

TMAC Proposes Management System

The Trace Metals and Air Contaminants Working Group (TMAC), part of the Cumulative Environmental Management Association (CEMA) is proposing a management system for trace metals emitted from oil sands activities. TMAC has completed a review and assessment of present and future risks posed by trace metals to human health and ecosystems in the north-eastern Alberta oil sands area. Aluminum, cadmium, mercury, nickel, and vanadium were selected for detailed review and assessment based on known metal emissions from the oil sands facilities in the Regional Municipality of Wood Buffalo, as well as public concern about metal deposition. Nickel and vanadium were chosen because concentrations of these two metals are known to be elevated in the soils in the vicinity of the oil sand facilities, although there was little indication of uptake by vegetation or animals. Aluminum was selected because soil aluminum may be mobilised if soils are acidified. Mercury was added to the list because of the known elevation of mercury concentrations in walleye in the Athabasca River system. Cadmium was selected as it is a concern in Canada's arctic, with respect to native diets.

A consulting firm was commissioned to do the detailed review and assessment of deposition, uptake, and accumulation of the five selected trace metals. This review



Aerial view of the Thickwood Hills Fen

and assessment is reported in "Review and Assessment of the Deposition and Potential Bioaccumulation of Trace Metals," prepared by Dillon Consulting Limited in July 2001 (for an electronic copy email lisa.zaplachinski@gov.ab.ca). TMAC finds the conclusions in the Dillon report to be valid, and believes that at current and projected metal emission rates, trace metals appear unlikely to pose risks to human health and regional ecosystems now or in the future, provided best management practices continue.

The following is the proposed adaptive management approach for trace metals in the Athabasca oil sands region:

Goal: To ensure an environmental management system is in place to protect human health, wildlife, fish and vegetation from the deposition and accumulation of trace metals in the environment.

Indicators: Receptor and ambient (PM_{2.5} and PM₁₀) concentrations of aluminum, cadmium, mercury, nickel, and vanadium in emissions from oil sands activities.

Management Objectives: Trace metal emissions should continue to be minimised and there should be no significant increase in exposure risk with respect to metals in regional air emissions.

Continued on page 2

INSIDE THIS ISSUE

- 2 TMAC Proposes Management System
- 2 TMAC Management System, continued
- 3 A TEEM Player
- 4 CEMA Briefs
- 4 Calendar of Regional Meetings
- 4 *Season's Greetings!*

Management System Implementation: The recommended management system should include the following parts: *management tools* to attain the goal, *research and monitoring* of the indicators and their receptors, and a *system evaluation* of the tools and monitoring/research to assess the success in achieving the goals and objectives.

Management Tools: TMAC recommends the following tools be implemented to aid with managing trace metal emissions:

- Industry maintain and/or improve current metals emission control technology using pollution prevention and particulate matter controls.
- Industry conduct a periodic emission inventory of indicator metals released in stack flue gas streams.
- Regulators issue approval conditions for particulate matter control and compulsory monitoring activities.

Research: Studies should be conducted to address uncertainties about current and future metal accumulation, as follows:

- Metals in water samples are commonly quantified by measuring 'total concentration' and less commonly by measuring 'dissolved concentration'. Measurements of the former are not always very meaningful as the metals may be bound to clay and not available to receptors. Studies of 'dissolved concentration' may more accurately reflect the amount of metals available to organic receptors.
- One-time survey of metal deposition patterns in the region to identify high-concentration areas.

Monitoring: Monitoring should be maintained/implemented to address uncertainties about current and future metal accumulation, as follows:

- Regional programs to conduct long term environmental monitoring for ambient levels of the trace metal indicators in regional biotic and physical sentinel receptors.
- Continuation of the following current RAMP programs:
1) monitoring trace metals in sediments in the oil sands area; 2) monitoring metal concentrations in regional water bodies; 3) monitoring metal concentrations in fish tissue in regional water bodies at three year intervals, with an expansion to include all fish used by local peoples, including fish resident in isolated regional lakes.

- Follow-up studies of the TEEM traditional foods survey to verify and better quantify observations of elevated aluminum in ratroot and cattail root and elevated cadmium and aluminum concentrations in wildlife.

