

**DATE** 15 June 2012**PROJECT No.** 09-1373-1004**TO** Rick Schryer  
Fortune Minerals Limited**CC** Jennifer Gibson, Lasha Young, Gary Ash**FROM** Tammie Morgan-Gray, Rein Jaagumagi**EMAIL** tmorgan-gray@golder.com,  
rjaagumagi@golder.com**NICO COBALT-GOLD-BISMUTH-COPPER PROJECT:  
REVISED SITE-SPECIFIC WATER QUALITY OBJECTIVES (TOXICITY THRESHOLDS)****1.0 INTRODUCTION**

Site-specific water quality objectives (SSWQOs) were derived for the NICO Cobalt-Gold-Bismuth-Copper Project (NICO Project). These objectives were presented in Section 7.0, Appendix 7.VII of the Developer's Assessment Report (DAR) (Fortune 2011). The SSWQOs were derived to help guide the design of the water treatment system for the NICO Project. As well, the Terms of Reference (ToR) for the NICO Project noted that SSWQOs were to be proposed for all chemicals of potential concern (CoPCs) identified for the NICO Project (MVRB 2009).

Aluminum, ammonia, antimony, arsenic, cadmium, chloride, cobalt, copper, iron, lead, nitrate, selenium, sulphate, uranium, and zinc were initially identified as CoPCs because predicted concentrations in the influent to the Effluent Treatment Facility (ETF) during operations and/or in the Pit Lake during post-closure were, at the time of the development of the SSWQOs, anticipated to be greater than Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life and baseline concentrations. Thus, SSWQOs were derived for these CoPCs in the DAR. Since the development of the SSWQOs, ion exchange technology and more recently, reverse osmosis technology has been selected as the water treatment option for the NICO Project. As such, the CoPCs for the NICO Project have changed. As well, revisions have been made to some of the SSWQOs in response to the second round of information requests on the SSWQOs made by various review parties (Fortune Minerals Limited [Fortune] 2012). During a meeting between Fortune, Aboriginal Affairs and Northern Development Canada (AANDC), Environment Canada (EC) and Wek'eezhii Land and Water Board (WLWB) on 16 May 2012, Fortune agreed to provide a table of the updated SSWQOs for the NICO Project. The purpose of this technical memorandum is to provide a brief overview of the revisions to the SSWQOs and to provide the current SSWQOs for the NICO Project.

**2.0 REVISIONS TO SITE-SPECIFIC WATER QUALITY OBJECTIVES**

The CoPC list for the NICO Project was updated for the reverse osmosis treatment technology. The approach used to identify CoPCs for the NICO Project is consistent with the approach described in the aquatic risk assessment (Golder 2012) and included comparison of predicted concentrations to CWQGs followed by comparison to baseline concentrations if predicted concentrations were greater than CWQGs. Where a parameter was predicted to be elevated 10% or more above the mean baseline concentration, the parameter was identified as a CoPC of the NICO Project. Comparison to a threshold of 10% above baseline concentrations was considered to represent a conservative evaluation of whether a measurable NICO Project-related impact of surface water quality could occur. Given spatial and temporal variability, field sampling variability, variability in



laboratory methods, and the conservatism applied in the predictive water quality models, any predicted increase of less than 10% above baseline concentrations was considered unlikely to reflect a “significant” change in environmental quality as a result of the NICO Project.

Predicted concentrations of ammonia, uranium, and zinc in Nico, Peanut, and Burke lakes, and the Marian River during all phases of the NICO Project (i.e., construction, operations, closure, and post-closure) are below the guidelines. As such, these parameters are no longer considered to be CoPCs for the NICO Project and SSWQOs are no longer required for these parameters (Table 1).

