MINREC, INC.

NORTH THOMPSON CREEK MINES

2019 ANNUAL HYDROLOGY REPORT

JANUARY 2020

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INTRODUCTION

The Operator completed reclamation of the North Thompson Creek Mines during 1987. The No.1 Mine was sealed during 1987 with the expectation that no water would discharge from it again. The No. 3 Mine was sealed, however pipes were placed in the lowest seal to allow water to drain from the mine.

During 1988, the No. 1 Mine filled with water and started to discharge. The portal area was excavated in order to control this seepage. One of the portals and a flooded air shaft were exposed to control the mine seepage. Access to the portal was restricted by locked wooden doors. A four foot thick concrete seal, which "dams" the seepage, was located approximately fifty feet back from the doors. Two three inch pipes with valves penetrated the seal.

The flooded air shaft was also a source of mine seepage water. There was a concrete plug in the shaft which water flowed through or around. From 1988 until about 1995 only about 15 gpm would flow around or through this concrete plug. Beginning in 1995 the integrity of the plug degraded and the flow rate from the shaft began to increase.

As of June 1998, all of the seepage water from the No. 1 Mine emerges from the shaft. No water is impounded behind the portal seals. The water from the shaft is conveyed to the long pond through a 6-inch PVC pipe. During late 1998, the Operator backfilled the portal area. A 36-inch culvert was installed in the fill to provide access to the air shaft and the inlet of the 6-inch PVC pipe.

The remaining disturbed area is a developed water resource area. The developed water resource area encompasses the access road, No. 1 Mine portal, three treatment ponds, sediment pond 9, the refuse pond as well and the pipeline corridor between the No. 3 Mine and the first treatment (long) pond.

Current monitoring requirements are shown on page 3-86 of the permit. Monitoring locations are presented in Volume V of the permit on Map D-4-23. TR-29, approved June 29, 2018 allowed for the suspension of water monitoring on North Thompson Creek.

By letter dated April 20, 2006, the Water Quality Control Division notified Minrec that its discharge permit had been given an inactive status effective March 14, 2005. Therefore, no discharge monitoring was performed from 2006 through 2009. By letter dated April 9, 2008 the Water Quality Control Division directed Minrec to apply for a new discharge permit. By letter dated April 28, 2008 Minrec applied for a discharge permit. The Water Quality Control Division issued Minrec's discharge permit number CO-048233 on December 22, 2009 with an effective date of February 1, 2010. Minrec commenced monitoring mine water discharge during February 2010.

Since May 2010 the flow from Treatment Pond T-2 has been routed to sediment pond P-9 and the refuse pile pond. This routing of water is approved as part of the developed water resource post mining land use. The ponds are periodically inspected to determine the water level in each pond. Water flows out of P-9 to the refuse pile pond after P-9 is full. The discharge from treatment pond T-2 will be routed to outfall 001A when the water level in the refuse pond approaches the level of its spillway. It is Minrec's intent to maintain a minimum 2 feet of freeboard in the refuse pond.

No field monitoring was performed during the year. Monitoring of North Thompson Creek was suspended during June 2018.

SURFACE WATER QUALITY

Monitoring of North Thompson Creek was initiated to determine if the mine site and mine discharges impacted the water quality in North Thompson Creek. There has never been an identified impact to North Thompson Creek. Since the mine site has been reclaimed and there is no mine discharge that flows into the Creek, impacts will continue to be minimal to non-existent.

MINE FLOWS

All of the water flowing into the No. 1 Mine flows out through a 6-inch PVC pipe and into the long pond.

Prior to sealing the No. 3 Mine, a point source of spring water located about a mile inside the mine was piped to the surface. The pipeline terminated in the manhole along the road below the No. 3 Mine. A second six inch diameter pipe was installed from immediately behind the No. 3 Mine seals to the manhole. The manhole had an outlet pipe that ran directly under the road to Outfall 007. The good quality water from the spring flowed into the manhole and was discharged directly to Outfall 007 from 1986 through mid 1995. During this period of time the second pipe originating from immediately behind the seals did not discharge. During the second quarter of 1995, wet spring weather caused the mine to fill and the pipe installed immediately behind the seals began discharging iron laden water. The pipeline that conveyed the good quality spring water eventually failed so all of the water being discharged from the mine now flows from the pipeline that was installed from immediately behind the seals to the manhole.

In order to treat this iron laden water, a 4-inch diameter PVC pipe was installed to convey the discharge from the No. 3 mine to the long pond located at the No. 1 Mine. The discharges from the mines were combined effective August 11, 1995. The combined discharge from the mines is treated by the passive water treatment system and then piped to Pond 9, or Outfall 001. Flow from Pond 9 can also be directed to the refuse pond. Outfall 007 is no longer a permitted discharge point.

