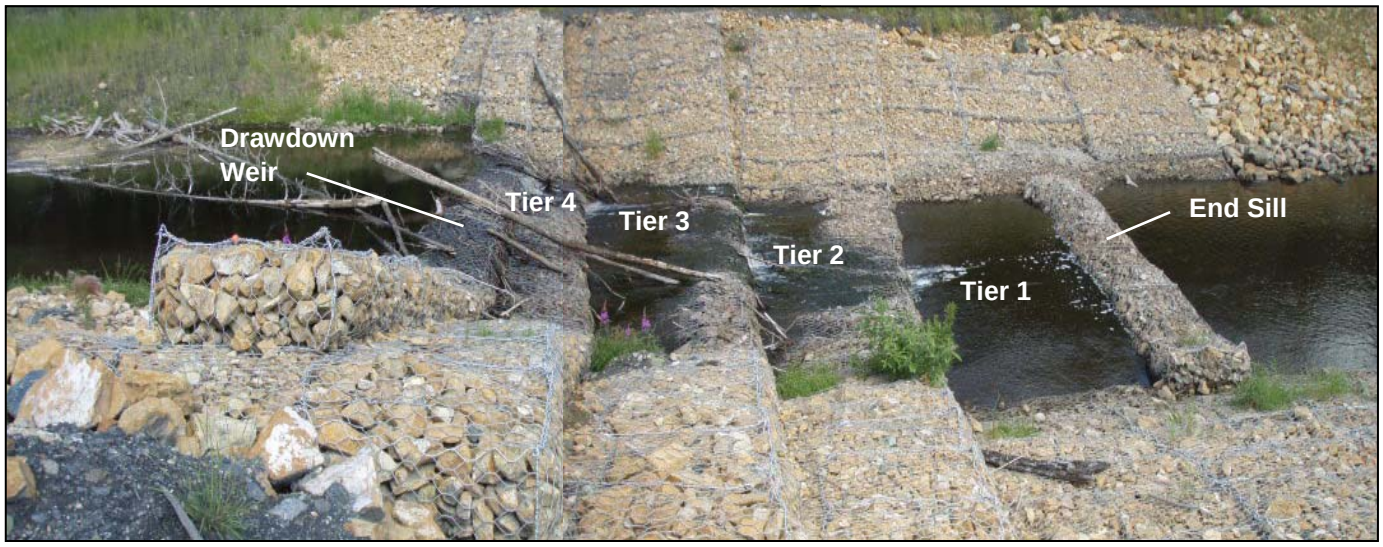


Figure 35 DS #1 in July 2007, view Cross-channel to North

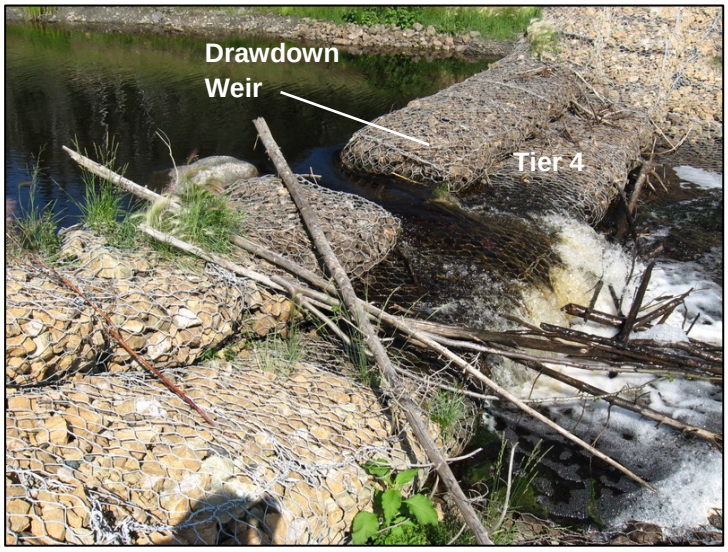


Figure 36 DS #1 Drawdown Weir & Tier 4 in July 2009, view N

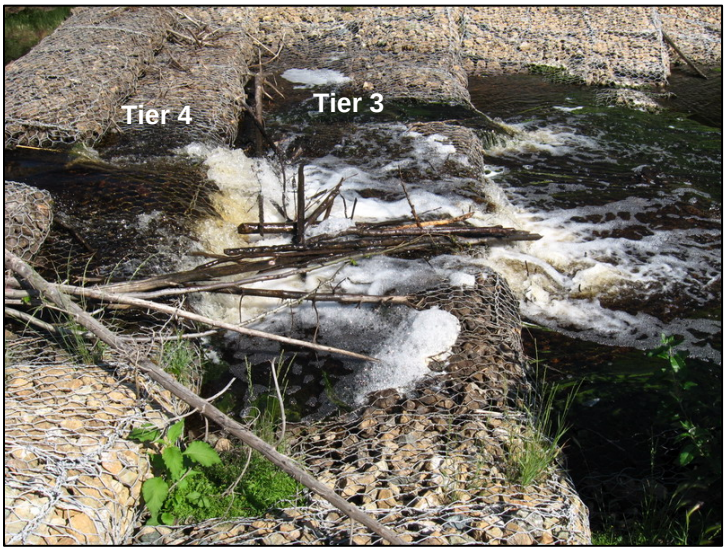


Figure 37 DS #1 Tier 3 and 4 in 2009, view N

Figure 38 DS #1 Tier 2 and 3 & End Sill in July 2009, view N

Figure 39 DS #1 End Sill in July 2009, view N

3.2.5 Drop Structure Monitoring Results

Measurements were taken across the drop structures to determine changes in horizontal distance from the north to south sides. Monitoring of the structures began in July 2004 and includes measuring the horizontal distance across the drawdown weir and the lowest tier in line with each end sill (Drawing B1, Appendix B). The results of the 2009 monitoring are attached in Appendix B. The change in horizontal distance of the drawdown weirs from September 2008 ranged from 5 to 8 cm. The closure of the lower tiers ranged from 3 to 11 cm with the greatest movement (11 cm) at Drop Structure # 1. These movements are consistent with those observed previously and as noted in the 2008 Long term Performance Monitoring Report (AECOM 2009), are in generally good agreement with the movement of the waste rock dump towards the creek channel.

4. Wolverine Creek Tailings Pile and Channel

4.1 Rock Lined Channel Section

An armoured section of the Wolverine Creek channel is located on the downstream (south) end of the south tailings lobe. It consists of a rock lined channel with a series of rock weirs constructed over about 5 to 10 m of tailings and its integrity is a critical component of the risk management of the site. Although normal summer flows through the channel are small, the spring freshet produces relatively higher albeit short term flows as seen in the aerial photo taken in May 2009 (Figure 40).