**Table 1: Site-Specific Water Quality Objectives (Toxicity Thresholds) for the NICO Project**

CoPC	CCME CWQG <sup>a</sup> (µg/L)	SSWQO (as presented in the DAR) (µg/L)		Revised SSWQO (µg/L)	
		Nico Lake	Peanut Lake	Nico Lake	Peanut Lake
Aluminum	100 <sup>b</sup>	420	410	420 <sup>g</sup>	410 <sup>g</sup>
Ammonia	1,100 <sup>c</sup>	4,160		No objective required <sup>h</sup>	
Antimony	NV	30		30 <sup>g</sup>	
Arsenic	5	50		50 <sup>g</sup>	
Barium	NV	No objective derived		1,000	
Cadmium	0.017 <sup>d</sup>	0.15		No objective required <sup>h</sup>	
Chloride	120,000	353,000		353,000 <sup>g</sup>	
Cobalt	NV	10		10 <sup>g</sup>	
Copper	2 <sup>e</sup>	25	22	25 <sup>g</sup>	22 <sup>g</sup>
Iron	300	1,500		1,500 <sup>g</sup>	
Lead	1 <sup>e</sup>	7.6		1	
Manganese	NV	No objective derived		700	
Mercury	0.026	No objective derived		0.26	
Nitrate	13,000 <sup>f</sup>	133,000 <sup>f</sup>		27,000 <sup>f</sup>	
Selenium	1	5.0		3.5	3.5
Sulphate	NV	500,000		500,000 <sup>g</sup>	
Uranium	15	27		No objective required <sup>h</sup>	
Vanadium	NV	No objective derived		6	
Zinc	30	110		No objective required <sup>h</sup>	

<sup>a</sup> Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guideline (CWQG) for the Protection of Freshwater Aquatic Life.

<sup>b</sup> Based on the guideline for when pH ≥ 6.5.

<sup>c</sup> Based on a temperature of 7°C and pH 8.

<sup>d</sup> Based on a water hardness of 47 mg/L as CaCO<sub>3</sub>.

<sup>e</sup> Minimum guideline, regardless of hardness.

<sup>f</sup> µg NO<sub>3</sub><sup>-</sup>/L (micrograms nitrate ion per litre).

<sup>g</sup> The SSWQO has not changed from the value presented in the DAR (Fortune 2011).

<sup>h</sup> This parameter is no longer considered a CoPC for the NICO Project so an SSWQO is not required.

CoPC = chemical of potential concern; SSWQO = site-specific water quality objective; DAR = Developer's Assessment Report (Fortune 2011); µg/L = micrograms per litre; NV = no guideline value.

The SSWQOs for lead, nitrate, and selenium have been revised from those values presented in the DAR to address information requests on the SSWQOs made by various review parties. The revised SSWQOs are provided in Table 1. Please refer to Fortune 2012 (responses to second round information requests TG\_7, TG\_8, and TG\_9) which outlines how these revised SSWQOs were derived.

Site-specific water quality objectives were not derived for barium, manganese, mercury, and vanadium in the DAR. However, predicted concentrations are greater than guidelines and/or baseline concentrations. Toxicity benchmarks were derived for these parameters in the aquatic risk assessment for the NICO Project (Golder 2012). These benchmarks are proposed as the SSWQOs for these parameters (Table 1). Please refer to the aquatic risk assessment (Golder 2012, Sections 5.3.1.4, 5.3.1.8, and 5.3.1.9) for how the SSWQOs for these parameters were derived.

### 3.0 CLOSURE

We trust that the information in this technical memorandum meets your needs. If you require additional information, please do not hesitate to contact the undersigned at your earliest convenience.

Sincerely,

**GOLDER ASSOCIATES LTD.**



Tammie Morgan-Gray  
Environmental Risk Assessor

TMG/RJ/LY/jg



Rein Jaagumagi  
Senior Environmental Specialist

c:\users\jgibson\documents\sharepoint drafts\final tech memo\_revised sswqos.docx

## 4.0 REFERENCES

Fortune (Fortune Minerals Limited). 2011. NICO Cobalt-Gold-Bismuth-Copper Project: Developer's Assessment Report. Submitted to the Mackenzie Valley Review Board. May 2011.

Fortune. 2012. Second Round Information Request Responses for the NICO Cobalt-Gold-Bismuth-Copper Project. Submitted to the Mackenzie Valley Review Board, Yellowknife, NWT. 11 May 2012.

Golder (Golder Associates Ltd.). 2012. NICO Cobalt-Gold-Bismuth-Copper Project, Aquatic Risk Assessment. Prepared for Fortune Minerals Limited. London, ON.

MVRB (Mackenzie Valley Review Board). 2009. Terms of Reference for the Environmental Assessment of the Fortune Minerals Ltd. NICO Cobalt-Gold-Bismuth-Copper Project. EA 0809-04.