BRITISH COLUMBIA | Ministry of Environment

LEMON CREEK SPILL: Shoreline Treatment End Points

The purpose of this document is to identify the Ministry of Environment determined end points for treatment/clean-up activities and the points for linking to the longer term Environmental Impact Monitoring and Assessment Plan/report.

1. Definition of end point

Two types of end points have been identified: short term shoreline clean-up and long term ecosystem recovery.

- Shoreline treatment or shoreline cleanup end points are specific criteria assigned to a segment or unit of oiled shoreline that stipulate when sufficient treatment effort has been completed for that segment or unit. In effect, the end points are the practical definition of 'clean' for that particular segment of shoreline in that particular spill. The end points are a standard against which treatment activities can be evaluated. 'Clean' has been achieved when the pre-defined end points have been attained and the specified treatment of that segment of oiled shoreline has reached the agreed objective or goal.
- Ecosystem Recovery end points are specific criteria assigned to specific environmental and ecosystem compartments/media that can be used to evaluate long term environmental recovery. These end points inform how the ecosystem is rehabilitating and when monitoring can be discontinued. Long term monitoring can also inform whether additional restoration/remediation is needed if conditions change and new information warrants workable actions. These end points will be monitored in the Environmental Impact Monitoring and Assessment Plan.

2. Objectives of the Shoreline Treatment End Point

The practical reasons for assigning shoreline treatment end points are to:

- assist the spill management team in selecting treatment objectives and techniques for a specified area or segment of shoreline before the response operation begins;
- provide Operations supervisors with a clear objective or target so they can tailor their activities towards a known point of completion; and
- provide an inspection team with criteria and standards with which to evaluate the condition of the shoreline and the results of the treatment activities with respect to the response objectives.

Other important benefits of developing end points are to:

- facilitate recognition and assessment of the various environmental, social, and economic factors that should be considered in the shoreline treatment decision-making process and assist in selecting appropriate and practical response options;
- facilitate recognition of the concerns of the various responsible parties and stakeholders and attempt to create a consensus between them. An effective and successful response is far more likely when all parties share the same expectation of what must be accomplished; and
- ensure that clean-up operations take into account "net environmental benefit" so that operations do not cause more environmental damage than repair.

3. Objectives of Ecosystem Recovery End Points

The practical reasons for defining ecosystem recovery end points are to:

- To define when ecosystem recovery is complete;
- To determine the extent and magnitude of impacts and effects on the environmental health due to the incident;
- To determine whether mitigation/remediation efforts have been effective; and
- To track and report on ecosystem recovery.

4. Definition of each type of shoreline in Lemon and Slocan rivers

There are four major types of shoreline in Lemon Creek and the Slocan River that have been impacted:

Log Jammed

Boulder-pebble-cobble coarse sediment riverbank

Vegetated bank with mixed sediments

Mixed sediments bank

5. **Example of the contaminations of the shoreline with Oiling maps**
    - SCAT maps attached as appendices

6. **Value of the habitat or use**

    There are various environmental activities and users that they use the river:
    - Domestic use
    - Recreational use
    - Agriculture use
    - Environmental sensitivity

7. **End points**

Three methods exist to create an end point:

- **Qualitative Field Observations** are used to describe the presence or absence of stranded oil and/or the character of such oil, e.g., no observed oil (NOO), no mobile oil, no oiled debris, or no rainbow sheens. The determination of this type of end point is relatively easy and rapid with a

simple descriptive output. Direct observations can be supplemented with still or video camera images taken from the air or on the ground. Qualitative field observations have been used at many spills and are common components of the chosen set of end points. Field observations conducted by qualified SCAT trained personnel.

- **Quantitative Field Measurement Methods** are based on visual measurements and observations of the quantity of oil. These methods have been used during many response operations. Measurements taken include one or more numerical standards, such as the extent of the oiled area, the percentage of surface oil distribution, oil coverage, oil thickness, and oil volume. Sometimes the standards are also keyed to the type of oil or a specific location.
  This visual measurement approach is a rapid and straightforward procedure with simple descriptive and numerical outputs that provide clear guidelines and targets for Operations supervisors. The measurement standards and terminology are often the same as those typically used in the Shoreline Cleanup Assessment Technique (SCAT) process (Owens and Sergy, 2000; 2004).

- Quantitative field measurements can also be made for various ecosystem components and compared to pre-spill data and/or a control location if pre-incident data is not available. Examples of quantitative measurements to track and report on ecological rehabilitation include: fish population numbers, fish health indices, benthic invertebrate community structure, terrestrial wildlife communities, etc. **Analytical Measurement Methods** typically require the collection of representative field samples of various media and subsequent analysis using instruments in a laboratory. Three types of analytical measurement methods are:
  - **chemical analyses** for measuring the concentration of oil or specific chemicals;
  - **toxicological analyses** for measuring the response of test organisms to toxic effects; and
  - **organoleptic analyses** to determine human detection of offensive odours.

  In addition to laboratory analysis, a limited selection of field analytical tools can be used to measure end points. Although not common, analytical measurement methods can play a role in specific or unusual circumstances. Most analytical criteria, however, have been developed as health standards related to chronic issues rather than to acute ones.

8. End points targeted for each type of shoreline and water use

Location	Types of shoreline	Use	End points	Authority
Lemon Creek Km 0 (spill site) to Km 2 downstream	Coarse sediment bank	Residential + drinking water	- No sheen - No consistent odour - WQ analysis (surface water) satisfy BC WQG for Aquatic health & Drinking water	MOE + IHA
Lemon Creek Km 2 to Km 4 downstream to confluence with Slocan River	Coarse sediment bank	Residential + use for drinking water	- No sheen - No consistent odour - WQ analysis (surface water) satisfy BC WQG for Aquatic health & Drinking water	MOE + IHA
Slocan River	Coarse sediment bank	Environmental use	No rainbow sheen	MOE
Slocan River	Vegetated bank	Environmental use	No rainbow sheen	MOE
Slocan River	Log jammed	Environmental use	No free product No rainbow sheen	MOE
Slocan River	Fine sediment beach	Environmental use	No rainbow sheen	MOE
Slocan River (first 10km)	Coarse sediment bank	Residential + Recreational use	- No sheen - No consistent odour	MOE + IHA
Slocan River (first 10km)	Vegetated bank	Residential + Recreational use	- No sheen - No consistent odour	MOE + IHA
Slocan River (First 10 km)	All types of shoreline	Agriculture	- No sheen - No consistent odour	MOA + MOE

Ecosystem Recovery End points are under development based upon the successful attainment of the above listed end points and the review of the complete data set (water, sediment, soil, vegetation, fish and mammal) collected to characterize the impacts of this spill.

Consumption of produce from farms and gardens is being addressed by the Ministry of Agriculture and guidance provided by Interior Health.

Treatment/Clean-up end points may be modified by the Ministry depending upon the overall environmental benefit of the treatment actions.