System Evaluation: TMAC recommends that in 2005, a regional body (perhaps the TEEM program under WBEA or a regulatory agency) re-evaluate the linkage between the environmental monitoring results for indicator metals, and oil sands air emissions, as well as compare the monitoring results with the latest environmental and human health benchmarks. If the re-evaluation indicates an adverse trend in environmental quality, or any potential risk to the ecosystem or human health, then it is recommended that a multi-stakeholder group be formed to review and assess the status of deposition and bioaccumulation of trace metals and to recommend appropriate management system changes. This system evaluation should be repeated at a date to be set during the 2005 review. ❖

A TEEM Player

The Terrestrial Environmental Effects Monitoring (TEEM) Program is an industry-funded long-term monitoring program focussing on terrestrial ecosystems potentially affected by air emissions from oil sands mining and processing facilities in the Athabasca oil sands region. The TEEM Committee, under the Wood Buffalo Environmental Association, has developed and operates a program which includes both monitoring studies initiated by the oil sands industry as early as 1978, as well as new studies. New projects are being developed as more is known about the potential responses of the terrestrial ecosystems to air emissions.

TEEM members are representative of industry, Aboriginal groups, government, and environmental organizations. TEEM membership is open to any group having an interest in the natural environment of the Regional Municipality of Wood Buffalo, including resource developers operating or having an environmental impact in the region. TEEM currently has two long-term monitoring programs in place and is also conducting several studies and pilot projects to assess the potential for new monitoring programs and to consider the potential of different monitoring protocols for use in the TEEM Program.

The following is a description of current and recent TEEM programs and studies:

Long-term monitoring programs

1. Jack pine acid deposition monitoring network

A long-term monitoring program has been established to determine whether sulphur dioxide and oxides of nitrogen emissions from oil sands mining and bitumen processing are resulting in long-lasting adverse effects on regional ecosystems. The jack pine acid deposition monitoring network was developed to focus on the effects of acid deposition on soils and vegetation. Jack pine sites were thought to be ideal for the program because they grow in sandy soils which are susceptible to acidification. To date, 11 jack pine sites, both near and far from oil sands emission sources, have been established. Tree growth and health, and soil chemistry will be measured on a regular basis.

2. False colour infrared forest stress survey

The aerial infrared forest stress survey was initiated to assess the health of large areas of vegetation within a short time frame. Stressed vegetation reflects light differently than non-stressed vegetation, and this difference can be captured with film that detects infrared light. Every few years an airplane is flown over a strip of forest, taking photos using infrared film. These photos indicate if there are any areas of stressed vegetation, and if so, the cause of the stress (flooding, fire, insects, pollutants) is later assessed by field visits.

TEEM studies and pilot projects

1. Edge effect pilot study

In the summer of 1999 TEEM conducted a pilot study on the potential use of forest edges to assess air quality effects on forests. Trees at forest edges generally have greater exposure to air pollutants than trees within large stands. The study concluded that trees and lichens at forest edges accumulate higher concentrations of some pollutants, and in some cases there was indication of a relationship between the distance from the emission sources and contaminant loading of the trees. It is important to note that the differences between trees in forest edges and trees within forest stands may be due to variations in soil composition, sunlight and water status.

2. Nitrogen in bogs study

Acid deposition may impact the composition and function of peatlands, especially in bogs, which receive their nutrients and moisture exclusively from the atmosphere. Research suggests that atmospheric deposition of nitrogen, a component of acid deposition, can initially stimulate growth in nitrogen-poor bogs, but may result in a decline in the number and types of plant species present in nitrogen-rich bogs. TEEM has been

collecting core samples of peat from regional bogs to assess whether nitrogen deposition from oil sands activities is having an effect on these bogs. Because peat accumulates in layers over time, the peat core samples should indicate whether acid deposition has had an effect on the bogs. This study is still in progress.

3. Spring acid pulse study

When soils freeze in autumn in the absence of snow, and remain frozen through winter, there is little opportunity for the soil to buffer any acidity in the melt water come spring. This decrease in pH in the receiving water body is known as a spring acid pulse. Acid pulse studies have been conducted over the past few years, most recently in spring 2001 in the Steepbank, Muskeg and Firebag rivers. TEEM is currently waiting for the final report.

