Sudbury Soils Study ERA Independent Expert Review Charge to Peer Reviewers March 6-7, 2007

Background

The purpose of the Independent Expert Review Panel (IERP) is to provide expert review and evaluation of the Sudbury Soils Study Ecological Risk Assessment (ERA). The panel members will review the provided documentation and will objectively discuss the materials and charge questions at a panel meeting on March 6 and 7, 2007. The panel will attempt to reach consensus opinions on the assessment's conclusions. *TERA* will compile the panel discussions into a meeting report that will summarize the key points from the discussions, with a focus on the conclusions regarding the charge questions.

Sudbury is a nickel mining community in Northern Ontario. The soils are contaminated with nickel, arsenic, lead and some other chemicals. In 2001, the Ontario Ministry of the Environment (MOE) published the results of soil monitoring studies conducted in the Sudbury area and identified elevated levels of several elements in soils near the three historic smelting and refining centers of Copper Cliff, Coniston, and Falconbridge. The MOE recommended a more detailed soil study be conducted to fill data gaps and that human health and ecological risk assessments be conducted. The Sudbury Soils Study was then initiated, with the underlying objective to answer the question: "Do Sudbury soils containing metal and arsenic levels above the generic guidelines pose an unacceptable ecological or human health risk?"

The Study is overseen by a Technical Committee (TC), comprised of Inco (CVRD) and Falconbridge Ltd. (Xstrata), the Ontario Ministry of the Environment (MOE), the Sudbury & District Health Unit, the City of Greater Sudbury, and the First Nations and Inuit Health Branch of Health Canada. The assessments were prepared by the SARA Group, a group of environmental consulting firms and consultants. The Study has included broad consultation with local communities and stakeholder groups. The two mining companies are providing funding for the study and this peer review. More information can be found at <u>www.sudburysoilsstudy.com</u>.

The package of materials for this review includes Volume I– Background, Study Organization and 2001 Soils Survey and Volume III – Ecological Risk Assessment. Some appendices, along with additional reference materials and data are provided on compact discs.

Background Information from Volume III, Executive Summary is extracted below (from pages ES-1 to ES-3):

"The main goal of the ERA, as stated below, not only recognizes the importance of evaluating ecological risks, but also the significance of evaluating ecological recovery:

To characterize the current and future risks of Chemicals of Concern (COC) to terrestrial and aquatic ecosystem components from particulate emissions from Sudbury smelters. To provide information to support activities related to the recovery of

Sudbury Soils Study Ecological Risk Assessment IERP regionally representative, self-sustaining ecosystems in areas of Sudbury affected by the COC.

Four specific objectives were identified to assist in meeting the main ERA goal:

Objective 1: Evaluate the extent to which COC are preventing the recover of regionally representative, self-sustaining terrestrial plant communities;

Objective 2: Evaluate risks to terrestrial wildlife populations and communities due to COC;

Objective 3: Evaluate risks to individuals of threatened of endangered terrestrial species due to COC; and,

Objective 4: Conduct a comprehensive problem formulation for the aquatic and wetland environments in the Sudbury areas to facilitate more detailed risk assessment in the aquatic/wetland ecosystems.

The overall Management Objective of the ERA was to -- *evaluate levels of COC in various soil types to determine COC levels in soil which do not result in unacceptable risks to Valued Ecosystem Components.* These objectives and goals were developed during the course of this study in consultation with members of the Technical Committee.

The current study is considered an area-wide, or community-based risk assessment (CBRA), because it evaluates a very large geographical area. While many elements of an area-wide risk assessment are based on the requirements for a site-specific risk assessments (SSRA), it is important to note there is no specific regulatory guidance available governing the application of risk assessment on this scale in Canada....

The initial study area for the Sudbury Soils Study was defined as the area from which soil samples were collected during the 2001 Sudbury Regional Soils Project. The study area encompasses approximately 40,000 km² (200 km x 200 km) of the Sudbury basin....The primary source of COC to the terrestrial environment included in this assessment is aerial deposition of particulate-associated metals and metalloids from smelter emissions. The selection of COC for the risk assessment was based on metal concentrations in Sudbury soils measured during the 2001 soil survey."

The ERA will provide information to support Sudbury ecosystem recovery efforts. The SARA Group and Technical Committee will consider the IERP recommendations and revise the ERA as needed. The final assessment will be released to the public.

