Appendix B

Flying Nickel Mining Corp. 2022. Minago Nickel Project – Water Quality Model Review. Report prepared by Flying Nickel Mining Corp. 10 June 2022.

Minago Nickel Project
Water Quality Model Review

10 June 2022

Prepared By:

Flying Nickel Mining Corp.

Suite 1610 – 409 Granville Street
Vancouver, BC
V6C 1T2 Canada

Table of Contents

List of Tables

List of Figures

1.0 Introduction

The 2014 NOA assessed the effect of discharging 100% of the TWRMF polishing pond outflow on water quality in the Minago River. This discharge source included excess water from the TWRMF, groundwater pumped from the perimeter dewatering wells, and water pumped from the open pit.

The 2014 NOA also specified that all surface runoff from the mine site would be collected and directed to the Minago River, in addition to the polishing pond discharge, but did not examine the potential effect of this runoff on Minago River water quality. Under this scenario, in addition to receiving 100% of the discharge from the TWRMF polishing pond, the discharge would also include mine site surface runoff from the waste rock (limestone and country rock) stockpiles, the sandstone stockpile, and the clay and peat stockpiles. None of these materials is potentially acid generating, but neutral metal leaching can still be a source of contaminants of concern. Review by Flying Nickel of the humidity cell test results for these materials individually, or combinations of these materials, indicated that some neutral metal leaching would occur and should be considered in the water quality model to determine if there was the potential for an adverse effect on water quality in the Minago River.

The 2014 NOA also restricted the water quality model to consideration of potential effects during average Minago River flow conditions. However, the Manitoba Water Quality Standards Objectives and Guidelines, which are incorporated into EAL No. 2981, also require that the criteria be met during $7Q_{10}$ low-flow conditions (i.e., the 7-day low-flow with a 10-year return period).

The following analysis builds on the 2014 NOA water quality model by adding runoff from the limestone, country rock, sandstone, peat, and clay stockpiles and by considering effects at both average and $7Q_{10}$ low flows.

2.0 Updated Water Quality Model

The updated water quality model has been structured to maximize the use of the previous model, is based on the same seasonal structure, and uses the TWRMF loading terms presented in the 2014 NOA. Model specifics are detailed in the following sections.

2.1 Seasons

The Minago Project water quality model presented in the 2010 EAP and the 2014 NOA considered water quality in three seasons: Winter (November through the following April); Freshet (May); and Summer (June through October). These seasonal divisions have been carried forward to this model update.

2.2 Minago River Flows

The effects of the contact water discharge on Minago R. water quality were estimated for two flow conditions – seasonal mean flow and the seasonal $7Q_{10}$ flow (Table 1).

Table 1. Estimated mean and $7Q_{10}$ flows in the Minago River (Golder 2009 in EAP 2010).

Flow (m^3/s)	Winter (Nov-April)	Freshet (May)	Summer (June-Oct)
Mean	0.8	10	1.9
$7Q_{10}$	0.48	0.48	0.48

2.3 Baseline Minago River Water Quality

The 2010 EAP and 2014 EAP water quality models focused on 13 metal/metalloid parameters in consideration of the geochemical analyses of the various mine waste materials conducted to support the 2010 EAP. The present analysis focuses on the same parameters. Hardness also was considered because it is necessary to calculate some water quality criteria.

Neither the 2010 EAP nor the 2014 NOA was explicit with respect to the baseline Minago River water quality values incorporated in the water quality model. Consequently, the present analysis is based on mean water values for the water quality parameters calculated for each season. Pre-project baseline Minago River water quality (Table 2) was estimated for each season using the overall mean concentrations at stations MRW-1, MRW-2, MRW-2X, and MRW-3 (Figure 1), during each of the three seasons, over the 2006-2008 monitoring period. The Freshet and Summer seasons are well represented in this dataset, with multiple measurements collected over the three-year period (Freshet, n=7; Summer, n=20). Winter season water quality is represented by a single sample collected at MRW-1 in March 2008.

Table 2. Baseline water quality in the Minago River; 2006-2008 (From EAP 2010). Values in boldface exceed the applicable MWQSOG (Tables 4 a and b). All values are for the total fraction.

Parameter	Winter (Nov-Apr)	Freshet (May)			Summer (June-Oct)		
(mg/L)	11-Mar-08	Mean	Max	Min	Mean	Max	Min
Hardness	256	122	184	87	164	213	130
Al	**0.904**	**0.151**	**0.333**	0.021	0.0655	**0.185**	0.0210
Sb	0.000827	0.00016	0.00054	<0.000050	0.000041	0.00015	<0.000050
As	0.00144	0.00053	0.00072	0.00039	0.000815	0.00105	0.00051
Cd	<0.000017	0.000224	0.00118	<0.000017	<0.000017	<0.000050	<0.00001
Cr	0.0004	0.00049	0.00064	<0.00050	0.00047	<0.004	0.00013
Co	0.001	0.00010	0.0002	<0.00010	0.00011	0.0010	0.00004
Cu	0.0005	0.00156	0.00560	0.00046	0.00049	0.00160	0.00027
Fe	**1.89**	0.214	**0.386**	0.052	0.146	0.262	0.086
Pb	0.00008	0.000252	0.000730	0.00010	0.000068	0.00033	<0.000050
Mo	<0.000050	0.000101	0.000139	0.000057	0.000138	0.00094	0.000053
Ni	0.00054	<0.00050	0.00066	<0.00050	0.00077	0.00592	<0.00050
Se	0.00012	<0.00050	0.00016	<0.00010	<0.00050	**<0.010**	<0.00010
Zn	<0.0010	0.0021	0.0048	0.0011	0.00128	0.0050	<0.0005

Background Minago R. water quality generally is within the MWQSOGs, with the exception of total Al and total Fe. Mean total Al exceeds the Tier III guideline of 0.1 mg/L in the Winter and Freshet seasons but not during summer. Mean total Fe exceeds the Tier III guideline of 0.3 mg/L during Winter. Total Se exceeded the Tier II objective of 0.001 mg/L in one sample during summer, but not on average.