4. Trace metals in traditional foods study

Due to a concern that trace metals emitted from oil sands activities may be accumulating in plants and animals used by local First Nation and Metis communities for food or medicine, TEEM undertook a traditional foods study with the help of the communities of Fort McKay and Fort Chipewyan. Members of the community collected plant and animal tissue in both 1999 and 2000. These samples were analysed for concentrations of trace metals. The results are expected to indicate if trace metal concentrations in traditional foods and medicines are higher in the Fort McKay area, compared to more distant, pristine locations, and if the plant and animal species of interest are safe for people to consume. The report will be finalised in 2002.

More information on the TEEM Program will soon be available on the newly designed Wood Buffalo Environmental Association web site (www.wbea.org). ❖

Did you know?

Some plants, like Jack Pines, need a forest fire for their seeds to germinate. Jack Pines usually seal their seeds in a cone so that only a fire will allow them to grow. Since most of the tree doesn't completely burn, after a fire the sealed cones are opened up by the heat of the fire and the winged pine seeds are released. Most of the other plants have been burned off the forest floor, and the ash from the fire provides a nutrient rich layer over the soil in which the pine seedlings thrive. While it's a great strategy for avoiding the competition, sometimes the plants don't reproduce for over a century.

From "Quirks and Quarks", Science Quizzes (<http://www.cbc.ca/>)

CEMA Briefs

CEMA Communications: CEMA brochures and a free-standing display are available to all members by calling the CEMA office at (780)799-3947. Please use these tools to educate your employees or your community about CEMA's work. Remember to book the display in advance.

NO_x/SO₂ Management Working Group: The ozone measurement program was conducted from July 31 to September 11, 2001. A workshop was held on December 10 and 11 to review results of this summer's program and to plan work for 2002.

Reclamation Working Group: Members have appointed Noreen Easterbrook as the new RWG chair. The workplans for the six new RWG subgroups are being finalised and the 2002 budget has been adjusted to reflect the subgroups' proposed activities.

Sustainable Ecosystems Working Group:

Landscape & Biodiversity: Members have been discussing prioritisation of indicators and study areas.

Wildlife & Fish: A modelling workshop was held in Calgary with Salmo Consulting to evaluate modelling tools for use in indicator evaluation.

Traditional Ecological Knowledge: The TEK standing committee has been working with local Aboriginal groups to revise the original workplan.

Trace Metals and Air Contaminants Working Group: TMAC has developed their proposed management system for trace metals (see article in this issue). The group has also received a comprehensive emissions inventory from Clearstone Engineering. Golder Associates Ltd. is currently developing a health-risk ranking of this inventory.

Quote: *I am I plus my surroundings and if I do not preserve the latter, I do not preserve myself.* - José Ortega Gasset, 1914

Water Working Group: The Communication subgroup has commissioned Dillon Consulting Ltd. to review and compile water and fisheries information for key regional water bodies. The Water Quality subgroup has sent out an RFP for a review of water quality guidelines. The Muskeg River Watershed subgroup will hold an experts workshop early in 2002. The IFN subgroup has a contract in place to conduct fish tagging, and has a contract with the University of Alberta to develop an hydraulic flow model for under-ice conditions in rivers. ❖

CALENDAR OF REGIONAL MEETINGS

JANUARY, 2002

- 16 – Cultural and Historical Resources, Ft. Mac.
- 17 – Landscape & Biodiversity Subgroup, Ft. Mac
- 28 – Trace Metals & Air Contaminants, Edmonton

FEBRUARY, 2002

- 6 – Water Working Group, Ft. Mac
- 12-14 – TEEM Process Evolution Workshop, Ft. Mac
- 14 – Cultural and Historical Resources, Ft. Mac
- 19 – Trace Metals & Air Contaminants, Edmonton

APRIL, 2002

- 24 – Water Working Group



The contributors of the Sustainable Times would like to wish all a safe and happy holiday, and the very best in 2002!



This newsletter is a joint effort between Alberta Environment, Alberta Sustainable Resource Development and CEMA. For additional copies of this newsletter or to submit an article, please contact Lisa Zaplachinski (AENV) at 403-297-5937 (lisa.zaplachinski@gov.ab.ca), Brenda Erskine (Suncor) at 780-743-6480 (berskine@suncor.com), or visit the CEMA website at <http://www.cema-wbr.org/>.