Figure 40 Rock Lined Channel in May 2009

A comparison of the channel in 2005 and 2009 and 2007 and 2009 is shown on Figures 41 and 42, respectively. There are no significant changes in the condition of the channel from 2005 to 2009 although heavy vegetation, including trees, is gradually encroaching on the channel after brushing work was carried out in 2007 (note that the photos in Figure 42 are not taken at exactly the same location). Brush clearing work was limited to the removal of the trees and brush from the bottom of the channel only and not the channel banks. The rock weirs are in good condition and there is minimal erosion along the bottom and sides of the channel.

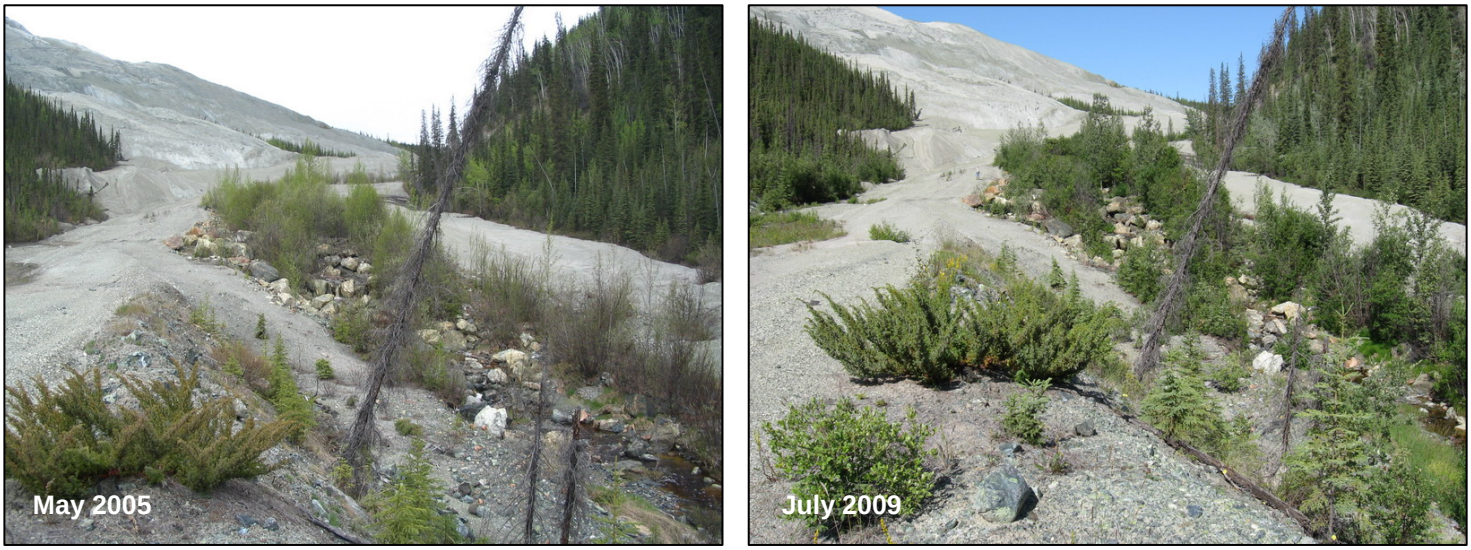


Figure 41 View U/S at Rock Lined Channel in 2005 (left) and 2009 (right), From UGL Tag 482

Figure 42 View U/S Along Rock Lined Channel in Wolverine Creek in 2007 (left) and at WP 335 in 2009 (right)

4.2 Creek Channel Across Tailings

The creek channel across the tailings can be seen on the aerial photograph taken in May 2009 (Figure 43). A view of the leading edge of the south lobe just downstream of the pond separating the two lobes from 2007 and 2009 is shown on Figure 44. It does not appear that there has been any significant change in the physical features of the tailings or channel. The vegetation in the 2009 photo is more prominent due to the time of year the photo was taken. Within the channel across the south lobe, there does not appear to have been any significant changes between 2007 and 2009 with trees and vegetation apparently undisturbed (Figure 45). The leading edge of the lobe however, consists of freshly exposed tailings with numerous slumps confirming that there is ongoing erosion of the tailings and deposition of this material downstream.

Figure 43 Wolverine Creek Channel Through Tailings (May 2009)

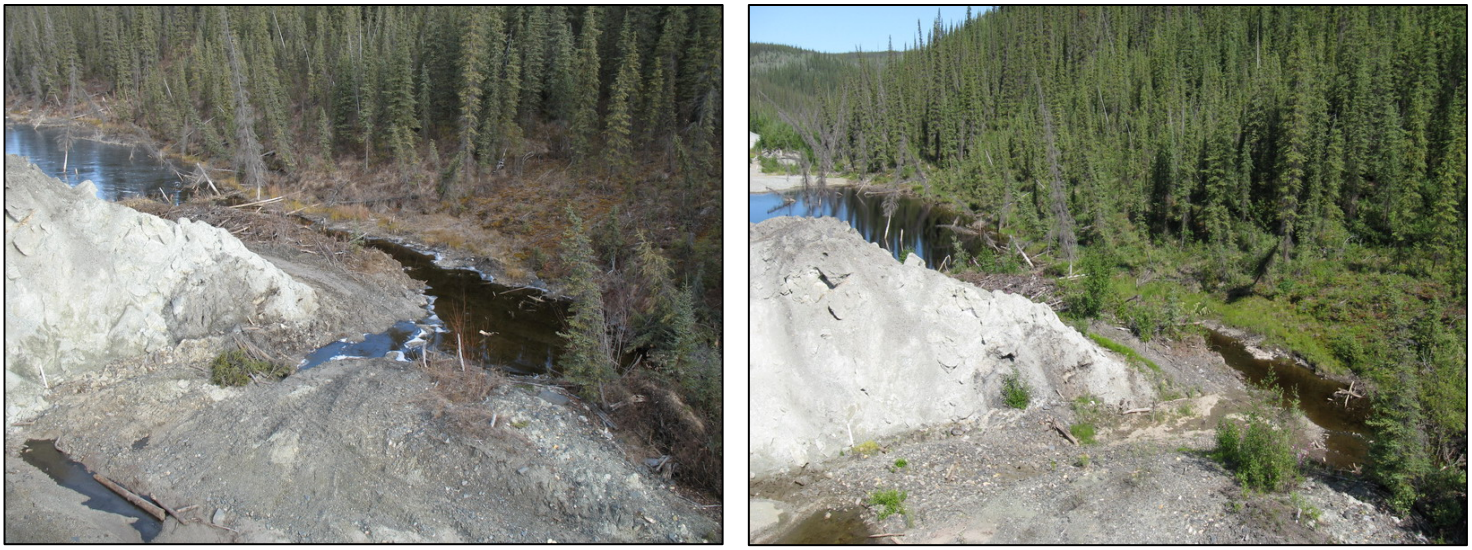


Figure 44 View of Toe of S Tailings Lobe in 2007 (left) and From WP 338 in 2009 (right)

Figure 45 View U/S Along Wolverine Creek Across S Lobe in July 2007 (left) and at WP 337 in July 2009 (right)

4.3 Mill Site

A brief inspection of the mill site was carried out by Rachel Pugh of the Government of Yukon. The ground subsidence reported in 2007 along the alignment of the former underground conveyor tunnel appears to have been filled in (personal communication, R. Pugh). An aerial view of the Mill Site and the area of the reported ground subsidence is shown on Figure 46.