Charge for Sudbury Soils Study Ecological Risk Assessment Independent Expert Review Panel

Problem Formulation [Chapter 2 and Volume I]

- 1. How effective was the process used to identify Valued Ecosystem Components (VECs) in identifying plant and animal species, populations, and communities of ecological importance in the region? of socio-economic importance? Did the authors identify an appropriate set of Valued Ecosystem Components (VECs)?
- 2. Have the appropriate Chemicals of Concern (COCs) and other stressors been identified and included in the risk assessment?
- 3. How well does the conceptual model convey the principle linkages among COCs, and terrestrial plant and wildlife VECs?
- 4. Recognizing that not all of the sampling sites were systematically chosen in an *a priori* manner for the ERA, how well did the breadth of the study area defined by the sites capture the spatial scale of ecological impact?

Objective 1 – Evaluate the extent to which COC are preventing the recovery of regionally representative, self-sustaining terrestrial plan communities. [Chapter 3]

To evaluate the extent to which COCs are preventing the recovery of regionally representative, self-sustaining terrestrial plant communities, the authors used multiple assessment approaches and then integrated the diverse data to reach conclusions. Data from 22 study sites were collected to produce four distinct "lines of evidence" (LOEs), which were evaluated independently at the 22 sites. Interactions between the LOEs were evaluated using statistical techniques and then the LOEs were integrated using a weight-of-evidence approach to determine whether the concentrations of metals in the soil were impeding recover of a self-sustaining forest ecosystem.

- 5. Discuss the strengths and weaknesses of the lines of evidence approach.
- 6. For each of the four LOEs, discuss whether the methods used were appropriate, whether the assessment approaches were effective, and the usefulness and reliability of the results of the studies.
- 7. Were the weightings of the LOE appropriate?
- 8. How well did the LOEs, singly and collectively, characterize the existing plant community and key stressors that are impeding recovery?
- 9. Are there additional important issues, concerns, or limitations regarding Objective 1?

Objective 2 – Evaluate risks to terrestrial wildlife populations and communities due to COCs. [Chapter 4]

- 10. Was the wildlife exposure modeling approach sound, and was it conducted appropriately? Was the selection of model inputs appropriate? Discuss the relative absorption fractions, concentrations of COCs in the environmental media and diets, and input distributions for the parameters.
- 11. Were the approaches to describe population densities across the study area sound? How well are the conclusions supported by the data?
- 12. Are the estimates of COC exposures to wildlife defensible? Are there additional data or different approaches that could be considered to improve these exposure estimates?
- 13. Are direct effects of COCs correctly distinguished from indirect effects of poor soil conditions and/or habitat constraints (e.g., lack of cover from predators, lack of food sources and nesting sites)?
- 14. Toxicity Reference Values (TRVs) were derived for each VEC and COC. Were the TRVs selected defensible? Are there alternatives? Was the approach used scientifically sound and consistent with established practice of regulatory bodies?.
- 15. Was the approach used to calculate Exposure Ratios consistent with accepted risk assessment methods and were they calculated correctly?
- 16. Are the predicted risk estimates for each Zone and Community of Interest scientifically defensible? Are the conclusions for each COC valid, and are they supported by the risk assessment?
- 17. Discuss the analysis of uncertainty and variability. Are the key sources of uncertainty and variability well characterized, and are they weighed in the interpretation of the results and the strength of the conclusions that can be drawn?
- 18. Do you have additional important issues, concerns, or limitations regarding Objective 2?

Objective 3 – Evaluate risks to individuals of threatened or endangered terrestrial species due to the COC. [Chapters 2 and 4]

- 19. Was the selection of the peregrine falcon as the only threatened/endangered species of concern appropriate? Is the conclusion regarding its status in the study area reasonable?
- 20. Do you have additional important issues, concerns, or limitations regarding Objective 3?

Conclusions and Recommendations

- 21. To what extent did the ERA achieve its two major goals: 1. To characterize the current and future risks of COCs to terrestrial and aquatic ecosystem components; and 2. To provide information to support activities related to the recovery of regionally-representative, self-sustaining ecosystems in areas affected by the COCs? To what extent did the ERA achieve Objectives 1-3?
- 22. Were the approaches used for this ecological risk assessment consistent with commonly accepted methods and sound scientific procedures?
- 23. Overall, how clear and transparent are the assumptions, methods, results, and conclusions described in the ERA? Have the important uncertainties been identified and have the uncertainties' significance and impact on the characterization of risk and overall conclusions been identified and fully discussed?
- 24. Were the non-COC stressors to terrestrial plant communities cited in the ERA (i.e., low pH, low nutrient levels, erosion, and lack of organic matter) appropriately identified and interpreted?
- 25. Discuss the recommendations found in Chapter 6. Are they supported by the data and are they scientifically defensible?