

Draft 2023 Environmental Guideline for Contaminated Site Remediation

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LIST OF ACRONYMS

| | |
|-----------|--|
| ADD | Average Daily Dose |
| AEP | Alberta Environment and Parks |
| APEC | Area of Potential Environmental Concern |
| APIRI | Atlantic Partnership in Risk-Based Corrective Action Implementation |
| ASTM | American Society for Testing and Materials |
| ARD | Acid Rock Drainage |
| B[a]P TPE | Benzo(a)pyrene Total Potency Equivalents |
| BMP | Best Management Practice |
| CALA | Canadian Association for Laboratory Accreditation Inc. |
| CASRN | Chemical Abstracts Service Registry Number |
| CCME | Canadian Council of Ministers of the Environment |
| CEHO | Chief Environmental Health Officer |
| CIRNAC | Crown-Indigenous Relations and Northern Affairs Canada (formerly Indian and Northern Affairs Canada) |
| COA | Certificate of Analysis |
| COC | Contaminant of Concern |
| COPC | Contaminant of Potential Concern |
| CSA | Canadian Standards Association |
| CSM | Conceptual Site Model |
| CVOC | Chlorinated Volatile Organic Compound |
| CWS | Canada-Wide Standard (referring to CCME CWS for PHCs) |
| DNALP | Dense Non-Aqueous Phase Liquid |
| DQRA | Detailed Quantitative Risk Assessment |
| ECC | Department of Environment and Climate Change (GNWT) |
| EDI | Estimated Daily Intake |
| EPA | Environmental Protection Act (GNWT) |
| EPIC | Educational Program Innovations Center |
| ERA | Ecological Risk Assessment |
| ESA | Environmental Site Assessment |
| ESL | Ecological Screening Level |
| FCSAP | Federal Contaminated Sites Action Plan |
| FIGQG | Federal Interim Groundwater Quality Guidelines |
| GCDWQ | Guidelines for Canadian Drinking Water Quality (Health Canada) |
| GLWB | Gwich'in Land and Water Board |
| GNWT | Government of the Northwest Territories |
| GOC | Government of Canada |
| HASP | Health and Safety Plan |
| HC | Health Canada |
| HHERA | Human Health and Ecological Risk Assessment |
| HHRA | Human Health Risk Assessment |

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|-------------------|---|
| HQ | Hazard Quotient |
| IEC | International Electrotechnical Commission |
| IGO | Indigenous Government Organization |
| ILA | Inuvialuit Land Administration |
| ILCR | Incremental Lifetime Cancer Risk |
| ISO | International Organization for Standardization |
| ISQG | Interim Sediment Quality Guideline (referring to CCME Sediment Quality Guideline) |
| IWB | Inuvialuit Water Board |
| L | Litre |
| LNAPL | Light Non-Aqueous Phase Liquid |
| LTM | Long Term Monitoring |
| LUP | Land Use Permit |
| LWB | Land and Water Board |
| m bgs | metres below ground surface |
| mL | millilitre |
| mg/L | milligram per litre (or parts per million) |
| mg/kg | milligrams per kilogram (or parts per million) |
| mg/m ³ | milligrams per cubic meter |
| ML | Metal Leaching |
| MVLWB | Mackenzie Valley Land and Water Board |
| NAPEG | Northwest Territories Association of Professional Engineers and Geoscientists |
| NAPL | Non-Aqueous Phase Liquid |
| NT or NWT | Northwest Territories |
| NU | Nunavut |
| OMOE | Ontario Ministry of Environment |
| OROGO | Office of the Regulator of Oil and Gas Operations |
| PAG | Potentially Acid Generating (referring to rock or other aggregate material) |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PEL | Probable Effect Level (referring to CCME Sediment Quality Guidelines) |
| PHC | Petroleum Hydrocarbon |
| POE | Point of Exposure |
| PPE | Personal Protective Equipment |
| PQRA | Preliminary Quantitative Risk Assessment |
| QA/QC | Quality Assurance/Quality Control |
| QP | Qualified Person |
| QPro | Qualified Professional |
| RAP | Remedial Action Plan |
| RDL | Reportable Detection Limit |
| RMP | Risk Management Plan |
| RP | Responsible Party |
| RSL | Regional Screening Levels (referring to USEPA Regions) |

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| SAR | Species at Risk |
| SCC | Standards Council of Canada |
| SLWB | Sahtu Land and Water Board |
| SSRA | Site-Specific Risk Assessment |
| SSTL | Site-Specific Target Level |
| SQG | Soil Quality Guideline |
| SQ _{HH} | Soil Quality Guideline based on Human Health |
| TDI | Tolerable Daily Intake |
| TR | Target Risk (related to a negligible increased incidence of cancer) |
| TRV | Toxicity Reference Value |
| UCLM | Upper Confidence Limits on the Mean |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |
| WHO | World Health Organization |
| WL | Water Licence |
| WLWB | Wek' èezhìi Land and Water Board |
| WSCC | Workers' Safety and Compensation Commission |

1.0 INTRODUCTION

Acts, regulations, policies, directives, frameworks and other documents such as this Environmental Guideline for Contaminated Site Remediation (the “Guideline”) are designed to protect the public interest in terms of the prevention of contamination, and if required, the remediation of contaminated sites to approved criteria. The Government of the Northwest Territories (GNWT) Department of Environment and Climate Change (ECC) is accountable for carrying out its regulatory roles in a way that holds the responsible party financially responsible through the Polluter Pays Principle for meeting their environmental obligations to protect the environment and prevent contaminated sites. The Northwest Territories *Environmental Protection Act* (EPA, the “Act”) gives ECC the authority to take all necessary measures to ensure the preservation, protection or enhancement of the environment. Section 2.2 (c) of the *Act* gives the Minister the authority to develop, coordinate, and administer this Guideline.

1.1 LEGISLATIVE FRAMEWORK AND AUTHORITY

Contamination can result from activities such as commercial or industrial operations, improper waste disposal, improper chemical storage, or chemical leaks and spills. Section 5(1) of the *Act* establishes that no person shall discharge or permit the discharge of a contaminant into the environment. Refer to Appendix 1 for applicable excerpts from the *Act* and Regulations.

Contamination can create legal liability in the form of orders, fines and penalties and can generate short- and long-term economic consequences for the Responsible Party (RP) to cleanup and/or manage the contamination. As a result, identification and effective cleanup of contamination is a major concern for facility operators, property owners, insurance companies, banks and government agencies.

New information is constantly emerging on chemicals in the environment, including methods for their assessment, evaluation, and effects on human and ecological health. As such, the GNWT will periodically review and update the Guideline to reflect updated technical and/or policy considerations. This update supersedes the Guideline prepared by ECC in 2003 (GNWT-ECC, 2003).

1.2 PURPOSE

This Guideline describes the process that is to be used to manage (i.e., identify, assess, remediate/manage) a contaminated site that falls under the jurisdiction of ECC as defined in Section 1 of the *Act* (i.e., Municipal, Commissioner’s and Territorial lands). The contaminated site Guideline Process has been established as a consistent and scientifically defensible process to ensure that human health and the environment is protected from any discharge that leads to a contaminated site.

1.3 SCOPE AND APPLICATION

ECC is committed to regulating the assessment, remediation and management of contaminated sites in a consistent manner, to reduce and eliminate, where possible, adverse effects on human health and the environment. This document is intended to provide guidance to the RP, Qualified Person (QP) or Qualified Professional (QPro) who are responsible for managing assessment and remediation of the contaminated site.

2.0 SOURCES AND DISCOVERY OF CONTAMINATION

Contamination is created when a substance is discharged to the environment at a rate or level that results in a concentration in soil or other media that causes or may result in an adverse effect to human health and/or the environment. Sites can become contaminated from discharges, spills, or from previous industrial or commercial activities that result in contamination.

The following sections introduce various ways in which contaminated sites may be identified.

2.1 SPILLS AND UNCONTROLLED DISCHARGES

In most cases, smaller spills or other discharges of a substance to the environment are localized and resulting contamination can generally be managed by the RP with the assistance of a QP or QPro.

Larger spills or discharges (e.g., train derailment, pipeline or marine oil spill) can result in substantial adverse effects to persons, property, or the environment. These types of incidents may result in severe local impacts and may have the potential for serious public health and safety concerns. A large spill or release of a contaminant may lead to an environmental emergency if the effects are beyond the capability of the RP to initiate an effective response. Such spills may require the involvement of public safety and emergency response agencies.

2.2 HISTORICAL CONTAMINATION

Historical contamination can be identified when completing a Phase I Environmental Site Assessment (ESA) conducted by an owner during refinancing or by a potential purchaser of a property as a due diligence measure to determine if the property is or may be subject to contamination.

Where the financial liability for contamination may be transferred with the transfer of ownership of a property, the purchaser will often wish to conduct due diligence assessment including conducting phased environmental site assessment(s) to identify potential or existing environmental contamination to support purchase, sale or some form of transfer of a real estate asset. Lenders may also conduct such investigations after the default of a loan when the lender is considering re-possession of the property.

2.3 SITE DEVELOPMENT OR DECOMMISSIONING

The age of the facility, the nature of the industrial process, operational practices and the waste management practices employed during the facility's operation may have resulted in the introduction of contaminants to the environment.

When an industrial facility is to be closed and decommissioned, the owners will generally be required to provide a decommissioning plan to ensure that any residual contamination does not represent a risk to human health and safety and is not the cause of unacceptable effects on the environment. Such an assessment is generally required for compliance with applicable laws and regulations, ensures the site is suitable for the anticipated land use, and is not a liability for current or future owners.

2.4 REGULATORY INVESTIGATIONS

GNWT regulatory authorities may identify contamination when responding to citizens' complaints, or when investigating off-site impacts under their respective jurisdictions. Other federal agencies, as well as the Inuvialuit Land Administration (ILA), are also responsible for conducting investigations and monitoring spill cleanups in the Northwest Territories (NWT).

3.0 ROLES AND RESPONSIBILITIES

This section identifies the roles and responsibilities of the key participants involved in the assessment, remediation and/or management of contamination and/or contaminated sites in the NWT, including various GNWT departments and agencies.

3.1 RESPONSIBLE PARTY (RP)

A RP may include:

- any person causing, permitting or contributing to the discharge of a contaminant;
- any person in management or control of a contaminant before its discharge; and
- owner of the land or the last person to own or occupy the land where contamination is identified.

When a RP is notified or otherwise knows or ought to have known that a site is potentially contaminated, that person shall immediately report the spill (suspected contamination) to the Northwest Territories/Nunavut (NT/NU) 24-Hour Spill Report Line and initiate an appropriate evaluation of the potential adverse effects and risks to determine what action, if any, is required under the Guideline Process. Refer to Section 6.1 for Notification requirements.

The RP is responsible for the following under the Guideline Process:

- retaining a QP or QPro to conduct an appropriate ESA to determine the presence and extent of contamination (refer to Sections 3.2 and 3.3)
- ensuring that a QP or QPro oversees the assessment and management of the contaminated site;
- conducting immediate action, if acute threat to human health or the environment is known or suspected;
- contacting any other person or agency who may be affected or may have a role in the assessment and/or remediation including: regional environmental health officer, Office of the Fire Marshal, local fire department, local government, the landowner, Indigenous Government Organizations (IGOs), or any other party as needed regarding health and safety concerns;
- obtaining authorization for assessment and remediation of other affected properties if contamination is suspected to have migrated from the source property;
- ensuring that any third-party property owner is notified about the presence of contamination on their property;

- developing and implementing an approved Remedial Action Plan (RAP) and ensuring the objectives of the RAP are met; and/or
- developing and implementing an approved Risk Management Plan (RMP) and monitoring ongoing site management operations;
- taking appropriate action to ensure that the environment and human health are protected throughout the Guideline Process;
- forwarding supporting documents to ECC for review and processing; and
- completion of the Guideline Process in a timely manner.

The RP is expected to finance the assessment and remediation process, manage the site in a timely fashion and maintain an appropriate level of due diligence throughout the Guideline Process.

3.2 QUALIFIED PERSON (QP)

A QP has an appropriate level of knowledge and experience in all aspects of contaminated site investigation, remediation and management to complete the assessment, remediation and documentation of a minor spill/release. A QP may be engaged by a RP to supervise and document the remediation of smaller spills (minor, for petroleum hydrocarbons [PHCs], a release of < 100 L and/or a contaminated soil volume of 10 m³) affecting soil only (e.g., where the contamination has not migrated under a building, off-site properties have not been impacted, the groundwater is classified as non-potable and contamination has not contacted groundwater or surface water).

Responsibilities of a QP under the Guideline Process include the following:

- ensuring technical competence for all work undertaken in accordance with the Guideline;
- notifying the RP of the presence of contamination;
- remediating the contamination by a criteria-based approach for the applicable land use and groundwater classification);
- confirmatory sampling to confirm that the criteria-based approach has been achieved;
- delivering all documentation related to the remediation of the contaminated site to the RP; and
- completion of the Closure Report and submission to ECC on behalf of the RP.