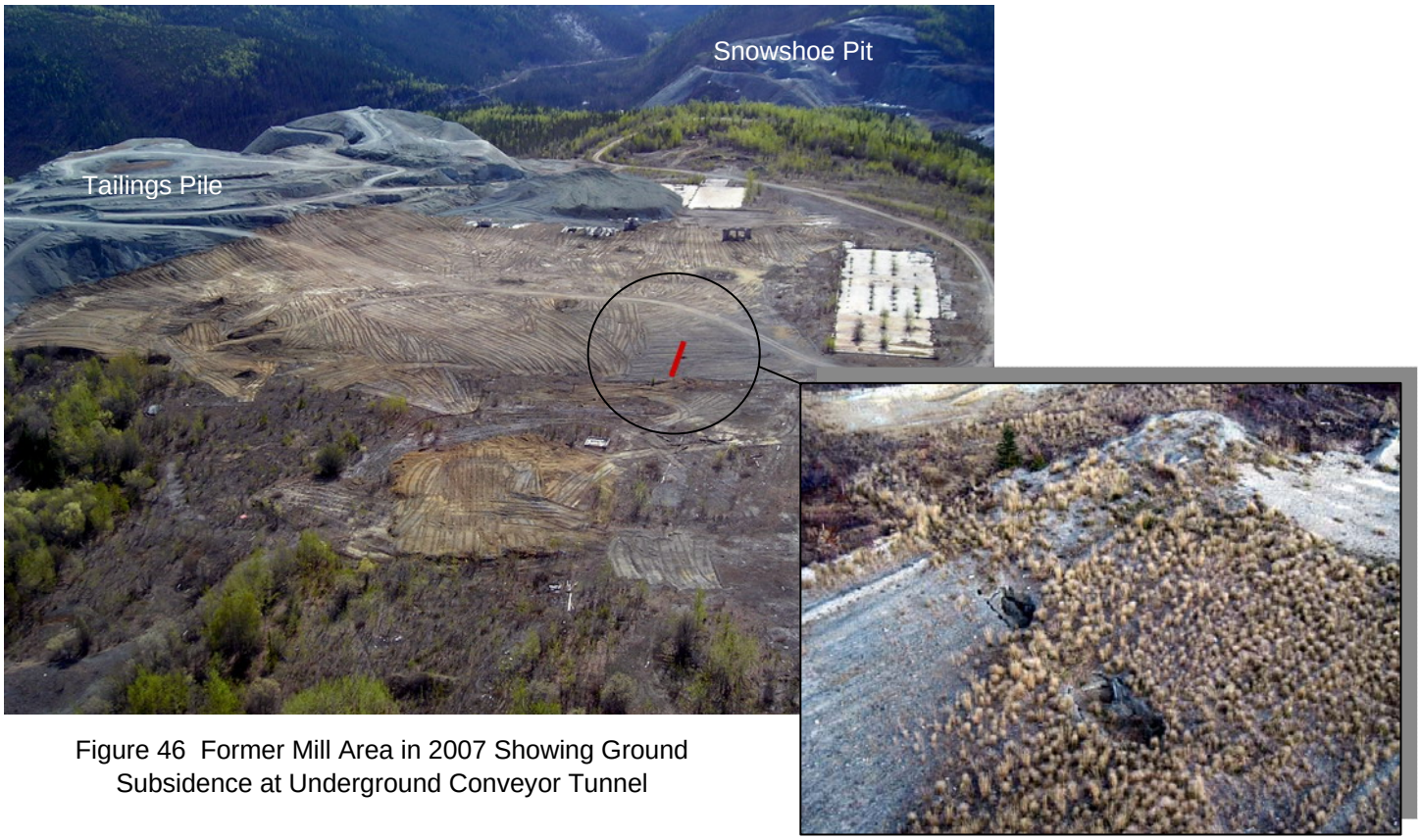


Figure 46 Former Mill Area in 2007 Showing Ground Subsidence at Underground Conveyor Tunnel

5. Porcupine Pit and Waste Rock Dump

5.1 Open Pit

No significant changes in the condition of the open pit were noted although gradual ravelling of the pit walls is ongoing. A series of photographs taken in 2003 and 2009 illustrate the overall condition of the open pit (Figures 47, 48 and 49). Waypoint (WP) locations for the photographs are shown on Drawing 02. A ditch has been excavated around the south and west side of the open pit to restrict access. The approximate alignment of the ditch is shown on Drawing 02. Excavated material from the ditch has been placed as a berm and warning signs have been posted (Figures 50 and 51). Warning signs have also been posted around the northeast portion of the pit perimeter which is readily accessible (Figure 52). Many areas along the open pit perimeter are over-steepened, overhanging and unsafe, for example at WP 349 as shown on Figure 53.