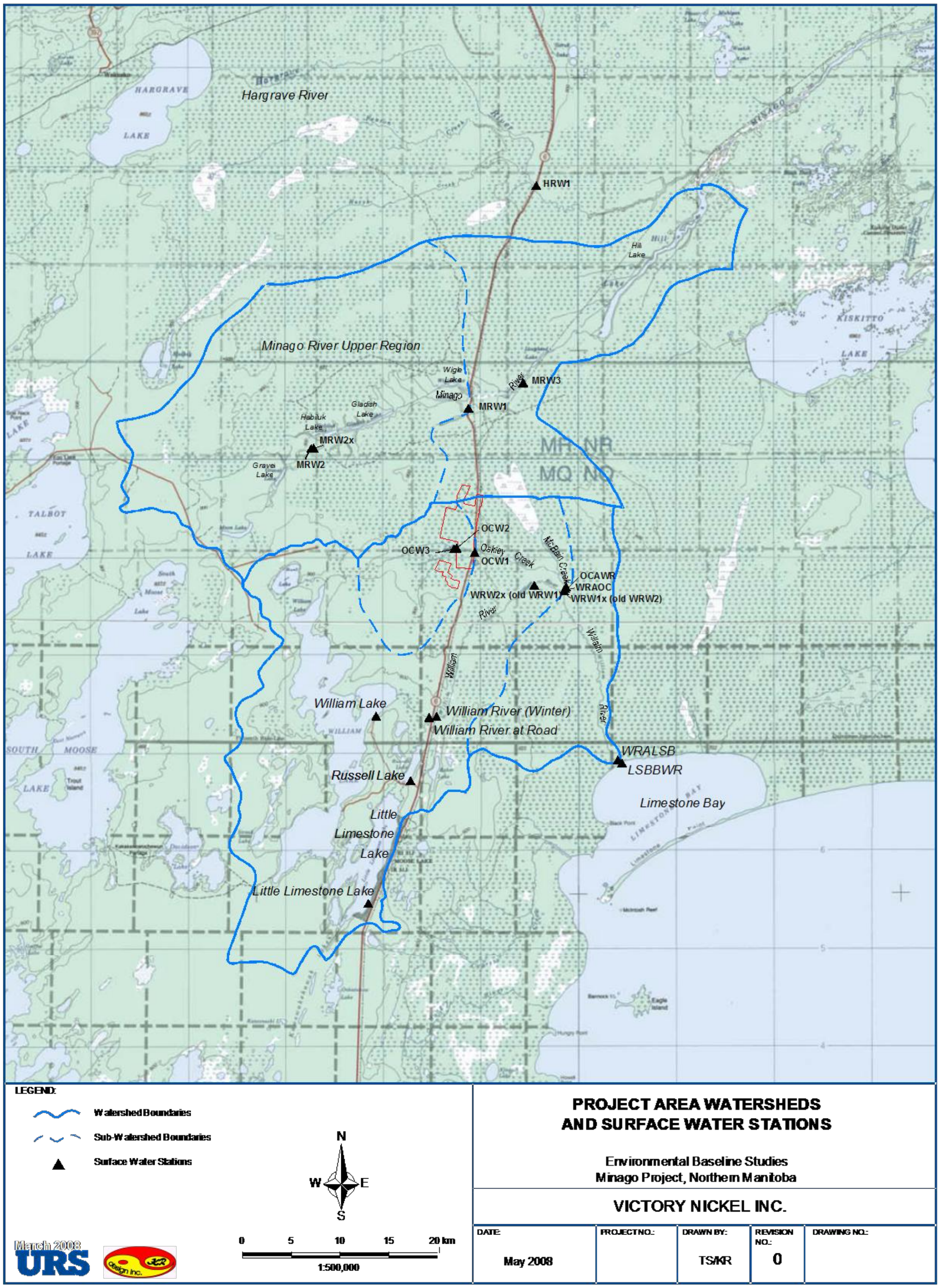

Figure 1. Locations of Minago River water quality monitoring stations MRW1, MRW2, MRW2X, and MRW3 (from 2010 EAP).

2.4 Applicable Water Quality Criteria

Water quality criteria applicable to the discharge include the Metal and Diamond Mining Effluent Regulations (MDMER; Minister of Justice 2022), which apply at the point where the effluent is released to the environment, and the Manitoba Water Quality Standards Objectives and Guidelines (MWQSOGs; Manitoba Water Stewardship 2011) which apply in the watercourse that receives the discharge, in this case the Minago River. Manitoba primarily relies on the MWQSOGs to manage and protect surface water quality, although additional water quality criteria (e.g., CCME (Canadian Council of Ministers of the Environment), British Columbia Water Quality Guidelines) may also be considered for parameters that may be of concern for specific projects but for which a MWQSOG has not been established.

The MWQSOGs include three categories of criteria:

- Tier I Standards, which must be met if applicable. These are compliance requirements set out in law/regulation (e.g., MDMER) or in a permit or license (e.g., a Manitoba Environment Act License).

- Tier II Objectives – These have been defined for a limited number of common pollutants and typically are applied to receiving waters rather than to discharges; representing the concentrations to be achieved after allowance for mixing. Tier II objectives are established for long-term (chronic) exposures and for short-term (acute) exposures. The acute exposure objectives typically are higher than the chronic exposure objectives. Tier II Objectives for some metals (cadmium, chromium III, copper, lead, nickel, and zinc) are calculated on the basis of the water hardness for a specific water body, with the objective increasing with water hardness. Hardness provides protection against the toxicity of some metals. Tier II Objectives are targets that should be met most of the time, except during extraordinary climate conditions (e.g., severe drought) or when background concentrations exceed the objective. Where background concentrations exceed the objective, no further increase in parameter concentration is permitted.

  For Tier II Objectives intended to prevent unacceptable chronic effects, the minimum applicable design flow is either the 4-Day, 3-Year Biological Flow or the 7Q10 Hydrological Flow. In the case of ammonia, an additional 30-Day, 3-year Biological Flow or 30Q10 Hydrological Flow is specified.

  For Tier II Objectives intended to prevent acute effects, the minimum design flow that applies to this return frequency is either the 1-Day, 3-Year Biological Flow or the 1Q10 Hydrological Flow.

  In cases where the minimum design flow calculated by either the biological or hydrological method is 0.003 m^3/s or less, the guidance for Intermittent Streams should apply.

- Tier III Guidelines – These cover a wide range of water quality parameters that are not otherwise included in the Tier II Objectives and include both numerical and narrative guidelines. The Tier III numerical guidelines provide a basis for evaluation of water quality, and a means to evaluate any need for site-specific criteria, but do not require strict compliance. The Tier III narrative guidelines, which refer to general non-numeric water quality characteristics, should be met at all times.

The specific water quality management criteria set out in EAL No. 2981 are:

> The Licencee shall not release any effluent from a final discharge point if:
>
> a) the concentration of total phosphorous exceeds 1.0 mg/L;
>
> b) the quality or toxicity of the effluent is in non-compliance with the MMER (since renamed as the MDMER); or
>
> c) the effluent quality is resulting in, or is likely to result in directly or cumulatively, a downstream degradation of the water quality immediately beyond a maximum 10% mixing zone (by volume) within Oakley Creek and /or the Minago River, relative to the Manitoba Water Quality Standards, Objectives, and Guidelines and/or nutrient control strategies and regulations developed by Manitoba Water Stewardship.