The following are the minimum requirements for technical qualifications of a QP:

- a minimum of 1 year of experience in contaminated site investigation, management and remediation, to be confirmed at the request of ECC and in the manner required by ECC; and

- successful completion of the Environmental Site Assessment and Remediation course offered by the Educational Program Innovations Center (EPIC) <https://www.epictraining.ca/course-catalogue/environmental/12782/environmental-site-assessment-and-remediation>; or
- other similar technical training or education as approved by ECC.

3.3 QUALIFIED PROFESSIONAL (QPro)

A QPro leads or supervises the ESA process, is accountable for documentation and quality of work and must have an appropriate level of knowledge and experience in all aspects of contaminated site investigation, remediation and management. A QPro must be engaged by a RP for all situations where a QP is not appropriate (see Section 3.2) but may also be engaged for those situations where a QP is appropriate. The QPro will design, direct and document the ESA and remediation activities.

Responsibilities of a QPro under the Guideline include the following:

- ensuring professional competence for all work undertaken in accordance with the Guideline;
- conducting the ESA in accordance with the requirements of the Guideline;
- advising the RP as soon as practicable, of the identification of any immediate and direct threat to human health or the environment;
- notifying the RP of the presence of contamination and associated risks to human health and the environment on subject and third-party properties as per the Guideline;
- developing and implementing an appropriate RAP or RMP and submitting to ECC for review and approval;
- determining if remedial criteria and objectives of the approved RAP have been achieved;
- delivering all documentation related to the remediation or management of the contaminated site to the RP; and
- completion of the Closure Report and submission to ECC on behalf of the RP.

The following are the minimum requirements for technical qualifications of a QPro:

- a minimum of 5 years of experience in contaminated site investigation, management and remediation, to be confirmed at the request of ECC and in the manner required by ECC, which must include experience in the following areas:
 - conducting a Phase I ESA;
 - conducting a Phase II ESA;
 - conducting a Phase III ESA;

- developing RAPs and/or RMPs; and
- implementing a RAP and/or RMP.

Although a QPro does not need to be a registered member of the Northwest Territories Association of Professional Engineers and Geoscientists (NAPEG), all reports must be reviewed and signed off by a registered member of NAPEG with the minimum of 5 years of experience in contaminated site investigation, management and remediation.

3.4 INSURANCE REQUIREMENTS

A person acting as a QP or a QPro must have and maintain insurance coverage under an insurance policy that satisfies the following requirements:

- a) indemnifies the QP or QPro against liability arising out of the performance of or the failure to perform any activity outlined in the Guideline during the period of insurance coverage, whenever the performance or failure to perform occurred;
- b) specifies an indemnity limit of at least \$2,000,000 per claim and at least \$2,000,000 in the aggregate during the period of the insurance;
- c) provides for coverage to continue if the insured becomes bankrupt or insolvent, is declared incompetent or dies during the period of insurance; and
- d) provides coverage for a period of up to 2 years after the date the person ceases to act as a QP or QPro.

A QP or QPro is deemed to be maintaining the insurance coverage required by this section if the person's employer maintains an insurance policy that satisfies the requirements.

3.5 DEPARTMENT OF ENVIRONMENT AND CLIMATE CHANGE

The Northwest Territories *Environmental Protection Act* provides ECC with the legislative authority to regulate the assessment and management of contaminated sites on Municipal, Commissioner's and Territorial lands, excluding Federal land and national parks. A listing of relevant legislation and guidelines relating to the regulation of discharges and contamination is provided in Appendix 1.

ECC will review and confirm the required level of assessment and remediation using the criteria established or adopted in this document. ECC will also review RAPs, monitor the progress until final remediation is complete and a Closure Report is submitted.

ECC also regulates hazardous waste generators, carriers, and receivers, as it pertains to off-site transport, treatment or disposal of contaminated soil. Parties transporting hazardous waste in the NWT are required to complete a movement document with ECC.

3.6 DEPARTMENT OF HEALTH AND SOCIAL SERVICES

If the contaminated site might impact residences or other buildings potentially affecting public health, the Chief Environmental Health Officer (CEHO) or the regional environmental health officers should be consulted regarding specific requirements under the [Public Health Act](#) (GNWT, 2009).

3.7 DEPARTMENT OF MUNICIPAL AND COMMUNITY AFFAIRS

The Office of the Fire Marshal has authority over the storage, handling, use, and processing of flammable and combustible liquids under the *Fire Prevention Act* as well as the withdrawal of petroleum storage tanks from service. Where the potential for fires and explosive hazards for hydrocarbon spills or other similar contamination are a concern at a contaminated site, the Office of the Fire Marshal should be consulted on the development of the RAP.

3.8 DEPARTMENT OF INFRASTRUCTURE

The Department of Infrastructure is responsible for administering the *Transportation of Dangerous Goods Act* and Regulations (NT) including the transportation of hazardous materials or other TDG regulated substances that may be required during the remediation of a contaminated site.

3.9 OFFICE OF THE REGULATOR OF OIL AND GAS OPERATIONS

The Office of the Regulator of Oil and Gas Operations (OROGO) regulates oil and gas operations in the NWT, outside federal areas and the Inuvialuit Settlement Region, for the primary purposes of ensuring safety, environmental protection and conservation of oil and gas resources.

OROGO's responsibilities include application reviews, regulation of seismic and drilling operations, pipeline and well regulation, inspection and compliance, emergency response and investigation.

3.10 WORKERS' SAFETY AND COMPENSATION COMMISSION

The Workers' Safety and Compensation Commission (WSCC) is a government agency responsible for administering the [Workers' Compensation Act](#), [Safety Act](#), [Explosives Use Act](#) and the [Mine Health and Safety Act](#). WSCC may become involved with a contaminated site where worker health and safety is a potential concern. For more complex sites, WSCC can also provide advice on the development of project specific Health and Safety Plans (HASP) related to a RAP or RMP.

3.11 LOCAL GOVERNMENTS AND AGENCIES

Local governments and agencies have an important role in the remediation of contaminated sites. Firstly, the applicable remediation criteria are often determined by designated zoning under local government planning documents. Secondly, some public infrastructure (e.g., landfill site, community landfarm with appropriate water licence, etc.) may be used with the consent of the local government to aid in the remediation process. Thirdly, the local fire department may be notified if a fire or public safety issue is identified with the contaminated site. Development permits may be

required in some communities for projects involving subsurface work or earthworks.

3.12 FEDERAL AGENCIES

Federal agencies including Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) are responsible to manage contaminated sites within its jurisdiction in accordance with the [Directive on the Management of Real Property](#) (TB, 2022).

Federal agencies will generally engage a QPro to have the assessment and a RAP prepared and other planning documents that define how remediation of a contaminated site will be undertaken in accordance with applicable federal guidelines and policies. Government of Canada agencies will generally follow the Federal 10 step process established under the Federal Approach to Contaminated Sites (GOC, 1999).

4.0 PERMITTING REQUIREMENTS IN THE NWT

In addition to the ECC Guideline Process, the following provides a summary of boards and agencies in the NWT that may need to be consulted for applicable permits and/or licences depending on the scope and scale of the contaminated site remediation project. A brief overview of their authority and responsibility under their relevant legislative framework is provided as it relates to the management of contamination. The intent of this section is to provide a brief background of various boards and agencies that may need to be consulted for permits and licences.

4.1 MACKENZIE VALLEY LAND AND WATER BOARD

The Mackenzie Valley Land and Water Board (MVLWB) is the regulator of uses of land and water and deposits of waste in the Mackenzie Valley, other than those occurring wholly in the Sahtu Settlement Area, Gwich'in Settlement Area or the Wek' èezhìi Management Area. The MVLWB conducts preliminary screenings of applications as per the federal *Mackenzie Valley Resource Management Act* and issues Land Use Permits (LUPs) and Water Licences (WLs) as appropriate to regulate activities per the Mackenzie Valley Land Use Regulations, and Mackenzie Valley Federal Areas Waters Regulations. The MVLWB has the authority to approve remediation activities for sites that are being regulated through a land use permit or water licence.

The Gwich'in, Sahtu and Wek' èezhìi Land and Water Boards act as regional panels of the MVLWB in issuing LUPs and WLs on public and private lands in their respective areas. Further details are provided in the sections below.

4.2 GWICH'IN LAND AND WATER BOARD

The Gwich'in Land and Water Board (GLWB) is a regulator established under the Gwich'in Comprehensive Land Claim Agreement and given effect by the *Mackenzie Valley Resource Management Act*. The GLWB has the same powers and functions as the MVLWB within the Gwich'in

Settlement Area.

4.3 SAHTU LAND AND WATER BOARD

The Sahtu Land and Water Board (SLWB) is a regulator established under the Sahtu Dene and Métis Comprehensive Land Claim Agreement and given effect by the *Mackenzie Valley Resource Management Act*. The SLWB has the same powers and functions as the MVLWB within the Sahtu Settlement Area.

4.4 WEK'ÈEZHÌI LAND AND WATER BOARD

The Wek' èezhìi Land and Water Board (WLWB) is a regulator established under the Tłchọ Land Claims and Self-Government Agreement and given effect by the *Mackenzie Valley Resource Management Act*. The WLWB has the same powers and functions as the MVLWB within the Wek' èezhìi Management Area.

4.5 INUVIALUIT WATER BOARD

The Inuvialuit Water Board (IWB) is a regulator established under the Inuvialuit Final Agreement. The IWB has the authority to issue water licences for water use and waste disposal within the Inuvialuit Settlement Region per the *Northwest Territories Waters Act* and Waters Regulations. The IWB has the authority to approve RAPs and other planning documents that define how remediation of a contaminated site will be undertaken where an IWB issued water licence is in place.

4.6 INUVIALUIT LAND ADMINISTRATION (ILA)

The ILA was established by the Inuvialuit Final Agreement (IFA) to manage and administer Inuvialuit-owned lands in the Inuvialuit Settlement Region. Pursuant to the IFA, the ILA has the authority to issue land use permits to access and use Inuvialuit category 7(1)(a) and 7(1)(b) lands. The ILA also has the authority to approve RAPs and other planning documents that define how remediation of a contaminated site will be undertaken on Inuvialuit category 7(1)(a) and 7(1)(b) lands.

5.0 THE GUIDELINE PROCESS

The contaminated site Guideline Process outlined in the following sections is specific to contaminated sites that are within ECC's jurisdiction. This process is not applicable to contaminated sites that are outside of ECC's jurisdiction unless those agencies with jurisdiction choose to adopt all or part of this Guideline as a surrogate for developing their own guidance.

The Guideline Process consists of five "Steps" from the time that contamination is discovered, to final site remediation and closure:

- Step 1: Notification
- Step 2: Site Assessment
- Step 3: Preparation of a RAP or RMP
- Step 4: RAP/RMP Implementation
- Step 5: Site Closure

A process flow chart has been included that provides the framework and outlines the overall Guideline Process. The following sections describe each step in more detail.

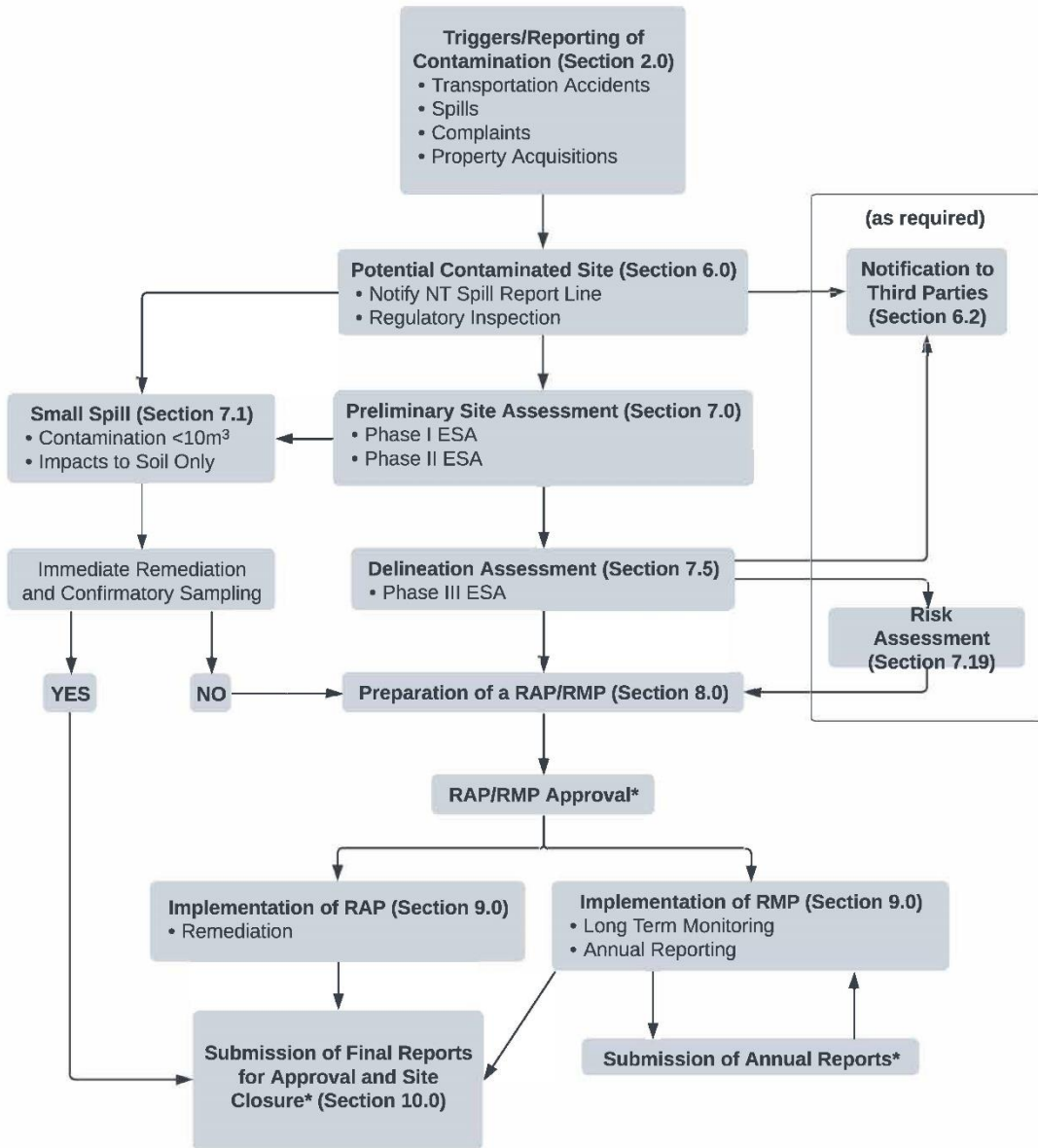
5.1 CONTAMINATED SITES PROCESS FLOW CHART

The Contaminated Site Guideline Process Flowchart presented on Figure 1 provides a summary of the main process outlined in the Guideline. The flowchart also provides an overview of the actions required during the response to a spill or a discharge that may result in an environmental emergency.