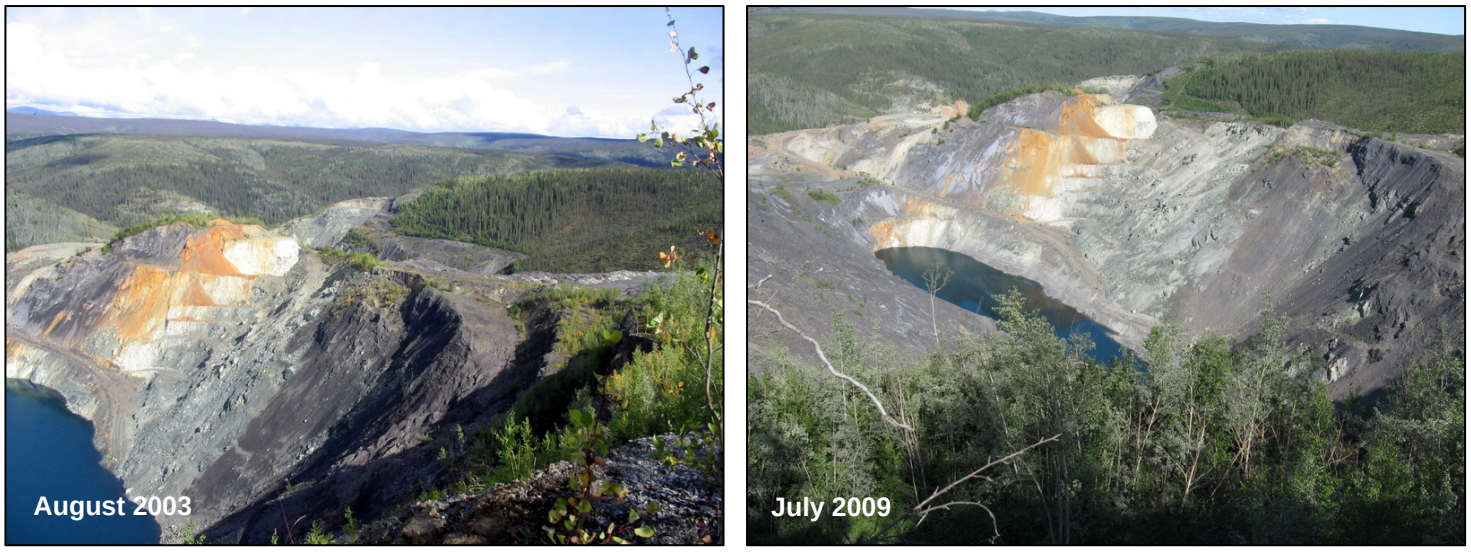


Figure 47 View NE Across Porcupine Pit in August 2003 (left) and From WP 358 in July 2009 (right)

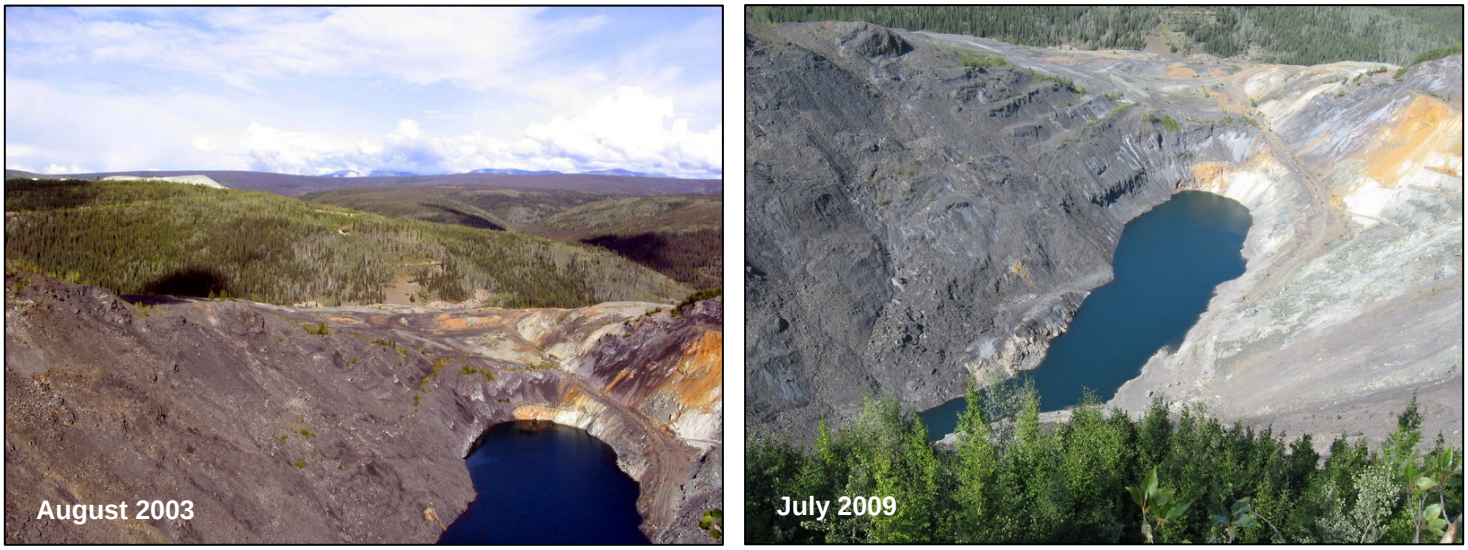


Figure 48 View N Across Porcupine Pit in August 2003 (left) and From WP 357 in July 2009 (right)

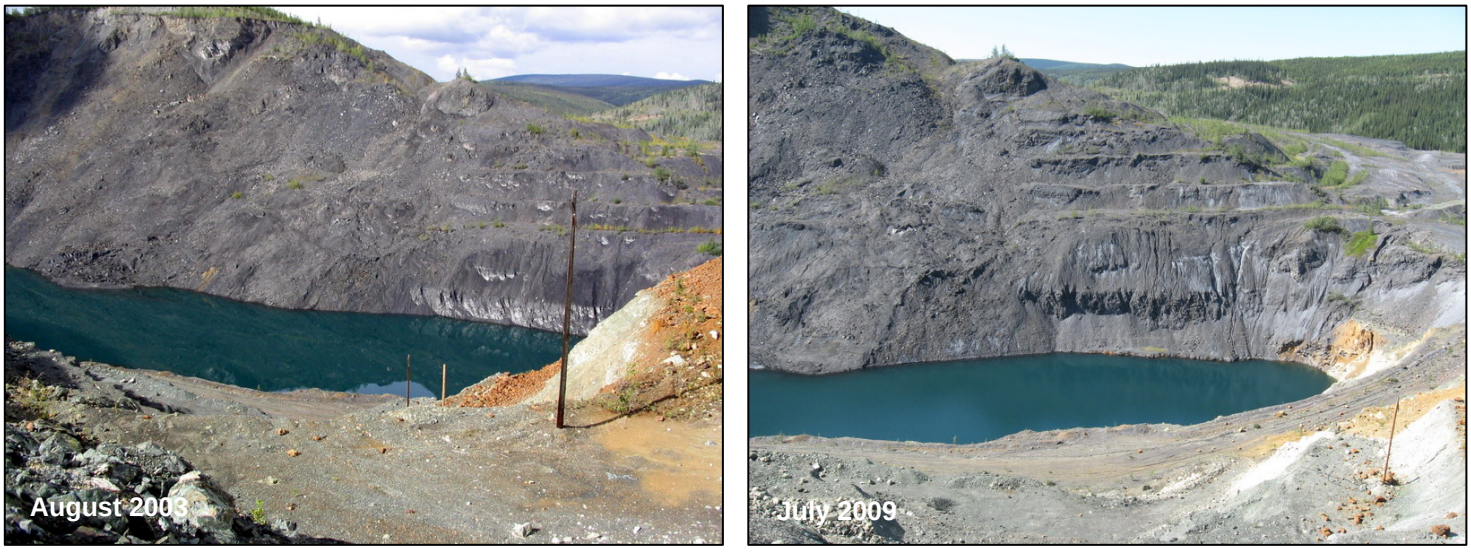


Figure 49 View W Across Porcupine Pit in August 2003 (left) and From WP 353 in July 2009 (right)

Figure 50 Warning Sign on Berm at WP 356

Figure 51 Ditch and Berm at WP 359

Figure 52 Warning Sign at Open Pit

Figure 53 Open Pit Perimeter at WP 349

5.2 Porcupine Creek Waste Rock Dump

Overall, there do not appear to be any significant changes in the condition of the Porcupine Creek waste rock dump. There was no water entering the Porcupine Creek Waste Rock Dump at WP 355 where inflow has been previously seen (UMA, 2004). The area was damp however and it was evident that water had been recently ponded at this location. An area of about 25 by 40 m at the north end of the dump (WP 352) was found to contain raw asbestos fibres on the ground surface; however this location is not readily accessible.