By invoking the MWQSOGs within the EAL, these criteria have been elevated to the status of water quality standards and must be complied with by the project in the Minago River outside the mixing zone.

Table 3. Metal and Diamond Mining Effluent Regulations (MDMER) discharge quality limits (Minister of Justice 2022). Units are mg/L except as noted.

Parameter	Grab Sample	Monthly Mean
TSS	30.00	15.00
pH (pH units)	6.0 to 9.5	6.0 to 9.5
Arsenic, total	0.20	0.10
Copper, total	0.20	0.10
Lead, total	0.16	0.08
Nickel, total	0.50	0.25
Zinc, total	0.80	0.40
Ammonia, unionized	1.00 mg/L (as N)	0.50 mg/ L (as N)
Radium 226	1.11 Bq/L	0.37 Bq/L
Rainbow Trout 96 hr LC_{50}	Non-toxic	Non-toxic
Daphnia magna	Non-toxic	Non-toxic

Table 4. a. Manitoba Water Quality Objectives and Guidelines (MWQSOGs; Manitoba Water Stewardship 2011) for protection of cool water aquatic life in the Minago River downstream of the Minago Nickel Project discharge mixing zone; all seasons. Units are mg/L except as noted.

Parameter	TIER II Objective (acute)		TIER II Objective (chronic)		TIER III Guideline
	Dissolved	Total	Dissolved	Total	
TSS	--	25 mg/L increase[a]	--	5 mg/L increase[a]	--
pH (pH Unit)	--	--	--	--	6.5 to 9.0
Nitrite	--	--	--	--	0.06
Dissolved Oxygen	5.0	--	6.0	--	--
Ammonia[b]	3.976	--	9.939	--	--
Phosphorus	--	--	--	--	0.025 (total)
Aluminum (Al)	--	--	--	--	0.1 (total; pH ≥6.5) 0.005 (total; pH < 6.5)
Arsenic (As)	0.340	--	0.150	--	--
Chromium VI (Cr^{VI})	--	0.016	--	0.011	--
Iron (Fe)	--	--	--	--	0.3 (total)
Mercury (Hg)	--	--	--	--	0.000026 (total)
Molybdenum (Mo)	--	--	--	--	0.073 (total)
Selenium (Se)	--	--	--	--	0.001 (total)
Silver (Ag)	--	--	--	--	0.0001 (total)
Thallium (Tl)	--	--	--	--	0.0008 (total)
Uranium (U)	--	--	--	--	0.015 (total)

a. Increase over background concentration.
b. Calculated as per Manitoba Water Stewardship (2011) using pH 7.6 and 10 °C.

Table 4. b. Hardness-based Tier II water quality objectives (Manitoba Water Stewardship 2011) for protection of cool water aquatic life in the Minago River downstream of the Minago Nickel Project discharge mixing zone; all seasons. Hardness values represent the mean water hardness for the indicated season at stations MRW-1, MRW-2, MRW-2X, and MRW-3 on the Minago River over the 2006-2008 baseline study period, as reported in the 2010 EAL. Units are mg/L except as noted.

Hardness	Winter 256		Freshet 122		Summer 164	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Cadmium (Cd)	0.00554	0.00054	0.00261	0.00031	0.00352	0.00039
Chromium III (Cr^{III})	3.893	0.186	2.122	0.101	2.703	0.129
Copper (Cu)	0.0339	0.0208	0.0169	0.0111	0.0223	0.0142
Lead (Pb)	0.27	0.0105	0.105	0.0041	0.153	0.00597
Nickel (Ni)	1.039	0.116	0.555	0.0617	0.713	0.0793
Zinc (Zn)	0.266	0.266	0.142	0.142	0.182	0.182

2.5 Stockpile Runoff Quality and Quantity

Runoff quality and quantity from the waste rock, sandstone, and overburden stockpiles was estimated using the HC-4 humidity cell test results reported in Appendix 2.8-A4 of the 2014 NOA, which examined leaching from a combination of materials representing overburden (OB; peat and clay), limestone (LS), sandstone (FS; also referred to as frac sand) and altered rock (AR) over 63 weeks. These results were used because humidity cell tests were not conducted on the individual materials. The humidity cell results are expressed for each measured parameter as a leaching rate in mg per kg of material per day (mg/kg/day). The mean humidity cell leaching rate for each parameter was calculated as the arithmetic mean of all measurements from week 20, when stable leaching conditions were determined to develop, through week 63, when the cells were suspended (Table 5).

The mean humidity cell leaching rate was converted to weathering-based leaching rate using 10% of the mean humidity cell value. The mass flux of a parameter into runoff from the collective stockpiles was calculated for each year of operation using the mass of the material in the stockpile in the year (Table 6), multiplied by the weathering-based leaching rate, to yield a mass flux from the stockpiles in mg/day for each parameter (Table 7). Daily runoff from the collective stockpiles was estimated using average precipitation and evaporation rates for the season, as estimated by Golder (2009) in the 2010 EAP, multiplied by the stockpile area and using a runoff coefficient of 0.85 (for industrial sites based on the rational method) to yield a concentration in the stockpile runoff in mg/L (Table 8).

2.6 TWRMF Discharge Quality and Quantity

The TWRMF discharge quality (Tables 10 and 11) and quantity (Table 16) were taken from Section 2.14 of the 2014 NOA.

2.7 Mass Balance Water Quality Model

The effect of the discharge to the Minago River was estimated using a simple mass balance model (equation 1):

$$(1)\ Minago\ R\ DS\ Concentration = \frac{Minago\ R\ US\ Mass + Tailings\ Facility\ Mass + Stockpile\ Mass}{Minago\ R\ DS\ Flow}$$

Where:

DS	= Downstream
US	= Upstream
Minago R Upstream Mass	= Minago R US flow X baseline parameter concentration
Tailings Facility Mass	= TWRMF polishing pond discharge flow X concentration
Stockpile Mass	= Stockpile runoff flow X concentration
Minago R DS Flow	= Minago R US Flow + TWRMF Discharge Flow + Stockpile Flow

3.0 Model Results

The results of the updated water quality model for $7Q_{10}$ low flows and average flows are summarized below. It should be noted that these model results do not include the influence of any water treatment beyond settling for removal of suspended solids.