5.2 RETAINING A QUALIFIED PERSON OR QUALIFIED PROFESSIONAL

Under the Guideline Process, contamination must be assessed and/or remediated under the direction of either a QP or a QPro. Qualifications and roles for a QP and QPro are described in Sections 3.2 and 3.3, respectively.

Figure 1 Contaminated Site Guideline Process Flowchart



*Approval by the Department of Environment and Climate Change or appropriate regulatory agency

6.0 STEP 1 - NOTIFICATION

6.1 NOTIFICATION TO NORTHWEST TERRITORIES AND NUNAVUT 24-HOUR SPILL REPORT LINE

The actions outlined in this section cover the initial time period following the discovery of suspected contamination. The suspected contamination might be a result of a spill or accident, or discovered through an internal audit or other investigation completed at a site. Contamination may also be discovered as a result of a public complaint and investigation.

The *Environmental Protection Act* prohibits the discharge of a contaminant into the environment, unless otherwise authorized. The [Spill Contingency Planning and Reporting Regulations](#) contains reportable quantities and states that a person reporting a spill (or suspected contamination) shall contact the NT/NU 24-Hour Spill Report Line by calling (867) 920-8130 or by e-mail to Spills@gov.nt.ca and initiate the following:

- take all reasonable measures to stop the discharge and repair any damage; and
- make a reasonable effort to notify affected public.

For the purposes of Notification, the source of the contamination does not have to be a recent or active spill. The identification of historical contamination also requires notification to the spill line upon its discovery.

Where ECC is the lead agency, ECC will assess the significance of the contamination by reviewing the spill report. An Officer will conduct a site visit and discuss the spill with the RP, which may also include a review of historical spill reports.

Should ECC determine that suspected contamination remains after the initial spill response clean-up, ECC will require additional clean-up and assessment to be completed by the RP in accordance with the Guideline Process to close the site within a specific time frame.

ECC will consult with the CEHO or Environmental Health Officers when exposure to the public (i.e., through migration of indoor air contaminants) originating from the spill or discharge is a suspected concern.

The collection, analysis, and screening of targeted samples in each suspected source area is generally required at this step to confirm the presence of contamination. Preliminary analytical results should be screened using a criteria-based approach for the applicable land use and/or media to make a determination of contamination.

If contamination of soil and other media (e.g., groundwater, surface water/sediment) has been confirmed through preliminary testing (one or more result(s) not meeting the criteria-based approach), or contamination of an off-site property is suspected, the immediate retention of a QPro

is mandatory. ECC will then consider both the source site and any impacted third-party sites to be a “contaminated site” until the Guideline Process has been completed and a Closure Letter has been issued.

In all cases, the RP is required to inform all affected parties about the contamination and provide written confirmation of such disclosure.

6.2 NOTIFICATION TO IMPACTED THIRD PARTIES

If contamination is suspected to have migrated to off-site properties, the RP must obtain authorization from the neighboring property owner to access the property for preliminary testing and/or additional assessment. Pending the results of the preliminary testing, the RP must make a reasonable effort to notify any affected third-party property owner and advise them of the nature and likely extent of the contamination present on their property, and the details that are proposed to address the contamination.

The RP must confirm these details in writing before a Closure Letter can be issued for the source property by ECC.

7.0 STEP 2 - SITE ASSESSMENT

The formal site assessment process will generally apply to more complex sites where a QPro has been engaged (excluded for smaller spills). The following steps are considered standard industry practices and while a part of the guideline process, generally occur prior to formal notification of contamination.

7.1 REQUIREMENTS FOR SMALLER (MINOR) SPILLS

A smaller (minor) spill is generally defined as one involving a volume less than the reportable limit prescribed in the [Spill Contingency Planning and Reporting Regulations](#) and is considered low risk to people or the environment. Smaller spills are of short duration and can be quickly contained and cleaned up by the RP under the supervision of either a QP or QPro.

While a formal assessment and /or RAP is not required to address a smaller spill, the QP must submit a Closure Report to ECC following successful implementation of the remedial excavation program. A QP or QPro must endorse all reports/records submitted to ECC.

7.2 ESTABLISHING SITE CONDITIONS

Environmental Site Assessments (ESAs) are generally conducted in phases and are ultimately intended to fully characterize the nature and extent of contamination. A well-planned, comprehensive ESA will allow the QPro and RP to make informed decisions about remediation or management of the contamination. During this step, the QPro conducts each phase of an ESA to collect required technical information about the site conditions. Impacts to soil, sediment, surface water, and groundwater must be assessed where suspected, as well as potential effects on all human and ecological receptors that could be exposed. The phases of the site assessment process are described below.

7.3 PHASE I ESA

The purpose of the Phase I ESA is to identify potential site contamination. At a minimum, the Phase I ESA must meet the Canada Standards Association (CSA) Standard Z768-01 (R2022) *Phase I Environmental Site Assessment* (CSA, 2022). A Phase I ESA is generally conducted in the context of a site audit or due diligence assessment to identify the potential for contamination to support an external process requirement (e.g., corporate policy, purchase or sale of a property, etc.).

In a Phase I ESA, all available historical and current site information is assembled to understand historical and current land use activities which can help in the development of a future sampling program (Phase II ESA), should one be required. The work begins by reviewing all data gathered for legal, transactional or environmental reasons (e.g., current and potential future land use and groundwater use classifications, if already conducted) and supplementing this information as required.

A typical Phase I ESA will consist of the following:

1. A records review to evaluate historical and present information pertaining to the site (land titles, aerial photographs, historical inspections).
2. Interviews with persons associated with the site (owners, neighbors, previous/current employees).
3. A site visit to assess actual/potential environmental contamination associated with, but not limited to, the following:
 - current site operations;
 - waste generation;
 - fuel, chemical, and waste storage;
 - building systems and equipment;
 - exterior site conditions including surface features such as fill material, and wells;
 - hazardous materials including asbestos, polychlorinated biphenyls, lead, urea formaldehyde foam insulation, and ozone-depleting substances;
 - special attention items including radon, mold, electric and magnetic frequencies, noise and vibrations, and acid generating bedrock; and
 - potential off-site sources of contamination (adjacent properties).
4. Evaluation of information and preparation of a report.

The Phase I ESA is a non-intrusive investigation and does not include sampling or testing of air, soil, water, or building materials. A Phase I ESA does not constitute a Hazardous Building Materials Assessment, Designated Substances Survey, or Indoor Air Quality Assessment and does not include a review or audit of operational environmental compliance issues, or any environmental management systems, which may exist for the site.

The Phase I ESA report must be provided to ECC where ECC is the lead agency and where contamination is suspected. For sites with federal land tenure or an authorization such as a LUP or WL, the Phase I ESA should be provided to lead regulatory agency as may be required.

7.3.1 Land Use Classification

The frequency, duration, and intensity with which people may come into contact with contaminants at a contaminated site are generally related to the nature of the land use. Also, the critical receptor for any land use category is dependent on the activities inherent to that land use. The Canadian Council of Ministers of the Environment (CCME) has defined four general land uses for developing Soil Quality Guidelines (SQGs): agricultural, residential/parkland, commercial, and industrial. The criteria presented in the Guideline are based on these four CCME land use categories. The criteria adopted are generally protective of human and environmental health for specified uses of soil and/or other media that may be impacted.

Identifying the most applicable land use helps to assess the extent of human and ecological

exposure to contaminants and is required for the development of an appropriate Human Health Risk Assessment (HHRA), Ecological Risk Assessment (ERA) and RAP. Anticipated future land use will govern the decision on the criteria selected for remediation at a site. Adjacent land use may be another important factor in the selection of the remediation criteria to be applied. If the contamination is suspected to cross property boundaries to a property with more sensitive land use classification, then the more sensitive land use classification shall be used to assess the off-site property. To assist in correctly determining the most appropriate land use for selecting criteria, the QPro should refer to land use bylaws and land designations, if needed consult with appropriate agencies such as local governments and ECC. The following provides a summary of each land use category and the activities that determine exposure.

7.3.1.1 Agricultural

Agricultural land use includes land where the activity is primarily related to the productive capability of the land or facility (e.g., greenhouse) and is agricultural in nature, or is related to the feeding and housing of animals such as livestock. This also includes agricultural lands that provide habitat for resident and transitory wildlife and native flora (CCME, 2006).

Agricultural land encompasses a wide range of activities including dairy, livestock, and/or crop production. Most farms include a homestead, so the possible presence of an onsite residence is considered in the default exposure scenario. Agricultural lands are generally accessible by the farmer and their family members, including children, which represent the more sensitive human receptor category. Therefore, the critical human receptor in the agricultural land use category is assumed to be a resident (toddler) who receives 100% of their daily intake of soil and drinking water (groundwater) from the property (CCME, 2008a).

7.3.1.2 Residential/Parkland

Residential/Parkland land use includes all land in which dwelling on a permanent, temporary or seasonal basis is the primary activity. This includes activity that is recreational in nature and requires the natural or designed capability of the land to sustain that activity. Parkland is defined as a buffer between areas of residency, and includes campground areas, but excludes wildlands such as national or territorial parks (CCME, 2006). Parks may serve as areas for children's play and other family activities and are therefore also included in the residential land use category (CCME, 2008a).

The generic residential property assumed for criteria derivation is a typical detached, single family home with a backyard where children, particularly toddlers, play. The critical receptor assumed on a residential property is a toddler who receives 100% of their daily intake of soil, drinking water (groundwater), and air (indoors) from the property. CCME considers two house foundation construction styles which include 1) below-grade concrete foundation wall and floor slab (basement); and 2) concrete slab-on-grade foundation as slab-on-grade construction. As slab-on-grade is considered to represent the more conservative of the two foundation types, criteria for this foundation type has been selected for criteria for this exposure pathway. The foundation construction styles only affect the vapour to indoor air exposure pathway by which volatile chemicals can penetrate the building envelope via foundation cracks and gaps.

7.3.1.3 Commercial

Commercial land use includes all uses of land in which the primary activity is related to the buying, selling or trading of merchandise or commercial services (e.g., shopping mall) and not residential or manufacturing. This land use does not include zones where food is grown. Institutions, hospitals, schools, daycare and associated playgrounds are also included under this land use (CCME, 2006).

Commercial properties span a wide variety of uses with varying degrees of public access. For purposes of deriving Tier 1 Criteria, a commercial property is assumed to contain a daycare facility, (a sensitive commercial property use). It is assumed that the critical receptor (toddler) spends a substantial portion of the weekdays at a daycare. In particular, it is assumed that the toddler spends 10 hours per day, 5 days per week for 48 of 52 weeks per year at the daycare. The toddler thereby receives an amount of their daily intake of drinking water (groundwater), and indoor air from the commercial property proportional to the number of hours per day, days per week and weeks per year spent at the facility. Intake via direct contact with soil (soil ingestion and dermal contact) is proportional to the days per week and weeks per year spent at the facility but is not adjusted for hours per day since these exposures occur during discrete exposure events, and not at a continuous rate over 24 hours.

Most commercial buildings are constructed with concrete slab-on-grade foundations. Therefore, PHC Tier 1 criteria for commercial properties only consider slab-on-grade foundation construction (CCME, 2008a).