6. Summary and Recommendations

6.1 Clinton Creek Waste Rock Dump and Channel

With the exception of the gabion drop structures there do not appear to be any significant changes in the overall condition of the portions of the waste rock dump inspected and the Clinton Creek channel across the leading edge of the Clinton Creek Waste Rock Dump. While the drop structures suffered damage during the spring freshet of 2009, they are continuing to function in terms of providing erosion protection of the creek channel at the Hudgeon Lake outlet. The channel downstream of the structures remains well armoured with no visual evidence of channel down-cutting. The structures will need to be more thoroughly inspected to assess the damage and repair work should be completed prior to the 2010 freshet as another major flow event could cause irreparable damage (Note: repair work was subsequently carried out in the fall of 2009). Horizontal movements of the structures are continuing but the movements are consistent with those previously observed and are not of a magnitude to date where the cross sectional geometry of the structures has been compromised.

6.2 Wolverine Creek Tailings Pile and Channel

No significant changes in the Wolverine Creek channel through the tailings were observed although ongoing erosion of the leading edge of the tailings continues. The rock lined channel and rock weirs at the downstream end of the south end of the south lobe are in good condition with the flow well within the channel banks. Vegetation (trees) is becoming re-established in the channel and removal of trees will be required in the foreseeable future to keep the channel unobstructed. The need for vegetation removal should be evaluated in 2010 to determine the timing for maintenance work.

6.3 Porcupine Open Pit and Waste Rock Dump

Ravelling of the over-steepened pit walls is continuing. Vegetation is beginning to encroach on the ditch and berm around the west side of the open pit. Consideration should be given to tree cutting along the ditch as part of routine maintenance.

References

UMA Engineering Ltd., 2004. Government of Yukon, Former Clinton Creek Asbestos Mine – Hazard Assessment Report - June 2004.

UMA Engineering Ltd., 2006. Government of Yukon, Former Clinton Creek Asbestos Mine – Long Term Performance Monitoring Program – August 2006.

UMA Engineering Ltd., 2008. Government of Yukon, Former Clinton Creek Asbestos Mine – Long Term Performance Monitoring – 2007.

AECOM Canada Ltd., 2009. Government of Yukon, Former Clinton Creek Asbestos Mine – Long Term Performance Monitoring – 2008.

AECOM Canada Ltd., 2009. Government of Yukon, Former Clinton Creek Asbestos Mine - Overview Report

Drawings

B SIZE 11" x 17" (279.4mm x 431.8mm)

PLOT: 10/02/03 11:08:00 AM

ISS/REV: A
AECOM FILE NAME: 6029-015-00_01-B-F001_RX.dwg Saved By: vibergj

513,000 513,500 514,000

7,148,000

7,147,500

7,147,000

FORMER MILL SITE

NORTH LOBE

WOLVERINE CREEK TAILINGS PILE

SOUTH LOBE

MILL ACCESS ROAD

ROCK LINED CHANNEL

HUDGEON LAKE

ACCESS ROAD

CLINTON CREEK

CLINTON CREEK WASTE ROCK DUMP

WOLVERIINE CREEK

MILL ACCESS ROAD

0+000 0+100 0+200 0+300 0+400 0+500 0+600 0+700 0+800

327 328 351 329 326 330 333 332 331 346 345 344 343 342 341 340 339 338 337 336 335 334