3.1 7Q10 Flows

Under low flow conditions, it can reasonably be expected that no contact runoff will report from the material stockpiles but that the TWRMF polishing pond discharge flow will largely be unaffected because the pond is primarily fed by groundwater from the deep dewatering wells, groundwater seepage pumped from the open pit, and process water. In this low flow condition, the TWRMF polishing pond discharge would account for approximately 37% of total river flow at winter $7Q_{10}$ low-flows, 75% of total river flow during freshet low flow, and 52% of total river flow during the June-Oct period low flow.

The effects of the TWRMF polishing pond discharge on receiving water quality during $7Q_{10}$ flows become evident early in the mine life (Tables 12 and 13). By Year 2, total Ni concentrations are estimated to exceed the MWQSOG Tier II chronic exposure objective during Freshet and the June-Oct period; total Se would exceed the Tier II objective in all seasons; total Fe concentrations would exceed the Tier III guideline during the Freshet and June-Oct periods; and total Al concentrations would exceed the Tier III objective during the June-Oct period. By Year 6, total Cu concentrations also begin to exceed the Tier II chronic exposure objectives during Freshet, with total Cd exceeding the Tier II chronic objective beginning in Year 7. None of these exceedances occurs at baseline conditions absent the discharge. Except for total Cd, the magnitudes of these exceedances all progressively increase to peak in Year 8 and, then decrease through years 9 and 10 following completion of nickel processing and as sand processing winds down. The increased total Cd in Year 7 continues through Year 10 at approximately the same concentration.

Baseline total Al concentrations in the Minago River exceed the Tier III guideline in Winter and during Freshet and total Fe concentrations exceed the Tier III guideline in Winter. The project discharge is expected to cause decreased Al and Fe concentrations in Winter through the mine life, because concentrations in the discharge are lower than in the Minago River under winter ice cover. Conversely, the project discharge would increase total Al concentrations during Freshet beginning in Year 2 and continuing through year 10.

Effluent treatment will be required to ensure the project is able to comply with the terms of EAL No. 2981 with respect to protecting water quality in the Minago River at low flows.

3.2 Including Stockpile Runoff

Runoff is expected to report from the material stockpiles under average precipitation conditions and the combination of the TWRMF polishing pond and runoff from the material stockpiles is estimated to adversely affect Minago River water quality at average river flows (Tables 14 and 15). The effects become evident in Year 1, with total Al, Fe, and Se exceeding the applicable criteria in the June-Oct period. In Year 2, total Fe begins to exceed the Tier III guideline during Freshet as well as in the June-Oct period. In Year 5, total Ni begins to exceed the Tier II chronic exposure objective during the June-Oct period. The magnitudes of these exceedances all progressively increase to peak in Year 8, the last year of nickel ore processing. Total Ni concentrations decline with the end of nickel ore processing and concentrations in the Minago River drop below the Tier II objective in Years 9 and 10. Similarly, total Fe in the Minago River drops below the Tier III guideline during Freshet in years 9 and 10. In contrast, no material declines in total Al or Se concentrations are predicted to occur in either of Years 9 or 10, although concentrations stop increasing after Year 8. Concentrations of both Cu and Cd remain below the applicable Tier II objectives under the average river flow scenario.

As noted above, baseline total Al concentrations in the Minago River exceed the Tier III guideline in Winter and during Freshet and total Fe concentrations exceed the Tier III guideline in Winter. At average river flows, the combined TWRMF polishing pond and materials stockpiles runoff discharge is expected to cause decreased total Al concentrations in Winter through the mine life due to the lower total Al concentrations in the mine discharge than in the river in winter. Winter total Fe concentrations aren't affected by the discharge.

Effluent treatment will be required to ensure the project is able to comply with the terms of EAL No. 2981 with respect to protecting water quality in the Minago River under average flow conditions when runoff from the material stockpiles occurs in addition to discharge from the TWRMF polishing pond.

4.0 References

Golder Associates. 2009. Hydrologic baseline study, Minago Project, Manitoba. Submitted to Victory Nickel Inc., March 6, 2009.

Manitoba Water Stewardship. 2011. Manitoba Water Quality Standards, Objectives, and Guidelines. Water Science and Management Branch, Manitoba Water Stewardship. Manitoba Water Stewardship Report No. 2011-01. November 28, 2011.

Minister of Justice. 2022. Metal and Diamond Mining Effluent Regulations (SOR 2002/222). Published by the Minister of Justice at: http://laws-lois.justice.gc.ca. Current to June 01, 2022.

Victory Nickel Inc. 2010. (2010 EAP). Minago Project, Manitoba. Environment Act Proposal – Environmental Impact Statement.

Victory Nickel Inc. 2013. (2014 NOA). Environment Act Proposal to Amend Environment Act Licence No. 2981 to Include the Proposed Tailings and waste Rock Management Facility. Environmental Impact Statement, V1-Part 1, December 08, 2013.

Table 5. Mean parameter leaching rate (mg/kg/day) in the HC-4 Humidity Cell (from EAP 2010).

Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mo	Ni	Se	Zn
0.019	0.00002	0.0001	0.000004	0.000089	0.00006	0.00047	0.017	0.00021	0.0003	0.003	0.0001	0.00048

Table 6. Waste rock and overburden quantities (tonnes) in site stockpiles, operations years 1 through 10 (from NOA 2014). Note that the sandstone stockpile is consumed over the life of mine in the sand processing plant.

Year	Overburden (Clay + Peat)	Limestone	Country Rock	Sandstone	Total
1	9,285,000	96,779,000	14,420,000	5,289,000	125,773,000
2	9,285,000	110,707,000	26,885,000	8,133,000	155,010,000
3	9,285,000	111,032,000	54,050,000	6,993,000	181,360,000
4	9,285,000	111,032,000	81,250,000	5,853,000	207,420,000
5	9,285,000	111,032,000	97,486,000	4,713,000	222,516,000
6	9,285,000	111,032,000	108,529,000	3,573,000	232,419,000
7	9,285,000	111,032,000	115,365,000	2,433,000	238,115,000
8	9,285,000	111,032,000	116,151,000	1,293,000	237,761,000
9	9,285,000	111,032,000	116,151,000	153,000	236,621,000
10	9,285,000	111,032,000	116,151,000	0	236,468,000

Table 7. Mean parameter leaching rates (mg/day) from the waste rock and overburden stockpiles. Rates calculated by year of operation using the total tonnes of waste rock and overburden on surface (Table 5) times 10% of the parameter leaching rate in the HC-4 humidity cell (Table 6).