7.3.1.4 Industrial

Industrial land use includes all lands and uses in which the primary activity is related to the production, manufacture or storage of materials. Access of the general public to this type of property is generally restricted, and therefore, children are not expected to be present on a regular basis.

Industrial properties can span a wide variety of uses. For purposes of deriving soil criteria, an industrial property is assumed to be a site which includes a building where adult workers spend 10 hours per day, 5 days per week for 48 weeks per year. As such, the adult receptor receives an amount of their daily intake of drinking water (groundwater), and air (indoors) from the industrial property proportional to the number of hours per day, days per week and weeks per year spent at the facility. Intake via direct contact with soil (soil ingestion and dermal contact) is proportional to the days per week and weeks per year spent at the facility, but is not adjusted for hours per day since these exposures occur during discrete exposure events, and not at a continuous rate over 24 hours.

Most industrial buildings are constructed with concrete slab-on-grade foundations. Therefore, criteria for industrial properties only consider slab-on-grade foundation construction (CCME, 2008a).

7.3.2 Conceptual Site Model

A conceptual site model (CSM) provides a narrative and/or graphical representation of contamination sources and physical, chemical, and biological processes occurring, or that have occurred at a contaminated site. Development of a CSM helps to characterize the nature and extent of the identified Chemicals of Potential Concern (COPC). The CSM forms the basis for understanding which COPCs may be present on-site and provides ready visualization of important fate and transport mechanisms, supports the design of the Phase II/III ESA sampling program, and provides the RP and other decision makers with a tool to understand and communicate potential exposures (CCME, 2016a). The CSM can be expressed in a table, matrix, diagram, or pictorial format. Importantly, the CSM should be supported with text that cross-references the rationale used to select receptors of concern and exposure pathways (CCME, 2016a). A CSM should include descriptions of the following:

- a) contamination source and impacted media, identifying the type, location, and extent of contamination on or off the site;
- b) relevant pathways for the contamination to migrate or create exposure conditions on or off the site; and
- c) receptors (human or ecological) that might be exposed to the contamination.

The QPro should prepare and include a CSM in the Phase I or II ESA and it is often carried forward to support the HHRA, ERA and/or RAP.

7.4 PHASE II ESA

A Phase II ESA will generally be conducted if the Phase I ESA results indicate the presence or potential for contamination sources that may require further assessment and/or remediation. A Phase II ESA may also be initiated after a known spill event has occurred and information is required to develop an appropriate RAP.

The identification and characterization of the contamination (i.e., degree, nature, estimated extent and media affected) and physical site conditions (i.e., geological, ecological, hydrogeological and hydrological) are necessary to develop an appropriate RAP, or to identify the need for more specific investigations. The Phase II ESA must meet the CSA Standard Z769-00 (R2018) Phase II Environmental Site Assessment (CSA, 2018).

The design of the testing program must reflect the fate and transport properties of the COPCs. It is also advised to consider potential remedial options and discuss the options with ECC during the early stages of an investigation to determine what data should be collected to support the design of the RAP. During any ESA, measures should be taken to avoid potential spreading of contamination to other areas of the site or other media.

7.4.1 Determining Assessment Criteria

Once the appropriate land use has been determined, there are two approaches that may be used for identifying the applicable assessment criteria:

- Tier 1** Adoption of Tier 1 as assessment criteria (Appendix 5, and other criteria adopted by ECC); or
- Tier 2** Adoption of Tier 1 Criteria with limited modifications based on the [CCME Guidance Manual for Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites in Canada](#) (CCME, 1996), or exposure pathway elimination.

7.4.1.1 Tier 1 - Criteria-Based Approach

Tier 1 Criteria (Appendix 5) are numerical standards that are established or adopted for concentrations of chemicals to determine the acceptability of soil or other environmental media at a site based on a specific land use or exposure scenario. In general, Tier 1 Criteria are most applicable where site conditions, receptors, and exposure pathways are similar to those assumed in the development of the criteria. The lowest applicable criteria for a given land use or media is selected as the Tier 1 Criteria.

7.4.1.2 Tier 2 – Modified Criteria-Based Approach or Pathway Specific Criteria

In general, Tier 2 Criteria may be used when it is possible to screen out certain exposure pathways and/or modify the Tier 1 Criteria on the basis of site conditions. Specific guidance on situations in which modifications are allowed to the criteria, as well as details concerning implementation of the approach are provided in the [Guidance Manual for Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites](#) (CCME, 1996).

7.4.2 Objectives of Phase II ESA

The objectives of a Phase II investigation include:

- test for COPCs to determine if the concentrations exist in media above the Tier 1 Criteria;
- target the boundaries of identified contamination (to Tier 1 Criteria) and delineate the boundary of contamination if possible;
- define, in greater detail, site conditions to identify all contaminant pathways and receptors, particularly with respect to potential future risk assessment;
- provide contaminant and additional site characterization (operable exposure pathways, habitat assessment) to select assessment/remediation criteria, or conduct a risk assessment; and
- provide information required to develop a RAP or proceed to a Phase III ESA.

Generally, a Phase II ESA will concentrate on Areas of Potential Environmental Concern (APECs) identified in the Phase I ESA or spill event, and involve a systematic process of sampling and analysis, evaluation, conclusions, and recommendations.

Appendix 3 lists land uses and activities that are commonly associated with contamination from various types or classes of chemicals. Since sources and types of contaminants can be highly

variable and complex, the information listed in this table should only be used as a guide. The onus is on the QPro to determine which, if any, of the COPCs may be present in site media and to conduct the assessment in accordance with the assessment procedures established in Appendix 4.

The Phase II ESA sampling program should include the adoption of sampling procedures, quality assurance/quality control (QA/QC) procedures and laboratory analytical protocols (see Appendix 4). In addition, appropriate assessment criteria must be selected for screening of site data.

Once the site data has been collected, the QPro will compare the data to applicable Tier 1 Criteria to determine whether further investigative or remedial actions are required. If sufficient data have been obtained by the Phase II ESA to characterize the site, then the process may move directly to development of a RAP. A Phase II ESA may also determine that no further action is required, or that immediate action is required, or that additional assessment/risk assessment may be necessary to determine risks to human health, safety or the environment. Additional assessment may take the form of a site-specific human health and ecological risk assessment (HHERA). Where ECC is the lead regulatory agency, the Phase II report is to be provided to ECC by the RP or QPro for review and comment prior to preparing the RAP or RMP.

7.5 PHASE III ESA

When media is found to contain COPC concentrations in excess of Tier 1 Criteria, and the Phase II ESA did not fully delineate the area(s) of contamination, then a Phase III ESA should be completed. The delineation program must generally meet the best practices established in Appendix 4. The delineation program shall confirm both the horizontal and vertical extent of contaminant concentrations exceeding the Tier 1 Criteria.

The delineation program shall confirm both the horizontal and vertical extent of contaminant concentrations exceeding the Tier 1 Criteria and shall delineate the extent of contamination in all affected media (i.e., soil, groundwater, surface water, sediment or soil vapour), even if it has crossed the property boundary of the source property. If the contamination is suspected to cross property boundaries to a property with more sensitive land use classification, then the more sensitive land use classification shall be used to assess the off-site property. As a minimum, all water uses within 300 m should be identified. Testing of surface water quality within 300 m of a source area should be conducted unless otherwise justified in the ESA. All potable water sources within 300 m of a contamination source should be tested. Delineation is complete when measured concentrations are less than the Tier 1 Criteria for the applicable land use or media. The delineation program must generally meet the best practices established in Appendix 4.

Note: Authorization to access off-site properties for additional assessment will require the approval of the property owner. ECC should be advised if property ownership cannot be confirmed or if authorization is refused.

7.5.1 Vapour Intrusion Assessment of Occupied Structures

When volatile contaminants are present, the ESA must identify presence of existing or potential future buildings including a general description of the dimensions, number of floors, construction

type, use and occupancy. When a building is not present, but the local zoning allows one to be built, its presence should be assumed for the purposes of the ESA and notification.

7.5.1.1 Qualitative Screening for Vapour Intrusion Risk

Vapour concentrations will decrease with increasing lateral or vertical distance from a subsurface vapour source until they reach negligible levels. The decrease in vapour concentrations is a function of contamination source size and geometry, soil properties, physical-chemical properties, and possible biological or chemical transformations within the subsurface environment (HC, 2010a).

Under most circumstances, the vapour intrusion pathway has sufficient natural attenuation to be of negligible concern if the distance between the contamination and building is greater than the following distances (OMOE, 2021):

- Thirty (30) metres for chemicals that resist biodegradation; and
- Fifteen (15) metres for chemicals that readily biodegrade under aerobic conditions (“biodegradable chemicals” e.g., hydrocarbons).

Additional details on the assessment of vapour migration to indoor air and other supporting information can be found in the following references:

- [A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours](#) (CCME, 2014)
- [Federal Contaminated Site Risk Assessment in Canada, Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites](#) (HC, 2010a)
- [\(Draft\) Technical Guidance for Soil Vapour Intrusion Assessment](#), January 2021 (OMOE, 2021)
- Atlantic RBCA (Risk-Based Corrective Action) Version 3.0 For Impacted Sites in Atlantic Canada [Guidance for Vapour Intrusion Assessments](#) (December 2016, updated April 2019) (APIRI, 2019)

7.6 CONTAMINANTS OF POTENTIAL CONCERN

A COPC includes (a) one or more chemicals found on or in any media at a concentration that exceeds the applicable Tier 1 Criteria for the land use and/or media, or (b) one or more chemicals found on or in any media for which no applicable Tier 1 Criteria is prescribed, and which are associated with a potential adverse effect (e.g., Per- and polyfluoroalkyl substances).

For the purposes of establishing remediation criteria under this Guideline, a master list of COPCs has been developed primarily based on the range of CCME SQGs and Canada Wide Standards (CWS). The master list forms the basis for the compilation of Tier 1 Criteria and Tier 2 Pathway Specific Criteria for assessment of typical COPCs encountered at sites in the NWT.

The master list of COPCs is provided in Appendix 3, along with corresponding Chemical Abstracts Service Registry Numbers (CASRN), where available and applicable.

7.7 CRITERIA FOR COPCS

Tier 1 Criteria endorsed for use under the Guideline include current applicable standards, and guidelines and criteria published by CCME or other regulatory agencies and adopted by ECC. The Tier 1 Criteria provide numerical standards that are used to determine the need for regulatory notification and entry into the Guideline Process. The Tier 1 Criteria can also be adopted directly as remediation criteria during the RAP development and implementation.

Criteria have also been established for individual exposure pathways (e.g., pathway specific criteria or Tier 2 Criteria).

The soil Tier 1 Criteria tables include factors that must be determined prior to application. The appropriate exposure considerations must be selected from the categories listed below:

- Land use classification (agricultural, residential/parkland, commercial, industrial).
- Soil texture classification (coarse-grained/fine-grained).
- Potential contaminants of concern.
- Groundwater use (potable/non-potable).

For some COPCs, exposure pathways, or receptors indicated in the Tier 1 Criteria tables, there may be no criteria values available using the selected hierarchy of sources. In such cases, the absence of an applicable criteria is indicated in the tables.

Analytical results for other media are to be compared to the corresponding criteria for the applicable media as prescribed in Sections 7.16, 7.17 and 7.18 for groundwater, surface water and sediment, respectively.

7.8 CRITERIA FOR ACID ROCK DRAINAGE AND METAL LEACHING

The Land and Water Board (LWB)/GNWT's Quarry Sampling and Testing Guideline for Identification of Acid Rock Drainage (ARD) and Metal Leaching (ML) Potential (GNWT, 2023) was developed to provide clarity and consistency for ARD/ML sampling and assessment. This document brings awareness to Potentially Acid Generating (PAG) rock and ML considerations prior to blasting, processing, and distribution of material generated from quarries.

The ARD/ML Guidance may be used by all quarry and borrow pit operators across the NWT. Use of PAG rock can lead to contamination (i.e., negative effects from ARD/ML). For the purposes of this Guideline, both ARD and ML are considered contaminants. Operators of quarries or borrow pits should refer to ARD/ML Guidance and avoid the quarrying of PAG material.

If a RP suspects that ARD or ML is a concern on their property, they must retain the services of a QPro experienced in the assessment and mitigation of ARD/ML and complete a Reconnaissance

Geological Assessment of the material as outlined in the ARD/ML Guidance.

7.9 COPCS WITHOUT CRITERIA

An emerging or known COPC cannot be excluded from a site investigation or screened out of a human health or ecological risk assessment, on the basis that an applicable Tier 1 Criteria is not provided.

For both emerging and known COPCs that currently lack human health and/or environmental quality guidelines, standards, or criteria, the QPro should consider evaluating these contaminants based on criteria from other sources or based upon comparison to adequately defined background concentrations, conducting evaluations of available toxicity studies and literature reviews, and/or consulting with academia or other researchers/departments with expertise pertaining to that specific class of contaminants (e.g., fire retardants, pesticides, etc.). Any proposed benchmarks should offer the same level of protection that is inherent in CCME and Health Canada (HC) guidance and protocols.