MINE WATER QUALITY

Water from the No.1 Mine and No. 3 Mine continues to be treated by the passive water treatment system. No flow rate or quality analyses were collected during the year.

The following table presents arithmetic averages of flow and quality measurements taken at Outfall 001. Outfall 001 is the discharge point for the passive water treatment system. All of the water flowing from Outfall 001 was contained in Pond 9 and the refuse pond during the year. There was no direct discharge from Outfall 001 to North Thompson Creek.

OUTFALL 001 – QUALITY						
YEAR	Flow Max	Flow Ave	pH	COND	TDS	IRON
2000	49.2	36.8	8.1	1924	1329	0.09
2001	30.0	25.5	8.1	1884	1376	0.09
2002	25.0	22.4	7.9	1907	1388	0.07
2003	22.0	17.2	8.2	1944	1346	0.03
2004	25.0	17.2	8.2	1970	1399	0.02
2005	17.0	14.9	8.0	1929	1321	0.03
2010	30.0	26.7	8.0	2027	1419	0.03
2011		25.0	7.4	2202*	1552	0.03
2012	No Data, No discharge from Outfall 001					
2013	No Data, No discharge from Outfall 001					
2014	No Data, No discharge from Outfall 001					
2015	No Data, No discharge from Outfall 001					
2016	No Data, No discharge from Outfall 001					
2017	No Data, No discharge from Outfall 001					
2018	No Data, No discharge from Outfall 001					
2019	No Data, No discharge from Outfall 001					

* Calculated based on 1.419 ratio of conductivity to TDS.

The units for the figures in the above table are; flow (gpm), pH (standard units); conductivity (umhos/cm); total dissolved solids (mg/l) and iron (mg/l). Iron was measured potentially dissolved through 2005. The current discharge permit requires iron to be measured as dissolved and total recoverable. Dissolved iron is presented in the table.

WET TESTS

Not required by discharge permit.

Discharge Monitoring Reports (DMRs)

DMRs are submitted quarterly to the Colorado Department of Public Health and Environment with copies to the Division of Reclamation Mining and Safety and are included herein by reference.

ANTICIPATED IMPACT

Discharge from outfall 001 may slightly impact the quality of water in North Thompson Creek. The mine water discharge has a low iron content and an acceptable pH, however its conductivity is moderately high. The following table presents the impact outfall 001 would have on the conductivity of North Thompson Creek at varying discharge rates.

Anticipated Impact - North Thompson Creek NTC - 2012					
Outfall 001 Flow gpm	Conductivity Outfall 001	NTC Flow cfs	Conductivity NTC	Conductivity Combined	% Increase (Decrease)
10	2202	5	494	502	1.5
15	2202	5	494	505	2.3
20	2202	5	494	509	3.1
25	2202	5	494	513	3.8
30	2202	5	494	517	4.6
35	2202	5	494	520	5.3
40	2202	5	494	524	6.1

An average flow of 25.0 gpm with a conductivity of 2202 discharging into a receiving stream with a 5 cfs flow and a conductivity of 494 (pre-permit mean) would increase the conductivity of the receiving stream to about 513 umhos/cm, an increase of about 3.8% which is considered insignificant.

The Colorado Department of Public Health and Environment has regulations regarding saline discharges into the Colorado River. A discharge of less than one ton of salt per day is considered a no-salt discharge by the Department of Health. Please refer to Regulation 61 for a discussion of the one ton of salt per day issue. A flow rate of 100 gpm with a TDS concentration of 1500 mg/l would yield a salt concentration of 0.9 tons per day, slightly below the one ton per day of salt discharge limitation. A flow rate of 25 gpm with a TDS of 1500 mg/l would introduce 0.23 tons of salt per day into North Thompson Creek.

METHODS

The following narrative explains the methods used to perform water monitoring:

Flow - Flow is determined at discharge points by timing flow into a bucket of known volume.

pH - A pocket size tester (pH. Range -1.0 to 15.0 pH). Resolution 0.1 pH. Accuracy +/- 0.1 pH. Operating temperature 0 to 50 ^{o}C. Temperature compensation: automatic 0 to 50 ^{o}C.

Conductivity - A pocket size EC tester. Accuracy: +/- 2% FS. Temperature compensation: automatic 0 to 50 ^{o}C. Operating temperature: 0 to 50 ^{o}C. Ranges: 0 to 0 to 1,900 umhos/cm and 2.0 to 19.90 mmhos/cm.

Temperature - A standard mercury thermometer which measures temperature in degrees Celsius or a microprocessor based pocket sized temperature tester is used.

Other parameters - Samples are submitted in bottles to either Grand Junction Laboratories Enviro-Chem or Accutest Laboratories.