Year	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mo	Ni	Se	Zn
1	34,138,386	35,935	179,676	7,187	159,911	107,805	844,476	30,544,871	377,319	539,027	5,390,271	179,676	862,443
2	42,074,143	44,289	221,443	8,858	197,084	132,866	1,040,781	37,645,286	465,030	664,329	6,643,286	221,443	1,062,926
3	49,226,286	51,817	259,086	10,363	230,586	155,451	1,217,703	44,044,571	544,080	777,257	7,772,571	259,086	1,243,611
4	56,299,714	59,263	296,314	11,853	263,720	177,789	1,392,677	50,373,429	622,260	888,943	8,889,429	296,314	1,422,309
5	60,397,200	63,576	317,880	12,715	282,913	190,728	1,494,036	54,039,600	667,548	953,640	9,536,400	317,880	1,525,824
6	63,085,157	66,405	332,027	13,281	295,504	199,216	1,560,528	56,444,614	697,257	996,081	9,960,814	332,027	1,593,730
7	64,631,214	68,033	340,164	13,607	302,746	204,099	1,598,772	57,827,929	714,345	1,020,493	10,204,929	340,164	1,632,789
8	64,535,129	67,932	339,659	13,586	302,296	203,795	1,596,395	57,741,957	713,283	1,018,976	10,189,757	339,659	1,630,361
9	64,225,700	67,606	338,030	13,521	300,847	202,818	1,588,741	57,465,100	709,863	1,014,090	10,140,900	338,030	1,622,544
10	64,184,171	67,562	337,811	13,512	300,652	202,687	1,587,714	57,427,943	709,404	1,013,434	10,134,343	337,811	1,621,495

Table 8. Estimated parameter concentrations in stockpile runoff (mg/L) during Freshet (May), by operating year, calculated using the mean daily parameter leaching rate (Table 7) times the estimated daily runoff volume (m³/day).

Year	Runoff (m³/day)	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mo	Ni	Se	Zn
1	20,441	1.6701	0.0018	0.0088	0.00035	0.0078	0.0053	0.0413	1.4943	0.0185	0.0264	0.2637	0.0088	0.0422
2	20,441	2.0583	0.0022	0.0108	0.00043	0.0096	0.0065	0.0509	1.8417	0.0227	0.0325	0.3250	0.0108	0.0520
3	20,441	2.4082	0.0025	0.0127	0.00051	0.0113	0.0076	0.0596	2.1547	0.0266	0.0380	0.3802	0.0127	0.0608
4	20,441	2.7543	0.0029	0.0145	0.00058	0.0129	0.0087	0.0681	2.4643	0.0304	0.0435	0.4349	0.0145	0.0696
5	20,441	2.9547	0.0031	0.0156	0.00062	0.0138	0.0093	0.0731	2.6437	0.0327	0.0467	0.4665	0.0156	0.0746
6	20,441	3.0862	0.0032	0.0162	0.00065	0.0145	0.0097	0.0763	2.7613	0.0341	0.0487	0.4873	0.0162	0.0780
7	20,441	3.1618	0.0033	0.0166	0.00067	0.0148	0.0100	0.0782	2.8290	0.0349	0.0499	0.4992	0.0166	0.0799
8	20,441	3.1571	0.0033	0.0166	0.00066	0.0148	0.0100	0.0781	2.8248	0.0349	0.0498	0.4985	0.0166	0.0798
9	20,441	3.1420	0.0033	0.0165	0.00066	0.0147	0.0099	0.0777	2.8113	0.0347	0.0496	0.4961	0.0165	0.0794
10	20,441	3.1400	0.0033	0.0165	0.00066	0.0147	0.0099	0.0777	2.8094	0.0347	0.0496	0.4958	0.0165	0.0793

Table 9. Estimated parameter concentrations in stockpile runoff (mg/L) during Summer (June-October), by operating year, calculated using the mean daily parameter leaching rate (Table 7) times the estimated daily runoff volume (m³/day).

Year	Runoff (m³/day)	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mo	Ni	Se	Zn
1	6,504	5.2487	0.0055	0.0276	0.0011	0.0246	0.0166	0.1298	4.6962	0.0580	0.0829	0.8287	0.0276	0.1326
2	6,504	6.4687	0.0068	0.0340	0.0014	0.0303	0.0204	0.1600	5.7878	0.0715	0.1021	1.0214	0.0340	0.1634
3	6,504	7.5684	0.0080	0.0398	0.0016	0.0355	0.0239	0.1872	6.7717	0.0837	0.1195	1.1950	0.0398	0.1912
4	6,504	8.6559	0.0091	0.0456	0.0018	0.0405	0.0273	0.2141	7.7447	0.0957	0.1367	1.3667	0.0456	0.2187
5	6,504	9.2858	0.0098	0.0489	0.0020	0.0435	0.0293	0.2297	8.3084	0.1026	0.1466	1.4662	0.0489	0.2346
6	6,504	9.6991	0.0102	0.0510	0.0020	0.0454	0.0306	0.2399	8.6782	0.1072	0.1531	1.5314	0.0510	0.2450
7	6,504	9.9368	0.0105	0.0523	0.0021	0.0465	0.0314	0.2458	8.8908	0.1098	0.1569	1.5690	0.0523	0.2510
8	6,504	9.9220	0.0104	0.0522	0.0021	0.0465	0.0313	0.2454	8.8776	0.1097	0.1567	1.5666	0.0522	0.2507
9	6,504	9.8745	0.0104	0.0520	0.0021	0.0463	0.0312	0.2443	8.8350	0.1091	0.1559	1.5591	0.0520	0.2495
10	6,504	9.8681	0.0104	0.0519	0.0021	0.0462	0.0312	0.2441	8.8293	0.1091	0.1558	1.5581	0.0519	0.2493

Table 10. TWRMF Polishing Pond Outflow Quality (mg/L) in operating years 1 through 5 (from NOA 2014). Boldface values exceed the applicable MWQSOG criterion.