7.10 APPROACH FOR ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBONS

Assessment of carcinogenic polycyclic aromatic hydrocarbons (PAHs) including Tier 1 Criteria in soil follows CCME SQGs for PAH (CCME, 2010). However, CCME does not provide human health-based SQGs (SQG_{HH}) for non-carcinogenic PAHs and instead specifies that human health-based guidelines should be sourced from other jurisdictions. Under the Government of Alberta (Alberta Environment and Parks [AEP]) guidance (AEP, 2023) separate analysis of non-carcinogenic PAHs is not necessary when the source of the contamination is crude oil or refined fuels because non-carcinogenic PAH compounds have been included as components of PHC fractions F1-F4.

However, this approach may not be appropriate for tar, coal tar or creosote sources of PAHs. Based on the AEP guidance, non-carcinogenic PAHs do not require separate screening where the source of contamination is associated with refined fuels. Where the source could potentially be tar, coal tar, creosote or other sources, concentrations of non-carcinogenic PAHs should be screened against separate human health-based criteria (AEP, 2023). Detected concentrations of benzo(a)pyrene Total Potency Equivalents (B[a]P TPE) should be multiplied by a factor of 3 to account for uncertainty related to presence of tar, coal tar or creosote (CCME, 2010). If the source of contamination is uncertain, PAHs should be analyzed.

ECC has adopted this approach for the purpose of assessing PAHs under this Guideline.

7.11 ANALYTICAL METHODS

ECC has adopted the 2016 CCME Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 4: Analytical Methods for Compliance with the Guidelines for Contaminated Sites Remediation (CCME, 2016b). Where

another jurisdiction's analytical methods are used, they must meet the requirements of section 7.12.

7.12 REQUIREMENTS FOR ANALYTICAL LABORATORIES

Appropriate laboratory analysis must be conducted for all ESAs used in support of this Guideline, including the following:

- a) Laboratories performing analysis must be accredited to International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 17025 standards (and subsequent revisions) by the Standards Council of Canada (SCC) or the Canadian Association for Laboratory Accreditation Inc. (CALA). All routinely required analyses must appear on the laboratory's Certificate of Analysis (COA), which should be included with the relevant assessment or monitoring reports.
- b) All sampling and analysis must be in accordance with laboratory recommendations concerning sample hold times, storage and preservation.
- c) There must be appropriate selection of laboratory analytical methods to ensure adequate conformance to data quality objectives, assessment endpoints (ecological or human health), and method/reportable detection limits (RDL).

Copies of the COA from the laboratory conducting the analysis should be included in the ESA documentation.

7.13 EXPOSURE PATHWAYS CONSIDERED IN TIER 1 CRITERIA

CCME (and other regulatory agencies) provide assessment/remediation criteria which consider the common range of potential exposure pathways based on common land use activities. The exposure pathways considered for the purpose of criteria selection to support this Guideline are summarized in Table 1 and Table 2 for human and ecological receptors, respectively.

Should other relevant exposure pathways be deemed operable at a given site that are not included in the exposure pathways included in Table 1 and Table 2, a more detailed Tier 2 or Tier 3 site-specific approach may be required. This may involve the use of criteria for specific pathways that have been derived by other jurisdictions, the development of site-specific target levels (SSTLs) for a given pathway, or the use of site-specific risk assessment (SSRA) approach.

7.13.1 Human Exposure Pathways

Table 1 presents the human exposure pathways that were considered in the selection or adoption of Tier 1 Criteria and Tier 2 Pathway Specific Criteria.

Table 1 Human Exposure Pathways

| MEDIA | EXPOSURE PATHWAYS CONSIDERED |
|---------------|---|
| Soil | <ul style="list-style-type: none"> • Direct contact (ingestion and/or dermal contact) and inhalation of soil or dust particles in outdoor/indoor air • Vapour migration from soil to indoor air (inhalation of soil vapour in indoor air, slab-on-grade construction) • Soil leaching for protection of potable groundwater (groundwater ingestion, as may be applicable (organics only)) • Off-site migration (for commercial and industrial sites only) • CWS management limits (for PHC F1, F2, F3 and F4 only) |
| Groundwater | <ul style="list-style-type: none"> • Ingestion as drinking water (as may be applicable) • Vapour migration and inhalation of vapours in indoor air • Refer to Section 7.16) |
| Surface Water | <ul style="list-style-type: none"> • Ingestion as drinking water or from incidental water ingestion during recreational activities, as may be applicable (refer to Section 7.17) |
| Sediment | <ul style="list-style-type: none"> • May be evaluated in a similar manner as soil under certain conditions (refer to Section 7.18) |

7.13.2 Ecological Exposure Pathways

Table 2 presents the ecological exposure pathways that were considered in the selection or adoption of Tier 1 Criteria and Tier 2 Pathway Specific Criteria.

Table 2 Ecological Exposure Pathways

| MEDIA | EXPOSURE PATHWAY (RECEPTOR GROUP) |
|---------------|--|
| Soil | <ul style="list-style-type: none"> • Direct contact (plants and soil invertebrates) • Soil and food ingestion (livestock and/or wildlife) • Soil leaching (protection of aquatic life, freshwater and marine) |
| Sediment | <ul style="list-style-type: none"> • Direct contact with sediments (freshwater and marine benthic aquatic life) |
| Surface Water | <ul style="list-style-type: none"> • Direct contact with surface water (freshwater and marine pelagic aquatic life) |
| Groundwater | <ul style="list-style-type: none"> • Migration of contaminants in groundwater to surface water (freshwater and marine pelagic aquatic life) |

7.14 CRITERIA FOR SOIL QUALITY

7.14.1 Tier 1 Criteria and Tier 2 Pathway Specific Criteria for Soil

The Tier 1 Criteria and Tier 2 Pathway Specific Criteria for soil quality adopted for use in the Guideline are provided in separate Tables in Appendix 5, based on each of the four CCME land use categories and whether groundwater use at a site is classified as potable or non-potable. The tables are presented in a format derived from the Alberta Tier 1 and Tier 2 Soil and Groundwater Remediation Guidelines (AEP, 2023).

General preference for the selection of soil criteria was given to CCME SQGs and CWS where they exist. In the absence of CCME guidelines for a given COPC, criteria from other Canadian regulatory authorities were identified and adopted as required.

7.14.2 Hierarchy of Criteria Sources

The hierarchy used to select pathway specific criteria for soil follows in order of preference:

1. [CCME Canadian Environmental Quality Guidelines](#) (CCME, 2022a) and [Canada Wide Standards](#) (CCME, 2008b).
2. [Federal Environmental Quality Guidelines](#) (ECCC, 2021).
3. As necessary, other Canadian jurisdictions (i.e., Alberta, British Columbia, Ontario) in specified order of preference.

If criteria values for a particular COPC, pathway or receptor type were not available from the initial preferred hierarchy, the next preferred jurisdiction in the hierarchy was consulted until an appropriate criteria value could be identified. Generic soil standards (i.e., CCME 1998 SQGs which are not based on effects to a particular receptor and/or pathway) were excluded in lieu of pathway specific standards provided by a jurisdiction that may be lower on the hierarchy.

7.14.3 Modifications to Criteria

Canadian jurisdictions generally consider the same or similar methods when developing criteria for contaminated sites. However, there can be differences in guideline values between two or more jurisdictions that reflect differing science policy with respect to exposure assumptions and/or default modeling parameter values. It is recommended that QPros and other users of the criteria prescribed or adopted in this document consult the relevant jurisdiction's documentation to ensure they understand the underlying scientific principles, approaches and assumptions for the derivation and application of the criteria.

In some cases, criteria have been modified to make the adopted values more consistent with those developed by CCME, HC and other Canadian jurisdictions (refer to footnotes in Tables in Appendix 5 for any modifications made). For instance, in cases where the original adopted guidelines from the source jurisdictions were based on a cancer target risk (TR) level of $1E^{-06}$ (1 in 1,000,000), such values have been adjusted to reflect a TR level of $1E^{-05}$.

If required, United States Environmental Protection Agency (USEPA) human health based Regional Screening Levels (RSLs) for non-carcinogens (derived based on a target hazard quotient [HQ] of 1.0) have been divided by a factor of 5 to reflect the standard approach for CCME and other Canadian jurisdictions to use a default hazard quotient of 0.2 (or 20% of the Oral Toxicity Reference Value [TRV]) in the development of human health-based soil quality guidelines.

7.14.4 Tier 3 Regional Risk Assessment for Arsenic in Soil Yellowknife and Inuvik

Tier 3 remediation criteria that have been adopted for use in this Guideline include regional specific arsenic criteria for the Yellowknife area including N'dilo and Dettah, and the Inuvik area. The

arsenic remediation criteria for Yellowknife and Inuvik, and their associated geographic boundaries, are discussed and presented in Appendix 6.

7.15 CONSIDERATIONS FOR APPLICATION OF SOIL CRITERIA

7.15.1 Surface and Sub-surface Soil

CCME does not specify the depth to which the generic SQGs apply. However, most direct human and ecological exposure pathways apply to soil located at or near surface. Soils at depth (i.e., greater than 1.5 metres below ground surface [mbgs]) are less accessible for human contact and are typically not required to perform the same level of ecological function, although such soils may still be sources of indirect exposure through vapour and soil leaching to groundwater pathways (CCME, 2008a).

Surface soils are considered to be those within the uppermost 1.5 m of the soil profile. For the purposes of the Guideline, Tier 1 Criteria will generally apply to all soil regardless of depth for the purposes of triggering the Guideline and notification. However, justification for excluding certain pathways can be considered on a site-specific basis in conjunction with a suitable risk management policy.

7.15.2 Soil Texture

CCME protocol (CCME, 2006) recognizes that contaminant fate and transport, as well as bioavailability, are dependent to varying degrees on soil texture, moisture content and other factors. To minimize the uncertainty in criteria derivation introduced by such soil variability, this Guideline considers the two generic soil types defined by CCME as follows: coarse-textured soils (soils containing predominantly sand and gravel sizes) and fine-textured soils (soils containing predominantly silt and clay sizes). The criterion distinguishing the two categories is a median grain size of 75 microns.

For the purposes of the Guideline, Tier 1 Criteria and Tier 2 Pathway Specific Criteria are prescribed for coarse-grained and fine-grained soils. Sufficient textural information should be obtained to permit classification of the soils as either coarse or fine. These are defined as follows:

- Fine-grained soil means soil having a median grain size of $<75 \mu\text{m}$ as defined by the American Society for Testing and Materials (ASTM).
- Coarse-grained soil means soil having a median grain size of $>75 \mu\text{m}$ as defined by the ASTM.

In the absence of specific testing results, criteria for coarse grained soil should be used as the default.

7.15.3 Use of Soil Check Values

Soil check values are criteria protective of indirect soil exposure pathways; the lowest check value often becoming the Tier 1 criterion. Check values for soil considered in the Tier 1 Criteria and Tier 2 Pathway Specific Criteria include 1) soil leaching for protection of potable groundwater and 2) soil

leaching for protection of aquatic life. The general expectation of ECC is that potable groundwater and surface water (if present) on or near a contaminated site, will be sampled directly at the point of exposure (POE) and screened against appropriate criteria by the QPro. In such cases, the soil check values can be eliminated at Tier 2 assuming data is available for direct assessment of these potential exposure pathways.

7.15.4 Management Limits for Petroleum Hydrocarbons

Based on the lack of clarity relative to the derivation and implementation of CWS for subsurface soil, in 2008 CCME developed management limits to assess risks that may be associated with PHC contamination at depth and to provide an option to remove the ecological direct contact pathway for contaminants located at depth. The approach is based on the reduced exposure and risk, posed by contamination in deeper soil. In general, management limits apply to subsoils which CCME defines as soils at depths of 1.5 m and greater.

The CWS Management Limits are intended to address potential hazards associated with PHCs other than human and ecological health, including technical and socio-economic factors. These factors include the following:

- Formation of free phase product.
- Exposure of workers in trenches to PHC vapours.
- Fire and explosive hazards.
- Effects on buried infrastructure.
- Aesthetic considerations.
- Technological factors.

However, CCME recognized that a stratified approach to remediation poses certain potential limitations on use within a land use category. For this reason, guidance on use of management limits is left to the discretion of the individual jurisdictions (CCME, 2008a).

In the absence of specific guidance on the use of management limits from CCME, and for the purposes of this Guideline, in addition to screening data against Tier 1 Criteria, maximum soil concentrations should also be screened against the CWS Management Limits (where they exist).

In cases where management limits are exceeded, the QPro should provide a qualitative assessment of potential risk associated with the exceedances and if necessary, propose mitigation measures that can reduce or eliminate unacceptable risk. This assessment should be included in the ESA report and/or the RAP. Exclusion of management limits in the RAP is subject to review and approval by ECC.

7.15.5 Consideration of Background Soil Conditions

Background concentrations of substances in the environment can be divided into two groups: 1) naturally occurring and 2) anthropogenic (i.e., associated with human activity). Naturally occurring concentrations of substances are present in the environment due to natural sources (e.g., metals associated with geologic formations, PAHs associated with forest fires, etc.).