N

LEGEND

334 GPS WAYPOINT

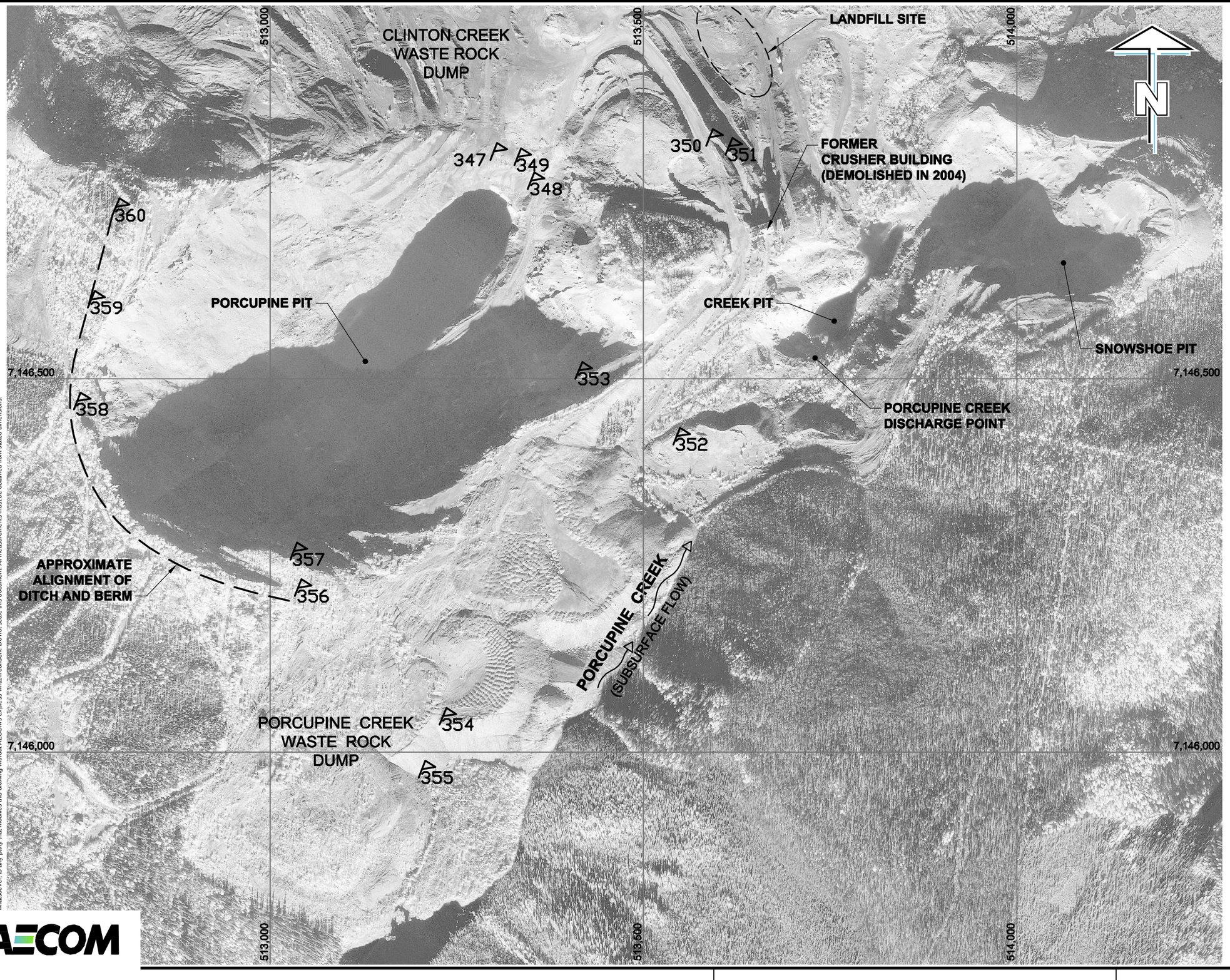
0 50 100 m SCALE 1:5000

UTM ZONE 7 NAD83
IMAGE DATE 1999

Government of Yukon
Former Clinton Creek Asbestos Mine
2009 Site Inspection

Site Plan - Clinton Creek and Wolverine Creek Drawing - 01

AECOM



LEGEND

353 GPS WAYPOINT

0 50 100 m SCALE 1:5000

UTM ZONE 7 NAD83
IMAGE DATE 1999

Government of Yukon
Former Clinton Creek Asbestos Mine
2009 Site Inspection

Site Plan - Open Pits and Waste Rock Dumps
Drawing - 02

AECOM

Appendix A

Site Photographs and Video

Clinton Creek Inspection - July 16, 2009
PHOTO INDEX

Photo	Description
	GABION DROP STRUCTURES
1667	View upstream at Drop Structure #4
1668	View upstream at Drop Structure #4
1669	View upstream at Drop Structure #4
1670	View downstream from 8 m downstream of Drop Structure #4
1671	View upstream from 20 m downstream of Drop Structure #4
1672	Drop Structure #4 end sill
1673	Drop Structure #4 end sill
1674	Drop Structure #4
1675	View upstream at RHS of Drop Structure #4
1676	View cross-channel at LHS of Drop Structure #4
1677	Drop Structure #4 end sill
1678	Damaged Tiers on Drop Structure #4
1679	Damaged Tiers on Drop Structure #4
1680	Damaged Tiers on Drop Structure #4
1681	Damaged Drawdown weir on Drop Structure #4
1682	Damaged Drawdown weir on Drop Structure #4
1683	Partially opened basket at Drop Structure #4
1684	Partially opened basket at Drop Structure #4
1685	Drop Structure #4 from north bank
1686	Stilling basin downstream of Drop Structure #4
1687	Partially opened baskets/missing rock in Drop Structure #4
1688	Partially opened baskets/missing rock in Drop Structure #4
1689	Partially opened baskets/missing rock in Drop Structure #4
1690	Partially opened baskets/missing rock in Drop Structure #4
1691	Fastening clips on Drop Structure #4 baskets
1692	Fastening clips on Drop Structure #4 baskets
1693	Fastening clips on Drop Structure #4 baskets
1694	Fastening clips on Drop Structure #4 baskets
1695	Fastening clips on Drop Structure #4 baskets
1696	Drawdown weir for Drop Structure #3
1697	Damaged Tiers on Drop Structure #3
1698	Damaged Tiers on Drop Structure #3
1699	Damaged Tiers on Drop Structure #3
1700	Drop Structure #3 end sill
1701	View upstream at Drop Structure #3
1702	View downstream at pond between Drop Structure #3 and #4
1703	View cross-channel at Drop Structure #3
1704	View cross-channel at Drop Structure #3
1705	Armouring and high water mark on bank between Drop Structure #2 and #3
1706	View upstream at Drop Structure #2
1707	View cross-channel at Drop Structure #2

Photo	Description
1708	View cross-channel at Drop Structure #2
1709	View cross-channel at Drop Structure #2
1710	View cross-channel at Drop Structure #2
1711	View cross-channel at Drop Structure #2
1712	Drop Structure #2 end sill
1713	View downstream at pond between Drop Structure #2 and #3
1714	View upstream at Drop Structure #1
1715	View downstream at Drop Structure #2
1716	View downstream at Drop Structures #2, 3 and 4
1717	Drawdown weir at Drop Structure #1
1718	View cross-channel at Drop Structure #1
1719	View cross-channel at Drop Structure #1
1720	Drop Structure #1 end sill
	HUDGEON LAKE OUTLET AREA
1721	Processed gabion rock fill stockpiled at outlet
1722	Processed gabion rock fill stockpiled at outlet
1723	Processed gabion rock fill stockpiled at outlet
1724	Processed gabion rock fill stockpiled at outlet
	WOLVERINE CREEK TAILINGS
1725	View upstream at rock lined channel from Underhill Tag 482
1726	View upstream at rock weir from WP 334
1727	View upstream at rock weir from WP 335
1728	View upstream along Wolverine Creek at S Lobe from WP 336
1729	View upstream along Wolverine Creek at S Lobe from WP 337
1730	Beaver dam at S Lobe from WP 338
1731	View at N Lobe from S Lobe at WP 339
1732	View at N Lobe from S Lobe at WP 339
1733	View upslope at S Lobe from WP 339
1734	View upslope at S Lobe from WP 340
	CLINTON CREEK CHANNEL
1735	View upstream from WP 339
1736	View downstream from WP 340
1737	View upstream from WP 341
1738	View cross-channel from WP 341
1739	View downstream from WP 341
1740	View upstream from WP 342
1741	View cross-channel from WP 342
1742	View upstream from WP 342
1743	View downstream from WP 342
1744	View upstream from WP 343
1745	View upstream from WP 344
1746	View cross-channel from WP 344
1747	View downstream from WP 344
1748	View upstream from WP 344
1749	View upstream from WP 345