	Year 1			Year 2			Year 3			Year 4			Year 5		
Parameter	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct
Al	**0.119**	**0.139**	**0.154**	**0.169**	**0.169**	**0.156**	**0.171**	**0.174**	**0.16**	**0.174**	**0.181**	**0.165**	**0.176**	**0.188**	**0.17**
Sb	0.00092	0.00115	0.0013	0.00135	0.00139	0.00132	0.00136	0.00144	0.00135	0.00138	0.00149	0.00139	0.0014	0.00155	0.00143
As	0.0010	0.0010	0.0020	0.0010	0.0010	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
Cd	0.00018	0.00021	0.00024	0.00026	0.00026	0.00024	0.00027	0.00027	0.00025	0.00028	0.00029	0.00027	0.00029	0.00031	0.00028
Cr	0.0038	0.0043	0.0048	0.0051	0.0051	0.0048	0.0051	0.0052	0.0049	0.0052	0.0054	0.005	0.0052	0.0056	0.0051
Co	0.00245	0.00292	0.00324	0.00353	0.00353	0.00329	0.00355	0.00364	0.00336	0.00358	0.00375	0.00344	0.00361	0.00389	0.00353
Cu	0.0084	0.010	0.011	0.0122	0.0122	0.0114	0.0124	0.01272	0.0118	0.0127	0.0133	0.0122	0.013	0.014	0.0127
Fe	**0.527**	**0.628**	**0.696**	**0.762**	**0.761**	**0.704**	**0.765**	**0.781**	**0.717**	**0.769**	**0.804**	**0.733**	**0.774**	**0.83**	**0.752**
Pb	**0.00141**	0.00172	0.00193	0.00216	0.0022	0.00209	0.00233	0.00242	0.00228	0.0025	0.00266	0.00249	0.00269	0.00293	0.00271
Mo	0.0032	0.0037	0.0041	0.0045	0.0046	0.0043	0.0047	0.0049	0.0046	0.0049	0.0052	0.0049	0.0052	0.0056	0.0052
Ni	**0.12**	**0.142**	**0.158**	0.174	0.173	0.16	0.175	0.178	0.164	0.177	0.184	0.168	0.179	0.191	0.173
Se	**0.0018**	**0.0022**	**0.0025**	0.0027	0.0026	0.0027	**0.0027**	**0.0028**	**0.0026**	**0.0027**	**0.0029**	**0.0027**	**0.0027**	**0.003**	**0.0028**
Zn	0.011	0.012	0.014	0.015	0.015	0.014	0.015	0.016	0.015	0.016	0.017	0.016	0.017	0.018	0.017

Table 11. TWRMF Polishing Pond Outflow Quality (mg/L) in operating years 6 through 10 (from NOA 2014). Boldface values exceed the applicable MWQSOG criterion.

	Year 6			Year 7			Year 8			Year 9			Year 10		
Parameter	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct
Al	**0.179**	**0.196**	**0.177**	**0.182**	**0.206**	**0.184**	**0.185**	**0.212**	**0.189**	**0.448**	**0.313**	**0.235**	**0.215**	**0.196**	**0.138**
Sb	0.00162	0.00162	0.00149	0.00145	0.0017	0.00155	0.00147	0.00175	0.00159	0.00422	0.00324	0.00291	0.00289	0.00271	0.00236
As	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0060	0.0050	0.0050	0.0060	0.0060	0.0050
Cd	0.0003	0.00033	0.0003	0.00031	0.00035	0.00031	0.00031	**0.00036**	0.00033	**0.00099**	**0.00073**	**0.00068**	**0.00074**	**0.00067**	**0.00056**
Cr	0.0053	0.0058	0.0053	0.0053	0.006	0.0055	0.0054	0.0062	0.0056	0.0113	0.0082	0.0061	0.0048	0.0045	0.0034
Co	0.00365	0.00404	0.00365	0.0037	0.00421	0.00379	0.00374	0.00433	0.00387	0.00901	0.00635	0.00469	0.00406	0.00373	0.00265
Cu	0.0133	0.0147	0.0133	0.0137	0.0156	0.014	0.014	**0.0161**	**0.0144**	**0.0393**	**0.0286**	**0.0247**	**0.0261**	**0.024**	**0.0192**
Fe	**0.781**	**0.86**	**0.774**	**0.788**	**0.896**	**0.802**	**0.797**	**0.92**	**0.82**	**1.772**	**1.208**	**0.779**	**0.555**	**0.5**	**0.273**
Pb	0.00287	0.00321	0.00295	0.00306	0.00353	0.00322	0.0032	0.00375	0.00338	**0.01304**	0.01008	0.0107	**0.01318**	0.01218	0.01076
Mo	0.0054	0.006	0.0055	0.0056	0.0064	0.0059	0.0058	0.0068	0.0061	0.0249	0.0196	0.0218	0.0278	0.0257	0.023
Ni	0.181	0.199	0.179	0.183	0.208	0.186	**0.186**	**0.214**	**0.191**	**0.447**	**0.308**	**0.219**	**0.19**	**0.172**	**0.113**
Se	**0.0028**	**0.0031**	**0.0029**	**0.0028**	**0.0033**	**0.003**	**0.0029**	**0.0034**	**0.0031**	**0.007**	**0.0054**	**0.0044**	**0.0038**	**0.0036**	**0.0031**
Zn	0.018	0.02	0.018	0.019	0.022	0.02	0.02	0.023	0.021	0.068	0.054	0.058	0.071	0.066	0.059

Table 12. Estimated effect of the Minago Nickel Project effluent discharge on water quality in the Minago River under 7Q10 low flow conditions – Operations Years 1 to 5. Boldface values exceed the applicable MWQSOG criterion.

Parameter	Minago R - Baseline			Year 1			Year 2			Year 3			Year 4			Year 5		
	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct
Al	**0.904**	**0.151**	0.0655	**0.639**	**0.142**	**0.111**	**0.630**	**0.165**	**0.112**	**0.631**	**0.168**	**0.114**	**0.632**	**0.174**	**0.117**	**0.633**	**0.179**	**0.119**
Sb	0.00083	0.00016	0.000041	0.00086	0.00089	0.00069	0.0010	0.0011	0.00070	0.00075	0.0011	0.00072	0.00076	0.0012	0.00074	0.00076	0.0012	0.00076
As	0.0014	0.00053	0.00082	0.0013	0.00088	0.0014	0.0013	0.00089	0.0014	0.0012	0.0016	0.0014	0.0012	0.0016	0.0014	0.0012	0.0016	0.0014
Cd	<0.000017	0.00022	<0.000017	0.000066	0.00021	0.00013	0.00010	0.00025	0.00013	0.000078	0.00026	0.00013	0.000080	0.00027	0.00014	0.000083	0.00029	0.00015
Cr	0.00040	0.00049	0.00047	0.0015	0.0033	0.0027	0.0022	0.0040	0.0027	0.0016	0.0041	0.0028	0.0016	0.0042	0.0028	0.0016	0.0044	0.0029
Co	0.0010	0.00010	0.00011	0.0015	0.0022	0.0017	0.0019	0.0027	0.0018	0.0014	0.0028	0.0018	0.0014	0.0029	0.0018	0.0014	0.0030	0.0019
Cu	0.00050	0.0016	0.00049	0.0032	0.0078	0.0059	0.0049	0.0096	0.0061	0.0036	0.010	0.0063	0.0037	0.010	0.0065	0.0038	0.011	0.0068
Fe	**1.89**	0.214	0.146	**1.43**	**0.521**	**0.430**	**1.47**	**0.628**	**0.434**	**1.08**	**0.643**	**0.441**	**1.08**	**0.660**	**0.449**	**1.08**	**0.680**	**0.459**
Pb	0.000080	0.00025	0.000068	0.00053	0.0013	0.0010	0.00086	0.0017	0.0011	0.00067	0.0019	0.0012	0.00072	0.0021	0.0013	0.00077	0.0023	0.0014
Mo	<0.000050	0.00010	0.00014	0.0011	0.0028	0.0022	0.0017	0.0035	0.0023	0.0013	0.0037	0.0024	0.0013	0.0040	0.0026	0.0014	0.0043	0.0027
Ni	0.00054	0.00025	0.00077	0.041	**0.105**	**0.082**	0.065	**0.13**	**0.083**	0.048	**0.13**	**0.085**	0.049	**0.14**	**0.087**	0.049	**0.14**	**0.090**
Se	0.00012	0.00025	0.00046	0.00069	**0.0017**	**0.0015**	**0.0011**	**0.0020**	**0.0016**	0.00079	**0.0022**	**0.0016**	0.00079	**0.0023**	**0.0016**	0.00079	**0.0023**	**0.0017**
Zn	0.00050	0.0021	0.0013	0.0040	0.0094	0.0078	0.0059	0.012	0.0078	0.0043	0.013	0.0084	0.0046	0.013	0.0089	0.0048	0.014	0.0094