In some situations, the background concentration of a substance can be a significant proportion of, or even exceed, the Tier 1 Criteria. In cases when the background concentration is demonstrated to be greater than Tier 1 Criteria, the remediation level should be set to background concentration, or other criteria developed using a Tier 2 or Tier 3 SSRA approach.

Data collected from undeveloped areas located away from urban centres and industrial facilities provide the best indication of natural levels of substances. Anthropogenic levels of substances may be present in urban environments due to historical human activities (e.g., vehicle emissions, industry, burning of fossil fuels for home heating, mining, etc.). Data collected from urban areas provides the best indication of anthropogenic contributions because they are centres of known human activity. Site data collected during an ESA should be compared to Tier 1 Criteria and background data, if available and if required. Where remediation to background concentrations is proposed, review and approval of ECC will be required.

Guidance on determining background concentrations is provided in the following references:

- BC Ministry of Environment Technical Guidance 16 - [Soil Sampling Guide for Local Background Reference Sites](#) (BC MOE, 2017).
- Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance [Module 5: Defining Background Conditions and using Background Concentrations](#) (GOC, 2019a).

7.15.6 Additional Resources

Additional details on the derivation of soil criteria and other supporting information can be found in the following references:

- [Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health](#) (CCME, 2022a); online or latest edition.
- [Alberta Tier 1 Soil and Groundwater Remediation Guidelines](#) AEP (AEP, 2023); or latest addition.
- British Columbia Contaminated Sites Regulations, [Schedule 3.1 – Numerical Standards for Soil](#) (BC MOE, 2021a); online or latest edition.
- Ontario Ministry of Environment (OMOE) [Rationale for Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario](#) (OMOE, 2011).

- [Regional Screening Levels](#) United States Environmental Protection Agency (USEPA, 2021); online, or latest edition.

7.16 CRITERIA FOR GROUNDWATER QUALITY

7.16.1 Classification of Groundwater Use

The selection of both Tier 1 Criteria and Tier 2 Pathway Specific Criteria for soil and groundwater must consider whether the local groundwater resource is used to supply potable water (i.e., used for drinking water or other domestic purposes) or is non-potable. Thus, soil and groundwater criteria have been considered for both potable and non-potable groundwater use conditions.

For the purpose of this Guideline Process, the QPro should make an appropriate determination on the application of potable or non-potable soil and groundwater criteria. Groundwater classification is subject to review and agreement of ECC.

7.16.2 Criteria for Potable Groundwater Quality

ECC has adopted HC's [Guidelines for Canadian Drinking Water Quality \(GCDWQ\)](#) (HC, 2022), or latest edition, as the Tier 1 Criteria for assessment and remediation of areas where groundwater is used as the source of a potable water supply or is being maintained for future potable groundwater use. The GCDWQ are established by HC in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water and other federal government departments.

Each guideline was established based on current, published scientific research related to health effects, aesthetic effects, and operational considerations. Aesthetic effects (e.g., taste, odour) should be considered when these play a role in determining whether consumers will consider the water drinkable. Operational considerations should be considered when the presence of a substance may interfere with or impair a treatment process or technology (e.g., turbidity interfering with chlorination or UV disinfection) or adversely affect drinking water infrastructure (e.g., corrosion of pipes) (HC, 2022).

It is acknowledged that GCDWQ may be updated at any time by HC, therefore users of this Guideline should check the original source of the GCDWQ prior to conducting an assessment to ensure that the most current criteria are being applied. Final selection of groundwater criteria is subject to review and agreement of ECC.

7.16.3 Criteria for Non-Potable Groundwater Quality

While CCME has established a Protocol for the Derivation of Groundwater Quality Guidelines for use at Contaminated Sites, as of the date of this publication, groundwater guidelines remain in development by CCME and have not been released for public use.

For the purposes of this Guideline, ECC has adopted the FCSAP Guidance Document on Federal Interim Groundwater Quality Guidelines (FIGQGs) (GOC, 2016), version 4 or latest edition, as the Tier 1 Criteria for groundwater quality and remediation in areas where groundwater is classified as non-potable.

The FIGQGs were developed to assist federal custodians in assessing and remediating/risk managing groundwater at federal contaminated sites. ECC endorses the use of these interim guidelines until Canadian groundwater quality guidelines are available from CCME.

7.16.4 Use of Groundwater Check Values

Check values for groundwater quality are criteria protective of indirect groundwater exposure pathways, the lowest check value often becoming the Tier 1 criterion. Check values for groundwater considered in the Tier 1 Criteria include 1) organic COPCs in groundwater migrating to indoor air and 2) COPCs in groundwater migrating to surface water for protection of aquatic life. The general expectation of ECC is that vapour concentrations (for buildings within the applicable screening distance) and surface water (if present) on or near (within 300 m of) a contamination source, will be sampled directly at the POE and screened against appropriate screening values by the QPro. In such cases, the groundwater check values can be eliminated, resulting in Tier 2 Pathway Specific Criteria, assuming data is available for direct assessment of these potential exposure pathways.

7.16.5 Additional Resources

Additional details on the selection of groundwater criteria and other supporting information can be found in the following references:

- [Alberta Tier 1 Soil and Groundwater Remediation Guidelines](#) AEP (AEP, 2023); or latest edition.
- British Columbia Contaminated Sites Regulations, [Schedule 3.2 Generic Water Standards](#) (BC MOE, 2021b); online or latest edition.
- [Rationale for Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario](#). Ontario Ministry of the Environment (OMOE, 2011).

The FIGQG or other groundwater quality guidelines may be updated at any time by the jurisdictional body responsible, therefore users of this Guideline should check the original source of the groundwater guidelines (including the expected release of CCME Groundwater Quality Guidelines) prior to conducting an assessment to ensure that the most current criteria are being applied. Final selection of groundwater criteria is subject to review and agreement of ECC.

7.17 CRITERIA FOR SURFACE WATER QUALITY

For the purposes of this Guideline, ECC has adopted the following CCME Water Quality Guidelines as the Tier 1 Criteria for assessing Surface Water Quality:

- CCME [Canadian Water Quality Guidelines for the Protection of Aquatic Life](#) (CCME, 2022b); online or latest edition.
- CCME [Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses](#) (CCME, 2022c); online or latest edition.

- Health Canada [Guidelines for Canadian Recreational Water Quality](#) (for biological contamination) (HC, 2012); online or latest edition.

Surface water samples must be screened against these criteria as appropriate to the site circumstances. Final selection of surface water criteria is subject to review and agreement of ECC.

7.17.1 Evaluating Human Exposure to Potable Surface Water

In cases where surface water is used as a potable water source, human exposure should be evaluated by comparison of analytical results to the GCDWQ (HC, 2022).

Surface water samples must be screened against these criteria as appropriate to the CSM. Final selection of surface water criteria is subject to review and agreement of ECC.

7.17.2 Evaluating Human Exposure to Recreational Surface Water

There are no criteria available for exposure of COPCs in surface water used for recreational purposes, other than criteria for biological contamination (e.g., fecal coliforms). Considerations should be made for the degree of potential human exposure to surface water that is likely to occur. Since ingestion presents the highest risk of the likely and available exposure pathways (i.e., direct contact, ingestion) for COPCs in recreational water, the guidelines/screening values for drinking water provide the most appropriate measure for incidental ingestion of surface water. World Health Organization (WHO) guidance assumes that incidental ingestion of surface water during recreational activities may result in a consumption of approximately 10 percent of an adult's daily drinking water intake (approximately 2 litres [L] per day) which would result in the ingestion of approximately 200 milliliters (mL). The multiplier of ten is considered a conservative method to estimate risk from potential human exposure to surface water during recreational activities.

In the absence of human health surface water screening values or guidelines for human health, surface water data should be screened against the GCDWQs (HC, 2022), multiplied by a factor of 10 to account for incidental ingestion of recreational water (WHO, 2003). Additional information can be found at [Guidelines for Safe Recreational Water Environments](#).

7.17.3 Additional Resources

Additional details on the derivation of surface water criteria and other supporting information can be found in the following references:

- AEP [Environmental Quality Guidelines for Alberta Surface Waters](#) (AEP, 2018); online or latest edition.
- British Columbia Contaminated Sites Regulations, [Schedule 3.2 Generic Water Standards](#) (BC MOE, 2021b); online or latest edition.
- [Ontario Water Management: Policies, Guidelines, Provincial Water Quality Objectives](#) (OMOE, 1994); online or latest edition.

Water quality guidelines may be updated at any time by the jurisdictional body responsible,

therefore users of this Guideline should check the original source of the surface water guidelines prior to conducting an assessment to ensure that the most current criteria are being applied.

7.18 CRITERIA FOR SEDIMENT QUALITY

For the purposes of this Guideline, ECC has adopted CCME Sediment Quality Guidelines (CCME, 2022d) as the Tier 1 Criteria for assessment and remediation of freshwater and marine sediment. CCME has developed the sediment quality guidelines from the available scientific information on the biological effects of sediment-associated COPCs. These criteria are intended to provide guidance to agencies involved in the protection, assessment, and management of sediment quality.

Guidelines are derived separately for freshwater and marine sediments using toxicological data compiled for each of these systems. Complementary information on background concentrations of natural substances should be considered during the assessment of sediment quality and implementation and the development of site-specific sediment quality objectives.

ECC recommends using CCME Interim Sediment Quality Guidelines (ISQGs) as the Tier 1 screening criteria for evaluating contaminant concentrations in sediment measured during the initial assessment phase for most sediment.

While it is understood that low-effect level and/or no-effect level sediment quality guidelines are highly conservative, and their exceedance often does not correlate well with other endpoints that are commonly evaluated in aquatic risk assessments (such as sediment toxicity test results and benthic community assessment metrics). In practice, exceedance of the Probable Effect Levels (PEL) (and similar values) is the more realistic indicator of a potential for population-level adverse effects within benthic invertebrate communities. Emphasis on PELs or similar guideline values has become a common practice in many sediment assessment programs conducted across Canada and can be considered when assessing a site using Tier 2 Criteria.

Further information can be found at:

- CCME [Protocol for the Derivation of Canadian Sediment Quality Guidelines for the Protection of Aquatic Life](#) (CCME, 1995).
- CCME Sediment Quality Guidelines [Canadian Sediment Quality Guidelines for the Protection of Aquatic Life](#) (CCME, 2022d); online or latest edition.

Sediment samples must be screened against these criteria as appropriate to the CSM. Final selection of sediment criteria is subject to review and agreement of ECC.

7.18.1 Assessment of Sediment Quality in Working Harbours

For the purposes of assessing sediment quality in working harbours under the Guideline, ECC has adopted the FSCAP Guidance for Assessing and Managing Aquatic Contaminated Sites in Working Harbours Version 1 (GOC, 2019b).

The working harbours guidance advises that the CCME PEL and the CCME Residential SQG_{HH} may be

used as the screening criteria for the initial assessment at working harbour sites.

An exception is made for highly bioaccumulative substances that are present over a large area of the site; concentrations of these chemicals are screened through comparisons to harbour ambient background conditions. General principles and an approach are established in the working harbour guidance for setting achievable remediation and risk management objectives given ongoing inputs into the harbour. These include a well-designed sampling program to establish harbour ambient background conditions. A re-contamination evaluation should also be considered to identify potential limits for remediation and/or risk management objectives. Details on a re-contamination evaluation are provided in the FCSAP reference below. Further information can be found at:

- FCSAP [Guidance for Assessing and Managing Aquatic Contaminated Sites in Working Harbours](#) Version 1.0 (GOC, 2019b); online or latest edition

7.18.2 Criteria for Petroleum Hydrocarbons in Sediment

In the absence of other applicable federal guidelines, Canadian territorial or provincial guidelines for PHCs in sediment, ECC has adopted Atlantic Partnership in Risk-Based Corrective Action Implementation (APIRI) (APIRI, 2021) Tier 1 Ecological Screening Levels (ESLs) for the Protection of Freshwater and Marine Aquatic Life as the Tier 1 Criteria for PHCs in sediment.

APIRI cites ecological screening levels for 'typical' sediment sites and 'other' sediment sites. These two categories are defined as follows:

1. 'Typical' sediment sites are defined as those where the sediment is used as habitat for sensitive components of freshwater, marine or estuarine aquatic ecosystems, including:
 - Habitats used by endangered or threatened species, or Species of Special Concern under the Species at Risk (NWT) Act.
 - Watercourses, wetlands, forested riparian areas, mudflats and intertidal zones that are important to preservation of fish and wildlife.
 - Reaches of aquatic habitats that are important to fish spawning or serve as important rearing habitat for fish.
 - Reaches of aquatic environments encompassing, and/or bordering habitat compensation or restoration sites, or other areas that are intended or designed to create, restore or enhance biological or habitat features.
 - Areas of unique habitat that are identified in federal, territorial, municipal or other land use plans.
 - Reaches of the aquatic environment that exist within federal and territorial marine parks, federal and territorial parks, or ecological reserves.
 - Areas and aquatic habitat included within territorial wildlife management areas.

