

## Appendix D Risk Assessment

Assessment of hazards and Risks are part of the Remedial Action Plan, Risk Management Plan, and Closure Report development process. A human health and/or ecological Risk Assessment may also be carried out at certain sites. Table 18.4 provides a brief summary of the information that should be included in an ecological and human health Risk assessment. Many items in the Problem Formulation portion of the table are key elements of a well-developed conceptual site model, which is necessary in developing a RAP or RMP, or in demonstrating that Remediation is complete in a Closure Report.

CCME and Health Canada approaches to risk assessment are recommended; however, provincial approaches may be acceptable.

**Read more about Risk Management in section 12.**

**Read about the Limited Exception to Application of Generic Remediation Criteria in section 11.5.**

**Table 18.4: Summary of Risk Assessment Worksheet**

Problem Formulation
<b>Site-Management Goal(s)</b>
<input type="checkbox"/> Describe site-management goal(s) and specific assessment goal
<b>Literature review</b>
<input type="checkbox"/> Previous ESAs including all historical data and site monitoring data <input type="checkbox"/> Federal (CCME) or provincial Risk Assessment guidance documents <input type="checkbox"/> Federal, provincial/territorial generic Remediation Criteria for all potential Receptors, land uses, soil types, etc. <input type="checkbox"/> Site Surveys with electromagnetic Surveys, as-built diagrams, etc.
<b>Receptor identification</b>
Identification of potential human receptors and ecological receptors of concern to be assessed in the Risk Assessment <input type="checkbox"/> Identify potential human receptors and receptor age groups which may be exposed to the Contamination <input type="checkbox"/> Identify habitats, communities and ecosystems which potentially have been exposed to the Contamination <input type="checkbox"/> Compile species lists for the site <input type="checkbox"/> Catalogue all potentially significant or sensitive species at or surrounding the site <input type="checkbox"/> Identify Receptors most likely to be affected by stressors associated with the site with Contamination <input type="checkbox"/> Compile background information on receptors of concern <input type="checkbox"/> Identify missing species using ecosystem classification systems (i.e., species that should be present but are absent) <input type="checkbox"/> Based on any new information, refine and re-evaluate assessment and measurement endpoints and ensure priority receptors are still relevant and emphasized
<b>Selection of target chemicals</b>
Chemicals of potential concern to be evaluated in the Risk Assessment are identified <input type="checkbox"/> Identify chemicals present at the site <input type="checkbox"/> Review those chemicals and their concentration with respect to hazard assessment (toxicity, persistence, bioaccumulation) <input type="checkbox"/> If toxicity data for the site exist, review and determine where responses indicate exposure <input type="checkbox"/> Select target chemicals based on review/assessment of their properties <input type="checkbox"/> Include all chemicals unless there is information that supports exclusion

**Table 18.4: Summary of Risk Assessment Worksheet (cont.)**

<b>Problem Formulation (cont.)</b>
<b>Exposure pathway analysis</b>
<p>Exposure pathways by which receptors may be exposed to chemicals of potential concern at a site are selected for evaluation in the Risk Assessment</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Identify operable exposure pathways</li> <li><input type="checkbox"/> Identify where there is not enough information to exclude potential pathways</li> <li><input type="checkbox"/> Identify why pathways have been eliminated</li> </ul>
<b>Relation to exposure assessment</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> Assess possible spatial/temporal overlap of Receptors and contaminants of concern, based on the exposure assessment</li> </ul>
<b>Development of Conceptual Site Model</b>
<p>The conceptual site model describes the connections between contaminants of concern, exposure pathways and receptors of concern</p>
<b>Describe Risk Assessment Strategy</b>
<p>The risk assessment strategy includes detail on how the risk assessment will be conducted</p>
<b>Uncertainty Analysis</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> Identify data gaps</li> <li><input type="checkbox"/> Identify key uncertainties, both qualitative and quantitative, and whether they are acceptable or unacceptable</li> <li><input type="checkbox"/> Evaluate whether preliminary quantitative ERA exposure assessment could reduce uncertainty significantly</li> </ul>
<b>Exposure Assessment</b>
<b>Contaminant Release/transport and fate</b>
<p>The exposure assessment quantifies or characterizes the magnitude of exposure that receptors may be exposed to</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Identify possible transport pathways</li> <li><input type="checkbox"/> Identify data gaps</li> <li><input type="checkbox"/> Provide preliminary quantitative estimates, if possible</li> <li><input type="checkbox"/> Identify areas to which contaminants have been or may be transported</li> <li><input type="checkbox"/> Identify potential reference sites, and obtain information for those sites</li> </ul>
<b>Aquatic and/or terrestrial exposure</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> Identify most important exposure pathways and their link to biological components at Risk</li> <li><input type="checkbox"/> If possible, provide preliminary estimates of exposure or tissue concentration using bioaccumulation and/or bio concentration factors, other measurements of exposure should be identified</li> </ul>

**Table 18.4: Summary of Risk Assessment Worksheet (cont.)**

<b>Hazard Assessment</b>
<p>The hazard assessment provides the nature of effects for each chemical of concern for which each receptor of concern may be exposed</p> <ul style="list-style-type: none"><li><input type="checkbox"/> Link exposure assessment to identify contaminants that are at concentrations that can be expected to be toxic/bioaccumulative</li><li><input type="checkbox"/> Consider mixtures of chemicals</li><li><input type="checkbox"/> Choose species for which toxicity data are readily available and extrapolate to valued ecosystem components (VEC).</li><li><input type="checkbox"/> Where data are available, examine population/community information</li><li><input type="checkbox"/> In conjunction with exposure assessment, use toxicological databases such as AQUIRE, IRIS</li><li><input type="checkbox"/> Include an assessment of uncertainty</li></ul>
<b>Risk Characterization</b>
<p>The risk characterization uses the information from the exposure and hazard assessments to characterize potential adverse effects and integrates them to make conclusions</p> <ul style="list-style-type: none"><li><input type="checkbox"/> Integrate the other components of the Risk Assessment</li><li><input type="checkbox"/> Identify key uncertainties and data gaps, make recommendations for filling data needs</li><li><input type="checkbox"/> Characterize risk as “high”, “intermediate” or “negligible”</li><li><input type="checkbox"/> Make Risk estimates</li></ul>