Table 13. Estimated effect of the Minago Nickel Project effluent discharge on water quality in the Minago River under 7Q10 low flow conditions – Operations Years 6 to 10. Boldface values exceed the applicable MWQSOG criterion.

Parameter	Minago R - Baseline			Year 6			Year 7			Year 8			Year 9			Year 10		
	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct
Al	**0.904**	**0.151**	0.0655	**0.634**	**0.185**	**0.123**	**0.635**	**0.193**	**0.127**	**0.636**	**0.196**	**0.129**	**0.867**	**0.184**	0.086	**0.848**	**0.171**	0.074
Sb	0.00083	0.00016	0.000041	0.00082	0.0013	0.00079	0.00078	0.0013	0.00082	0.0011	0.0013	0.00084	0.0011	0.00079	0.00040	0.00099	0.0013	0.00033
As	0.0014	0.00053	0.00082	0.0012	0.0016	0.0014	0.0012	0.0016	0.0014	0.0016	0.0016	0.0014	0.0018	0.0014	0.0013	0.0018	0.0029	0.0013
Cd	<0.000017	0.00022	<0.000017	0.000086	0.00030	0.00016	0.000089	**0.00032**	0.00016	0.00012	**0.00032**	0.00017	0.000088	**0.00033**	0.000091	0.000068	**0.00042**	0.000077
Cr	0.00040	0.00049	0.00047	0.0016	0.0045	0.0030	0.0016	0.0047	0.0031	0.0023	0.0047	0.0031	0.0013	0.0021	0.0012	0.00076	0.0022	0.00083
Co	0.0010	0.00010	0.00011	0.0015	0.0031	0.0019	0.0014	0.0032	0.0020	0.0020	0.0032	0.0021	0.0017	0.0014	0.00068	0.0012	0.0017	0.00043
Cu	0.00050	0.0016	0.00049	0.0039	**0.012**	0.0071	0.0040	**0.012**	0.0075	0.0055	**0.012**	0.0077	0.0037	0.0071	0.0035	0.0026	0.011	0.0028
Fe	**1.89**	0.214	0.146	**1.08**	**0.702**	**0.470**	**1.08**	**0.730**	**0.484**	**1.48**	**0.730**	**0.494**	**1.88**	**0.417**	0.224	**1.78**	**0.338**	0.162
Pb	0.000080	0.00025	0.000068	0.00082	0.0025	0.0016	0.00087	0.0027	0.0017	0.0012	0.0028	0.0018	0.0011	0.0023	0.0014	0.0011	0.0054	0.0014
Mo	<0.000050	0.00010	0.00014	0.0015	0.0046	0.0029	0.0015	0.0049	0.0031	0.0022	0.0050	0.0032	0.0020	0.0041	0.0028	0.0023	0.011	0.0030
Ni	0.00054	0.00025	0.00077	0.050	**0.15**	**0.093**	0.050	**0.16**	**0.096**	0.070	**0.16**	**0.099**	0.037	**0.063**	0.028	0.016	**0.075**	0.015
Se	0.00012	0.00025	0.00046	0.00082	**0.0024**	**0.0017**	0.00082	**0.0026**	**0.0018**	**0.0012**	**0.0026**	**0.0018**	0.00068	**0.0013**	0.00095	0.00042	**0.0017**	0.00079
Zn	0.00050	0.0021	0.0013	0.0051	0.016	0.0099	0.0054	0.017	0.011	0.0078	0.017	0.011	0.0060	0.013	0.0083	0.0062	0.0299	0.0084

Table 14. Estimated effect of the Minago Nickel Project effluent discharge on water quality in the Minago River under average flow conditions – Operations Years 1 to 5. Boldface values exceed the applicable MWQSOG criterion.