- Areas covered under conservation agreements and areas designated as “Environmentally Sensitive” in land use plans or strategies.
2. ‘Other’ sediment sites are those sites where the sediment is not classified as ‘typical’ such as ditches, industrial-influenced receiving areas, working harbours, etc. (APIRI, 2021).

Under the Guideline, all sediments should be screened using the ‘typical’ screening levels. The QPro must provide a sufficient rationale for applying the ‘other’ screening levels. Final selection of sediment criteria is subject to review and agreement of ECC.

7.18.3 Evaluating Human Exposure to Sediment

There are currently no applicable federal or territorial criteria for human exposure to COPCs in sediment. In the absence of screening values or guidelines for human exposure to sediment, ECC has adopted HC’s [Supplemental Guidance on Human Health Risk Assessment of Contaminated Sediments for Direct Contact Pathway](#) (HC, 2017).

HC indicates that sediment concentrations of COPCs may be screened against available residential/parkland SQG_{HH} for scenarios where only direct contact exposure (i.e., ingestion, dermal contact) with sediments is expected (such as CCME Canadian SQG_{HH} or other regulatory human health-based soil quality guidelines). However, HC cautions that the exposure factors used to develop soil quality guidelines differ from sediment exposure factors, such that soil quality guidelines could either be over-protective or insufficiently protective of human health, depending on the sediment exposure scenario.

In such cases, adjustment of the soil quality criteria or derivation of site-specific criteria may be warranted, so long as sufficient technical rationale is provided by the QPro. Final selection of sediment criteria is subject to review and agreement of ECC.

7.18.4 Additional Resources

The jurisdictional hierarchy for the selection of criteria for sediment (freshwater and marine) is provided below in preferential order. All adopted sediment quality criteria are protective of benthic organisms in direct contact with sediments. The adopted sediment quality guidelines do not address other ecological pathways or receptors currently.

- Government of Canada. [Federal Environmental Quality Guidelines](#) (GOC, 2021); online or latest edition.
- British Columbia Contaminated Sites Regulation [Schedule 3.4 – Generic Numerical Sediment Standards](#) (BC MOE, 2021c); online or latest edition.
- OMOE. [Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario](#): An Integrated Approach (OMOE, 2008). online or latest edition.
- USEPA Region 3 [BTAG Freshwater Screening Benchmarks](#). (USEPA, 2006). [online or latest edition](#).

7.19 RISK BASED SITE-SPECIFIC REMEDIATION CRITERIA

Any risk-based approach to determine the level of risk or to develop site-specific remediation criteria (i.e., SSTLs) for any COPC under the Guideline is considered a Tier 3 risk-based approach. A Tier 3 site-specific risk assessment can be used to quantify risk (i.e., Preliminary Quantitative Risk Assessment [PQRA], Detailed Quantitative Risk Assessment [DQRA]) and/or develop SSTLs, which provide alternate risk-based remediation criteria for a contaminated site. SSTLs are protective of risks to human health and the environment found at a site, based on site specific hazards and exposure pathways. The differences between PQRA and DQRA are summarized in (HC, 2021a).

A SSRA requires the collection of detailed site information. Default modeling parameters can be substituted with actual site data in the analytical models or formulas to calculate risks to environmental receptors and SSTLs.

When a parameter does not have an applicable Tier 1 Criteria or Tier 2 Pathway Specific Criteria and is below the laboratory RDL, the parameter can be reasonably assumed to not be present at the site at concentrations that result in unacceptable risk.

Parameters that do not have criteria but were above the laboratory RDL should be considered on a case-by-case basis to determine if the parameter should be assessed further for potential risk.

Once developed, the SSTLs may be used as remediation criteria and are to be included in the remedial action plan for the site. Final selection of site-specific criteria is subject to review and agreement of ECC.

7.19.1 Human Health Risk Assessment Methods and Guidance

The primary guidance for conducting a HHRA and/or developing SSTLs is that of CCME and HC, and includes:

- Federal Contaminated Site Risk Assessment in Canada: [Guidance on Human Health Preliminary Quantitative Risk Assessment \(PQRA\), Version 3.0](#) (HC, 2021a).
- Federal Contaminated Site Risk Assessment in Canada: [Health Canada Toxicological Reference Values \(TRVs\) and Chemical-Specific Factors, Version 3.0](#) (HC, 2021b).
- Federal Contaminated Site Risk Assessment in Canada: [Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals \(DQRACHEM\)](#) (HC, 2010b).
- [Canada Wide Standards \(CWS\) for Petroleum Hydrocarbons in Soil: Scientific Rationale. Supporting Technical Document](#) (CCME, 2008a).
- [A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines](#) (CCME, 2006).

7.19.2 Human Health Hazard Quotients and Cancer Risk Targets

The human health protection endpoint is the same at all tiers under the Guideline and is expressed in terms of an allowable exposure level at which the likelihood of a receptor experiencing adverse health effects is essentially negligible. Specifically, the level of human exposure to a threshold chemical (non-carcinogen) must not exceed the tolerable daily intake (TDI) specified by CCME, HC or other appropriate regulatory agency, including background exposure to the chemical (i.e., Estimated Daily Intake (EDI)).

SSTLs must be developed that meet a HQ <0.2 for non-carcinogens in each medium evaluated (e.g., soil, water). The use of other HQs (between 0.2 and 1.0) will only be considered if research and documentation of suitable, alternate site specific estimated daily intake rates are provided. In these cases, consultation with ECC is required prior to acceptance of values used.

For non-threshold COPCs (e.g., carcinogens), ECC has adopted a target risk-based Incremental Lifetime Cancer Risk (ILCR) of $1E^{-05}$ (1 in 100,000) as a default scientific policy with respect to what is considered an acceptable level of carcinogenic risk. This policy position is consistent with that of HC for federally owned contaminated sites. (HC, 2021a) notes that a cancer risk in the range of 1 in 100,000 to 1 in 1,000,000 is “essentially negligible” for carcinogenic substances. Final selection of site-specific criteria is subject to review and agreement of ECC.

7.19.3 Ecological Risk Assessment Methods and Guidance

The risk assessment methodology for a typical ERA will consider guidance from the following references:

- [Ecological Risk Assessment Guidance Document](#) (CCME, 2020).
- FCSAP [Ecological Risk Assessment Guidance](#) and technical appendices (GOC, 2012).
- [Canada Wide Standards \(CWS\) for Petroleum Hydrocarbons in Soil: Scientific Rationale. Supporting Technical Document](#) (CCME, 2008a).
- [A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines](#) (CCME, 2006).

7.19.4 Ecological Risk Characterization

An Ecological Risk Assessment (ERA) should evaluate the potential that terrestrial or aquatic ecological receptors may experience toxicologically induced changes in health as a result of exposure to COPCs identified at the contaminated site.

Ecological risk-based criteria should fulfill two main goals from the ecological standpoint:

- 1) protection of ecological receptors expected to be present at a site based on land use and habitat availability; and
- 2) preservation of an appropriate level of ecological function of the site and its ecosystem components.

Risk Characterization evaluates the evidence linking COPCs with adverse ecological effects by combining information from an exposure and toxicity assessment.

The potential for adverse effects is quantified by comparing the amount of a substance that can be tolerated, below which adverse environmental effects are not expected (e.g., TRV or toxicity benchmarks), to the amount of a COPC an organism is expected to be exposed to, or come into contact with, on a daily basis (Average Daily Dose [ADD]). This is defined as the HQ:

$$\text{HQ} = \frac{\text{ADD (mg/kg-d)}}{\text{TRV (mg/kg-d)}}$$

The magnitude by which values differ from parity (e.g., TRV = daily dose, HQ = 1.0) is used to make inferences about the possibility of ecological risks.

An HQ less than 1.0 indicates that the exposure concentration is less than the threshold of toxicity and there is a low probability that adverse environmental effects might occur. Given the conservative approach to the ERA, it is likely that no adverse environmental effects would occur at HQs less than 1.0. However, a HQ value of greater than 1.0 does not automatically indicate that there is an unacceptable level of risk, only that there is a possibility of adverse ecological effects. HQ values greater than 1.0 should be examined carefully and further, more focused, investigations may be required to reduce conservatism and provide a more accurate assessment of the actual level of risk. If it is ultimately determined that the HQ is indeed indicating unacceptable risk, then mitigation or remediation activities may be appropriate to reduce risks to ecological receptors.

7.20 DETERMINING REMEDIATION CRITERIA

Once the appropriate land use has been determined, and the ESA has determined that the site requires remediation, there are three approaches that may be used for identifying the applicable remediation criteria:

- Tier 1** Adoption of Tier 1 as remediation criteria (Appendix 5, and other criteria adopted by ECC);
- Tier 2** Adoption of Tier 1 Criteria with limited modifications based on the [CCME Guidance Manual for Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites in Canada](#) (CCME, 1996), or exposure pathway elimination; or
- Tier 3** Derivation of SSTLs based upon risk assessment (risk-based approach).

The selection of the remediation criteria for a particular site is subject to the approval of ECC.

7.20.1 Tier 1 - Criteria-Based Approach

Factors that might bear weight on the decision to directly adopt Tier1 Criteria include cost, time, simplicity and technical feasibility.

Where the application of Tier 1 Criteria is not feasible, site-specific remediation criteria can be

established through the application of Tier 2 Pathway Specific Criteria or Tier 3 (SSRA approach).

7.20.2 Tier 2 – Modified Criteria-Based Approach

In some cases, certain exposure pathways may be eliminated when additional assessment data is collected at the point of exposure for comparison to criteria based on check values for the media (e.g., groundwater analytical results are more relevant than the application of soil check values including soil leaching to potable groundwater or soil leaching for protection of aquatic life). In such cases certain pathway specific criteria can be removed from consideration for the purposes of determining the appropriate remediation requirements for the site.

7.20.3 Tier 3 - Risk-Based Approach

The Tier 3 site specific risk-based approach is considered to be more complex and costly to develop, but may result in overall project cost savings when compared to Tier 1 or Tier 2 criteria for certain sites. A Tier 3 approach is generally used when the Tier 1 and Tier 2 approaches are not suitable for a site (e.g., pathways of exposure, COPCs, receptors or other site characteristics differ from those used to develop the Tier 1 Criteria or Tier 2 Pathway Specific Criteria) and risk assessment procedures might be required in the development of site-specific remediation criteria. SSTLs are developed through a risk assessment to establish a concentration corresponding to an acceptable risk to human or ecological receptors. SSTLs developed through this process can be adopted directly as remediation criteria.

Site-specific remediation criteria for soil may be developed using risk assessment when there are:

- significant ecological concerns (e.g., critical or sensitive habitats for wildlife; rare, threatened or endangered species; parkland or ecological reserves; hunting or trapping resources).
- unacceptable data gaps such as:
 - exposure conditions are particularly unpredictable or uncertain.
 - there is a lack of information about receptors.
 - there is a high degree of uncertainty about hazard levels.
- special site characteristics such as:
 - the site is so large, or the estimated cost of remediation is so high, that a risk assessment is needed to provide a framework for site investigation and to set remediation priorities.
 - site conditions, receptors and/or exposure pathways differ significantly from those assumed in the derivation of Tier 1 Criteria or Tier 2 Pathway Specific Criteria.

7.21 USE OF STATISTICAL METHODS FOR ASSESSING EXPOSURE

When a sufficient number of source zone test results are available, 90 or 95% Upper Confidence Limit on the Mean concentration (UCLM) as determined using an appropriate software program (e.g., US EPA ProUCL, version 5.00 or later) may be used to evaluate potential risk. A statistically significant number of samples (minimum of ten) must be used when calculating a UCLM to represent exposure. Alternatively, maximum site concentrations should be used. Site data from source zones and non-impacted areas cannot be combined when calculating a UCLM to represent exposure concentrations. It is important to note calculation of a UCLM may not be an applicable approach on all sites. For instance, if there is an indoor air quality concern, the maximum soil concentration in the vicinity of the building may be more applicable to use in a risk assessment.

ECC may consider soil to meet regulatory criteria when:

- the data is demonstrably representative of one population;
- the upper 90th percentile of sample concentrations is less than the criterion concentration;
- the upper 95 percent confidence limit of the arithmetic mean concentration of the samples is less than the criterion concentration; and
- no sample within the data-set has a concentration exceeding two times the criterion concentration.

The QPro should consult with the ECC to confirm that the UCLMs or other statistical methods are acceptable for site screening or for obtaining regulatory closure for the site.

8.0 STEP 3 - PREPARATION OF A RAP OR RMP

When the COPCs that exceed Tier 1 Criteria and/or the remediation criteria are delineated, a RAP or RMP must be developed by the QPro to remediate or otherwise manage the contamination.

8.1 REMEDIAL ACTION PLAN

Once the remediation objectives have been determined for the site, the QPro must prepare a RAP detailing the methodology for achieving these objectives as well as the proposed remedial approach.