Photo	Description
1750	View cross-channel from WP 345
1751	View downstream from WP 345
1752	View upstream from WP 346
1753	View cross-channel from WP 346
1754	View downstream from WP 346
	PORCUPINE PIT
1755	Open Pit from WP 347
1756	Open Pit from WP 347
1757	Open Pit from WP 347
1758	Open Pit from WP 347
1759	Open Pit from WP 347
1760	Open Pit from WP 347
1761	Open Pit from WP 347
1762	Warning Sign - Open Hole
1763	Overhang at edge of pit
1764	Warning Sign - Falling Rocks
1765	View across at Snowshoe Pit from WP 350
1766	Clinton Creek valley and equipment from WP 350
1767	Demolition waste landfill from WP 350
1768	Demolition waste landfill from WP 350
1769	Demolition waste landfill from WP 350
1770	Raw asbestos fibers at WP 352
1771	Open Pit from WP 353
1772	Open Pit from WP 353
1773	Open Pit from WP 353
1774	Pond upstream of Porcupine Cr Waste Rock Dump from WP 354
1775	Trench and berm at WP 356
1776	Trench and berm at WP 356
1777	Open Pit from WP 357
1778	Open Pit from WP 357
1779	Open Pit from WP 357
1780	Open Pit from WP 358
1781	Open Pit from WP 358
1782	Trench and berm at WP 359
1783	End of trench at WP 360
	MISCELLANEOUS
1784	Information Signs at Waste Rock Dump
1785	Information Signs at Waste Rock Dump
1786	Information Signs at Waste Rock Dump
1787	Information Signs at Waste Rock Dump
1788	Information Signs at Waste Rock Dump
1789	Old tension crack on LHS bank at Drop Structure #4
1790	Erosion rills on LHS of bank between Drop Structures #2 and #3
1791	Erosion rills on LHS of bank between Drop Structures #2 and #3
1792	Ditch along access road through waste rock dump at WP 361

Photo	Description
1793	Ditch along access road through waste rock dump at WP 361
1794	Ford crossing at Hudgeon Lake Outlet
1795	Ford crossing at Hudgeon Lake Outlet
1796	Bedrock quarry at Wolverine Creek
1797	Bedrock quarry at Wolverine Creek
1798	Bedrock quarry at Wolverine Creek
1799	Bedrock quarry at Wolverine Creek
1800	Bedrock quarry at Wolverine Creek
1801	Bedrock quarry at Wolverine Creek
1802	Information Signs at Wolverine Creek
1803	Information Signs at Wolverine Creek
1804	Rock fall on access road 200m from quarry

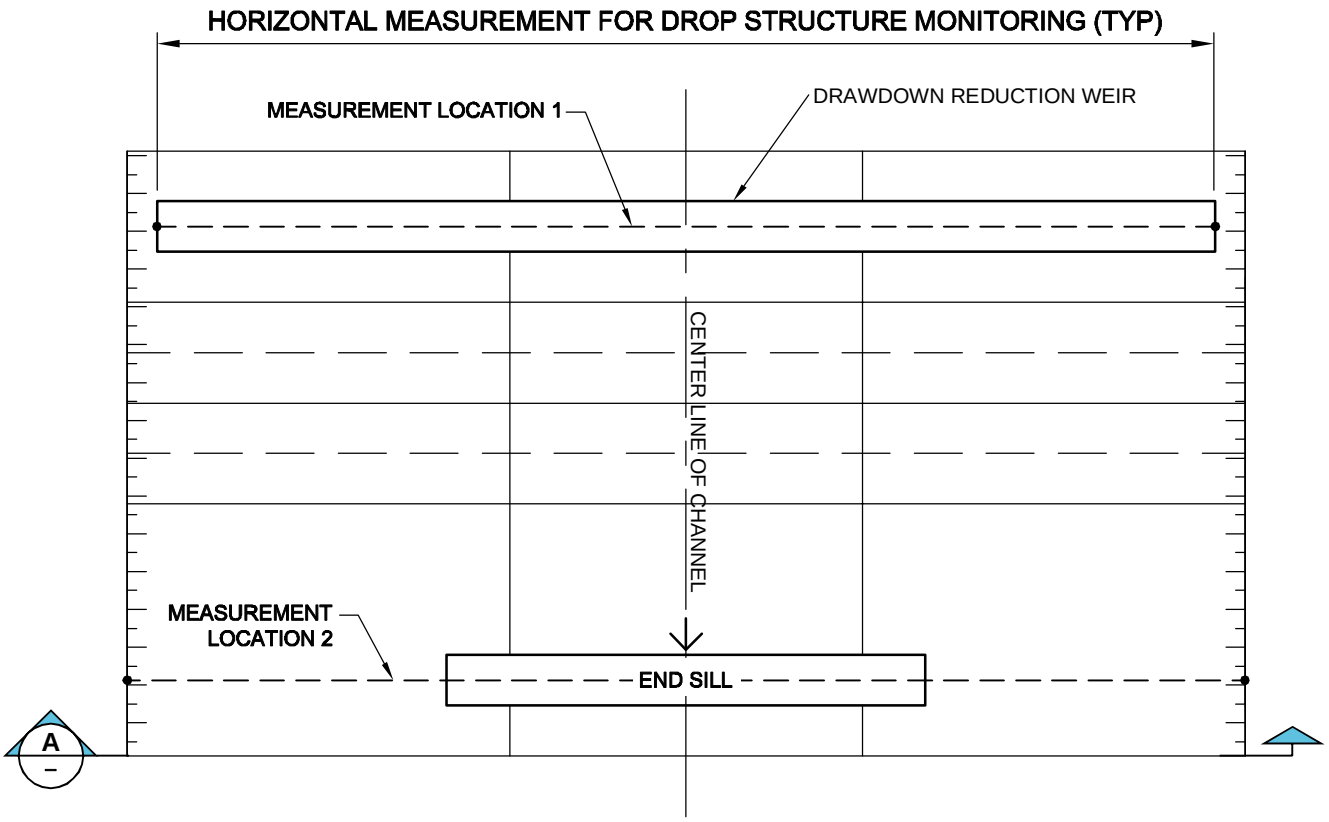
Clinton Creek Inspection - July 16, 2009