	Minago R - Baseline			Year 1			Year 2			Year 3			Year 4			Year 5		
Parameter	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct
Al	**0.904**	**0.151**	0.0655	**0.720**	**0.181**	**0.241**	**0.711**	**0.192**	**0.278**	**0.711**	**0.199**	**0.312**	**0.712**	**0.207**	**0.346**	**0.713**	**0.212**	**0.366**
Sb	0.00083	0.00016	0.000041	0.00085	0.00031	0.00047	0.0010	0.00036	0.00051	0.0010	0.00037	0.00055	0.0010	0.00038	0.00059	0.0010	0.00040	0.00062
As	0.0014	0.00053	0.00082	0.0013	0.00075	0.0019	0.0014	0.00080	0.0021	0.0017	0.00096	0.0022	0.0016	0.0010	0.0024	0.0016	0.0010	0.0025
Cd	<0.000017	0.00022	<0.000017	0.000049	0.00023	0.000089	0.000077	0.00023	0.000097	0.000080	0.00024	0.00011	0.000083	0.00024	0.00012	0.000086	0.00024	0.00012
Cr	0.00040	0.00049	0.00047	0.0012	0.0011	0.0021	0.0017	0.0013	0.0023	0.0017	0.0013	0.0024	0.0017	0.0014	0.0026	0.0017	0.0014	0.0027
Co	0.0010	0.00010	0.00011	0.0013	0.00054	0.0013	0.0017	0.00067	0.0014	0.0017	0.00070	0.0015	0.0017	0.00074	0.0016	0.0018	0.00077	0.0017
Cu	0.00050	0.0016	0.00049	0.0024	0.0034	0.0066	0.0037	0.0039	0.0076	0.0038	0.0042	0.0085	0.0039	0.0044	0.0094	0.0039	0.0046	0.0099
Fe	**1.89**	0.214	0.146	**1.57**	0.289	**0.397**	**1.66**	**0.316**	**0.432**	**1.66**	**0.325**	**0.464**	**1.66**	**0.334**	**0.497**	**1.66**	**0.341**	**0.518**
Pb	0.000080	0.00025	0.000068	0.00039	0.00080	0.0022	0.00065	0.00095	0.0026	0.00070	0.0011	0.0031	0.00074	0.0012	0.0035	0.00080	0.0012	0.0037
Mo	0.000025	0.00010	0.00014	0.00077	0.0011	0.0035	0.0012	0.0013	0.0041	0.0013	0.0015	0.0047	0.0014	0.0016	0.0053	0.0014	0.0017	0.0056
Ni	0.00054	0.00025	0.00077	0.029	0.022	0.058	0.048	0.029	0.064	0.048	0.030	0.071	0.049	0.032	0.077	0.049	0.034	**0.081**
Se	0.00012	0.00025	0.00046	0.00051	0.00066	**0.0017**	0.00083	0.00076	**0.0019**	0.00083	0.00082	**0.0021**	0.00083	0.00087	**0.0023**	0.00083	0.00091	**0.0024**
Zn	0.00050	0.0021	0.0013	0.0030	0.0041	0.0079	0.0045	0.0047	0.0088	0.0045	0.0051	0.0099	0.0048	0.0054	0.011	0.0050	0.0056	0.012

Table 15. Estimated effect of the Minago Nickel Project effluent discharge on water quality in the Minago River under average flow conditions – Operations Years 6 to 10. Boldface values exceed the applicable MWQSOG criterion.

	Minago R - Baseline			Year 6			Year 7			Year 8			Year 9			Year 10		
Parameter	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct
Al	**0.904**	**0.151**	0.0655	**0.713**	**0.216**	**0.380**	**0.714**	**0.219**	**0.389**	**0.715**	**0.220**	**0.389**	**0.881**	**0.221**	**0.433**	**0.869**	**0.219**	**0.429**
Sb	0.00083	0.00016	0.000041	0.0011	0.00041	0.00065	0.0010	0.00042	0.00067	0.0010	0.00041	0.00068	0.00080	0.00027	0.00052	0.00093	0.00032	0.00050
As	0.0014	0.00053	0.00082	0.0016	0.0010	0.0026	0.0016	0.0010	0.0026	0.0016	0.0010	0.0026	0.0013	0.00095	0.0028	0.0018	0.0011	0.0028
Cd	<0.000017	0.00022	<0.000017	0.000088	0.00025	0.00013	0.000091	0.00025	0.00013	0.000091	0.00025	0.00014	0.000047	0.00024	0.00011	0.000045	0.00025	0.00010
Cr	0.00040	0.00049	0.00047	0.0018	0.0014	0.0028	0.0018	0.0015	0.0029	0.0018	0.0014	0.0029	0.00077	0.00091	0.0023	0.00062	0.00095	0.0023
Co	0.0010	0.00010	0.00011	0.0018	0.00080	0.0018	0.0018	0.00082	0.0018	0.0018	0.00078	0.0018	0.0011	0.00040	0.0014	0.0012	0.00045	0.0013
Cu	0.00050	0.0016	0.00049	0.0040	0.0047	0.010	0.0041	0.0049	0.011	0.0042	0.0048	0.011	0.0020	0.0036	0.010	0.0018	0.0040	0.010
Fe	**1.89**	0.214	0.146	**1.66**	**0.347**	**0.533**	**1.66**	**0.353**	**0.546**	**1.66**	**0.347**	**0.549**	**1.52**	0.285	**0.487**	**1.82**	0.282	**0.470**
Pb	0.000080	0.00025	0.000068	0.00085	0.0013	0.0039	0.00090	0.0014	0.0040	0.00094	0.0014	0.0041	0.00059	0.0012	0.0044	0.00074	0.0014	0.0044
Mo	0.000025	0.00010	0.00014	0.0015	0.0018	0.0059	0.0015	0.0019	0.0061	0.0016	0.0019	0.0061	0.0010	0.0015	0.0066	0.0014	0.0021	0.0066
Ni	0.00054	0.00025	0.00077	0.050	0.035	**0.084**	0.050	0.037	**0.086**	0.051	0.035	**0.087**	0.019	0.015	0.065	0.011	0.017	0.062
Se	0.00012	0.00025	0.00046	0.00086	0.00094	**0.0025**	0.00086	0.00097	**0.0026**	0.00088	0.00094	**0.0026**	0.00038	0.00068	**0.0025**	0.00031	0.00073	**0.0024**
Zn	0.00050	0.0021	0.0013	0.0053	0.0059	0.012	0.0056	0.0062	0.013	0.0058	0.0061	0.0129	0.0031	0.0045	0.012	0.0040	0.0061	0.012

Table 16. Comparison of estimated discharge to the Minago River as indicated in the 2014 NOA, with the estimated runoff from the waste rock and overburden stockpiles, and the estimated total discharge from both sources under average precipitation conditions.

	2014 NOA TWRMF, Dewatering Wells, Pit Dewatering (m³/day)			Additional Stockpile Runoff (m³/day)			Total Discharge (m³/day)			% Increase		
Year	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct	Winter	Freshet	June-Oct
1	21,158	119,119	44,193	0	20,441	6,504	21,158	139,560	50,697	0%	17%	15%
2	24,643	128,618	44,193	0	20,441	6,504	24,643	149,059	50,697	0%	16%	15%
3	24,643	128,618	44,193	0	20,441	6,504	24,643	149,059	50,697	0%	16%	15%
4	24,643	128,618	44,193	0	20,441	6,504	24,643	149,059	50,697	0%	16%	15%
5	24,643	128,618	44,193	0	20,441	6,504	24,643	149,059	50,697	0%	16%	15%
6	24,643	128,618	44,193	0	20,441	6,504	24,643	149,059	50,697	0%	16%	15%
7	24,643	128,618	44,193	0	20,441	6,504	24,643	149,059	50,697	0%	16%	15%
8	24,643	112,706	44,193	0	20,441	6,504	24,643	133,147	50,697	0%	18%	15%
9	3,664	10,668	5,836	0	20,441	6,504	3,664	31,109	12,340	0%	192%	111%
10	3,664	31,941	5,836	0	20,441	6,504	3,664	52,382	12,340	0%	64%	111%