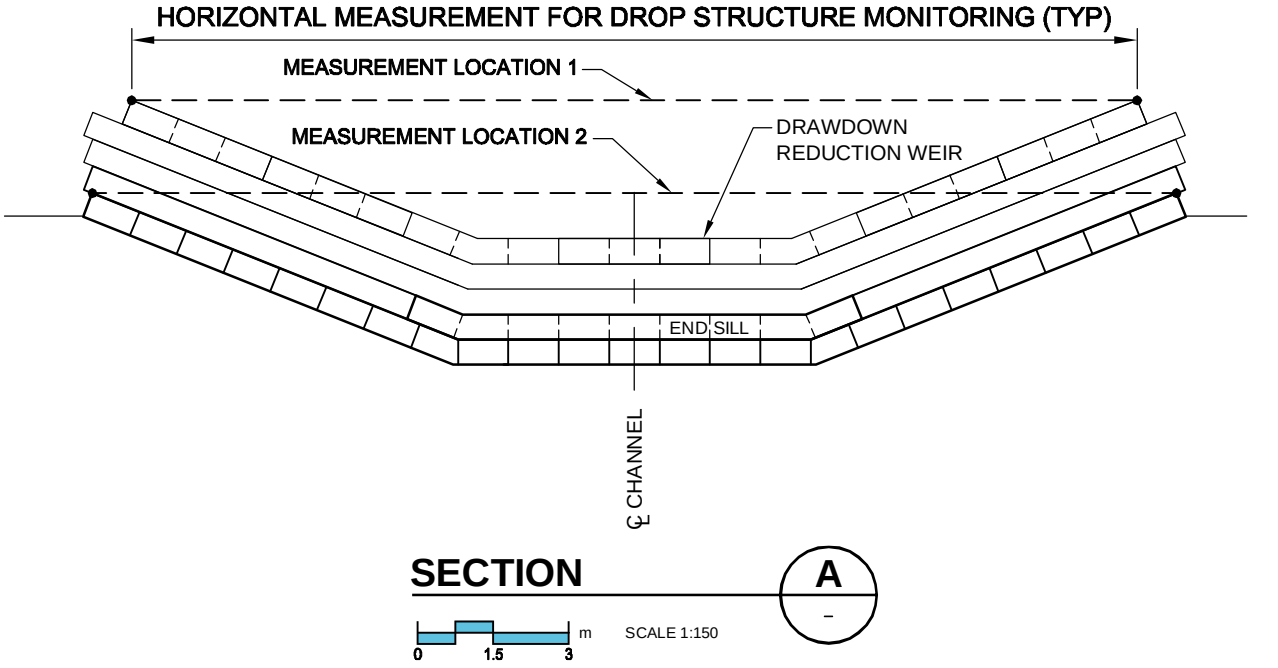
VIDEO INDEX

Video Clip	Description
20090716	Drop Stucture #4
20090716-110347	View upstream & downstrem from end of Drop Structure #4
20090716-110338	Drop Stucture #4
20090716-114510	Drop Stucture #4 baskets
20090716-121352	Drop Stucture #3
20090716-123236	Drop Stucture #2
20090716-123743	Drop Stucture #2
20090716-124526	Drop Stucture #1
20090716-134719	Wolverine Creek - rock lined channel at WP 335
20090716-135705	South tailings lobe at WP337
20090716-140637	View upstream at dop structures
20090716-144532	Clinton Creek channel at WP 339
20090716-145427	Clinton Creek channel at WP 341
20090716-150625	Clinton Creek channel at WP 342
20090716-150640	Clinton Creek channel at Tag 0222
20090716-151128	Clinton Creek channel at WP 343
20090716-151824	Clinton Creek channel at WP 344
20090716-152256	Clinton Creek channel at WP 345
20090716-152637	Tailings from South Lobe
20090716-154503	Porcupine Creek Open Pit from WP 347
20090716-160428	Clinton Creek Waste Rock Dump - former crusher and demolition waste landfill
20090716-170410	Porcupine Creek Waste Rock Dump
20090716-172944	Porcupine Creek Open Pit
20090716-174430	Trench and berm around Open Pit
20090716-185641	Bedrock quarry
20090716-185838	Bedrock quarry
20090716-190002	Bedrock quarry
20090716 (3)	Stockpiles of processed rock for gabions
20090716 (5)	Hudgeon Lake outlet and lake

Appendix B

Gabion Drop Structure Horizontal Measurement Summary





Government of Yukon
Former Clinton Creek Asbestos Mine

Drop Structure Measurements

AECOM

Drawing - B1

Client: Government of Yukon
Project: Former Clinton Creek Asbestos Mine - Channel Stabilization
Job No.: 6029-009-00 2940-044-00 6029-015-00
Date: 21-Sep-07 8-Sep-08 16-Jul-09

Table C-1) Former Clinton Creek Asbestos Mine - Clinton Creek Drop Structure Monitoring
Horizontal Measurements - Summary

Measurement Location #1 - Across Drawdown Weir

Drop Structure	Horizontal Distance Across Drop Structure (metres) Date 29-Jul-04	Date 22-May-05	Date 21-Jun-06	Date 3-Oct-06	Date 4-Jul-07	Date 21-Sep-07	Date 8-Sep-08	Date 16-Jul-09	Incremental Change (m) Sept 2008 to July 2009	Average Annual Rate Of Movement (m/yr) Sept 2008 to July 2009	Total Change (m)	Comment
1	19.62	19.57	19.57	19.58	19.51	19.55	19.48	19.40	-0.08	-0.09	-0.22	survey tags 1 & 2
2	19.49	19.48	19.48	19.48	19.43	19.48	19.46	19.41	-0.05	-0.06	-0.08	survey tags 5 & 6
3	19.44	19.32	19.25	19.21	19.14	19.17	19.08	19.00	-0.08	-0.09	-0.44	survey tags 9 & 10
4	n/a	19.61	19.55	19.51	19.43	19.46	19.40	19.35	-0.05	-0.06	-0.26	survey tags 13 & 14

Measurement Location #2 - Across Lower Tier In-Line With End Sill

Drop Structure	Horizontal Distance Across Drop Structure (metres) Date 29-Jul-04	Date 22-May-05	Date 21-Jun-06	Date 3-Oct-06	Date 4-Jul-07	Date 21-Sep-07	Date 8-Sep-08	Date 16-Jul-09	Incremental Change (m) Sept 2008 to July 2009	Average Annual Rate Of Movement (m/yr) Sept 2008 to July 2009	Total Change (m)	Comment
1	n/a	21.00	20.99	20.90	20.83	20.85	20.77	20.66	-0.11	-0.13	-0.34	survey tags 3 & 4
2	n/a	21.15	21.06	21.05	21.01	21.01	20.95	20.90	-0.05	-0.06	-0.25	survey tags 7 & 8
3	n/a	21.50	21.31	21.31	21.25	21.24	21.17	21.09	-0.08	-0.09	-0.41	survey tags 11 & 12
4	n/a	21.48	21.46	21.36	21.34	21.35	21.30	21.27	-0.03	-0.04	-0.21	survey tags 15 & 16

Year	**Monitored By**	
2004	UMA	
2005	UMA	
2006	Gov of Yukon	Survey tags installed in September 2006
2007	UMA (July) / GY (Sept)	
2008	Gov of Yukon	
2009	AECOM	

Average	**-0.07**	**-0.08**	**-0.28**
Minimum	**-0.03**	**-0.04**	**-0.08**
Maximum	**-0.11**	**-0.13**	**-0.44**