The RAP must include contact information, including names of key personnel, other consultants and contractors (if applicable/available). Additional information will generally include the following:

- identify all contaminants of concern (COCs) and the media affected;
- summarize all data on contaminants identified during the ESA(s);
- identify the proposed remediation criteria and method(s) by which they have been derived;
- identify, quantify and characterize the contaminated media to be removed/treated or otherwise managed;
- summarize remedial options evaluated and the method used to select the preferred remedial strategy (if applicable);
- describe the selected remediation approach and its technical feasibility;
- detail an implementation plan, including a proposed schedule;
- discuss control measures to minimize fugitive air emissions, to protect surface water and groundwater, and to protect worker health and safety;
- identify the fate of residual contaminants proposed to be left in place (if applicable); and
- identify confirmatory sampling approach to ensure the remediation objectives have been met.

The RAP must be submitted to ECC for review and approval prior to its implementation. Where third-party properties are impacted, ECC will accept the assessment and remediation for third-party properties based on any appropriate criteria that is consistent with this Guideline.

8.2 RISK MANAGEMENT PLAN

It may not always be possible to remediate a site to a level that results in removal of all contamination in excess of either Tier 1 Criteria or Tier 2 Pathway Specific Criteria, or in some cases SSTLs. The feasibility of remediation may be constrained as a result of limitations in technology, safety concerns related to implementing the RAP, including structural integrity of building(s), limitations in available funding, ecological concerns, accepted operating practices of the industry, and/or the nature of the contamination. Residual risk describes the risk remaining at a site after the RAP or RMP has been implemented.

The RMP must be submitted to ECC for review and approval prior to its implementation.

8.2.1 Exposure Management

Both institutional and engineered controls can be effective in eliminating the exposure pathway between the source and the receptor. In some cases, both institutional and engineered controls may be combined on a site. When controls that limit the flexibility of the property use or have long-term obligations are placed on a site to minimize risk, ECC must be in agreement with the specific controls.

Where the future management of most of these measures lies outside the regulatory jurisdiction of ECC, the RP must assume long-term responsibility for ensuring that engineered controls are monitored and maintained.

8.2.1.1 Engineering/Physical Controls

Soil or groundwater contamination exceeding remediation criteria for a site (Tier 1 Criteria or Tier 2 Pathway Specific Criteria) may be left in place if appropriate engineering or physical controls have been implemented to ensure that receptors are not exposed to the contamination.

Engineered controls are constructed systems that require some degree of maintenance to remain effective. Engineered controls interrupt the pathway between the source and the receptor while allowing both the source and the receptor to remain on the site. Engineered controls can be passive or active mechanical systems. Examples of passive engineered systems include security fencing, soil, asphalt and concrete covers, caps or liners, building sub-floor vapour barriers/ ventilation systems, or groundwater hydraulic barriers. Examples of active mechanical systems include air exchange units, groundwater pumping systems, and potable groundwater treatment systems.

The following are considered minimum requirements related to engineering or physical controls that must be included in a RMP:

- a clear definition of the management/control objectives;
- physical controls must be appropriately designed, or otherwise determined by the QPro;
- demonstrated effectiveness of physical controls prior to closure;
- ongoing monitoring and inspection of physical control structures;

- frequency of scheduled inspection and documentation of results;
- how acceptable and unacceptable results will be determined;
- what procedures will be followed if unsatisfactory results are obtained; and
- when and how results will be communicated to ECC.

8.2.1.2 Administrative/Institutional Controls

Administrative/Institutional controls generally include municipal zoning and site-specific land use controls that state what type of receptors may occupy the contaminated site in the future. They essentially prevent certain types of exposure to receptors present at the site. Typically, this is achieved by a documented municipal zoning or site-specific statement which outlines the site's designated land use (i.e., residential/parkland use). Human occupancy of certain buildings may be excluded from all or part of the site to prevent unacceptable indoor air quality exposure risk. Potable groundwater wells or building construction may be prohibited or restricted to a non-impacted area of the site. In some cases, a site-specific institutional control may state no human occupancy or a limited number of occupancy days per year based on reasonable expectations of land use to be controlled by the site owner. Regulatory acceptance of such a scenario would normally be subject to certain conditions and would likely involve ECC and consultation with other stakeholders.

8.2.2 Long Term Monitoring

Generally, the main driver for developing Long Term Monitoring (LTM) plans is the need to ensure that risk management controls remain protective of human and ecological exposures. In general, LTM plan objectives may be grouped into one of four categories (USEPA, 2005):

- identification of changes in ambient conditions;
- detection of movement of COPCs;
- demonstration of compliance with regulatory requirements; or
- demonstration of the effectiveness of a particular risk management strategy.

A monitoring plan to support a RMP shall include (as a minimum) the following components:

- clear definition of the monitoring objectives and timeline;
- definition of parameters to be monitored or measured;
- when, where and how data is to be collected and analyzed;
- frequency of regulatory reporting;
- how acceptable and unacceptable results will be determined; and

- what procedures will be followed if unsatisfactory results are obtained.

LTM plans should be discussed with ECC and require the approval of ECC. Additional information on long term monitoring is provided in the [FCSAP Long-Term Monitoring Planning Guidance](#) (GOC, 2013).

8.3 WORKER HEALTH AND SAFETY

Construction/utility workers can potentially be exposed to COPC hazards in soil during the installation of underground utilities or other re-development activities. Worker education and training related to potential chemical hazards at work sites is required by WSCC, see Section 4.6.

The following risk management measures should be considered and implemented on a case-by-case basis:

- Personnel involved in future construction projects within impacted areas should be made aware of the potential hazards associated with the soil contamination that could be encountered.
- If deemed appropriate, a project-specific HASP should be developed by contractors or others who may be involved in ground disturbances within the impacted areas (prior to the start of work) to confirm that construction workers are educated on the nature of the hazards at the Site and are trained on how to prevent unacceptable exposures.

General mitigation measures to control construction worker exposures should consider the following:

- Exposure of construction workers can generally be mitigated through the use of appropriate site controls, personal protective equipment (PPE), monitoring and good industrial hygiene practices.
- PPE for the identified hazards typically includes use of gloves, coveralls and/or disposable clothing.
- Appropriate industrial hygiene practices typically include hand washing after working in contaminated areas, separate washing of potentially contaminated clothing, etc.
- A project-specific HASP should include the selection and use of appropriate PPE.
- If trench work is planned for areas impacted with organic compounds that could generate vapour risks, it is recommended that vapour readings be taken and health and safety risks be evaluated prior to work progressing.

Where exposure of workers is a potential concern, or for additional information on project-specific HASPs, the WSCC should be contacted.

9.0 STEP 4 – RAP/RMP IMPLEMENTATION

9.1 RAP/RMP IMPLEMENTATION

The RP and the QPro shall proceed with the approved RAP or RMP and submit monitoring reports to ECC on the approved schedule.

The RP must advise ECC if activities deviate from the approved RAP or RMP. ECC will assess the significance of any deviations and respond accordingly. In situations where predictions included in the RAP fail to be achieved, the RP might be required to re-evaluate Step 3 and revise the RAP or RMP.

9.2 REMEDIATION OF THIRD-PARTY PROPERTIES

In cases where contamination has migrated beyond the property boundary of the source property and has affected properties owned by others, these third parties become an active component within the Guideline Process. All contamination must be delineated to the applicable Tier 1 remediation Criteria specified in Appendix 5, including the assessment of off-site third-party properties where contamination has migrated from the source property.

In general, ECC will accept the assessment and remediation for any third-party property based on any appropriate remediation criteria or management measures that are consistent with the requirements of the Guideline.

The written consent of a third-party property owner is required for application of remediation criteria or risk management measures that would impact future maintenance costs or result in land use restrictions on the property.

9.3 CONFIRMATORY SOIL SAMPLES

Remedial excavation as the chosen method of remediation must be supported by confirmatory sampling to confirm that the remedial objectives established for the site have been achieved. Discrete samples must be collected from each excavation wall and floor by a QP/QPro. A minimum of 5 samples must be collected: one from each wall, and the fifth from the floor of the excavation. Samples must be collected within a depth of 0.25 m from a wall or excavation floor.

For excavations greater than 100 m², one wall sample must be collected for every 10 m in length and 3 m in depth and one floor sample must be collected for every 10 m in length and 10 m in width. If any of the characterization samples indicate the excavated material is highly contaminated, one wall sample must be collected for every 5 m in length and 3 m in depth and one floor sample must be collected for every 5 m in length and 5 m in width.

For excavations less than 100 m², one wall sample must be collected for every 5 m in length and 3 m in depth and one floor sample must be collected for every 5 m in length and 5 m in width.

For shallow excavations not exceeding 0.2 m in depth, step out samples are to be collected adjacent to the excavation boundary in lieu of wall samples at the same frequency as wall samples are to be collected. For excavations greater than 100 m², one wall sample must be collected for every 10 m in length or for every 5 m in length if any of the characterization samples indicate the excavated material is highly contaminated. For excavations less than 100 m², one wall sample must be collected for every 5 m in length. Floor samples are to be collected as outlined above.

Alternative site-specific confirmatory sampling procedures may be recommended by a QPro subject to ECC approval.

If an excavation must be backfilled prior to receiving confirmatory results and contaminant levels are found to be above the applicable land use criteria, the site may continue to be designated as a contaminated site.

The following requirements must be met to confirm remediation to close a site:

- In cases where remediation of soils will be completed, the schedule, location, and concentration of confirmatory sample results must be documented.
- Results of confirmatory sampling must demonstrate that the criteria established in the RAP have been met prior to completing the Closure Report.

The results of all confirmatory sampling must be included in the Closure Report and submitted to ECC for review.

9.4 WASTE MANAGEMENT

Contaminated soil or other materials that must be transported off-site for treatment and/or disposal are subject to the requirements outlined in the [Guideline for Hazardous Waste Management](#) (GNWT, 2017).

RPs and QPros are encouraged to consult the Guideline for Hazardous Waste Management to understand the roles and responsibilities of hazardous waste generators, carriers, and receivers, as it pertains to off-site transport, treatment or disposal of contaminated soil. Parties transporting hazardous waste in the NWT are required to complete a movement document with ECC to identify the type and volume of the waste as well as the generator, carrier and receiver.

Soil with concentrations below applicable Tier 1 Criteria for the source site does not require special consideration to remain on-site. However, excess soil which may also result from potential future development and cannot be accommodated within the site boundaries should follow procedures for off-site disposal, unless relocation to another property is otherwise approved by ECC. Soil quality should be compatible with the receiving site (similar land use and exposure pathways) or treatment/disposal facility.

Soil excavated for off-site disposal should be stockpiled and re-tested to confirm contaminant concentrations in soil if required by the receiving facility. Soil meeting the facility acceptance

criteria should be excavated and transported by an approved hazardous waste carrier to an approved soil disposal facility or other authorized location.

All hazardous waste streams as defined by the [Guideline for Hazardous Waste Management](#) must be managed appropriately and documented. ECC can be contacted for further clarification.

The characterization, storage, transportation, and disposal of all other non-hazardous wastes generated during remediation activities must be included in the Closure Report. Documentation to be included in a Closure Report shall include:

- field methodologies and controls used to manage materials on site and prevent dilution of wastes;
- measures taken to ensure stockpiled soils and water for disposal have been adequately characterized and appropriately managed;
- description of any control measures taken to address materials being discharged from the site (e.g., excavation dewatering); and
- manifests or manifest summaries which document all materials transported off-site.

Additional guidance on the requirements for off-site disposal of petroleum contaminated soil is provided in the [Guideline for the Design, Operation, Monitoring, Maintenance and Closure of Petroleum Hydrocarbon-Contaminated Soil Treatment Facilities in the Northwest Territories](#) (GNWT, 2020).

9.5 BACKFILL DOCUMENTATION

If imported backfill material is used during the restoration of a contaminated site, documentation must be provided in the Closure Report to confirm the following:

- a) source of the material;
- b) characterization to ensure backfill material does not create contamination (an accurate representation of COPC concentrations subject to source property historical activities); and
- c) volume of material.

If the backfill material used was generated on-site, documentation must be provided to confirm the following:

- a) adequate characterization to support quality necessary to meet site remediation criteria. In cases where contaminants have been identified in a stockpile, a sampling program must be conducted to determine an accurate representation of the contaminant concentrations in the entire pile. If a single soil chemistry description is to be applied to an entire stockpile, justification that the material is sufficiently homogeneous must be provided; and
- b) volume of material used.

9.6 RESTORATION

Apart from the documentation of backfill sources and quantities, other documentation of restoration activities is optional under the Guideline Process.

10.0 STEP 5 - SITE CLOSURE

Closure can be achieved by demonstrating that applicable Tier I Criteria or Tier 2 Pathway Specific Criteria or Tier 3 SSTL Criteria have been met in accordance with the Guideline.

A Closure Letter from ECC will only be issued where the level of remediation offers unrestricted future development or use within the particular land use designation (agricultural, residential/parkland, commercial, industrial, etc.).

10.1 CLOSURE REPORTING AND EXITING THE PROCESS

When the RP and QPro are satisfied that all the requirements of the RAP have been met, a Closure Report must be provided to ECC.

Upon review and acceptance of the Closure Report, ECC will conclude the Guideline Process by issuing a Closure Letter advising that no further remedial action is required and that the site is no longer classified as a contaminated site.

10.2 RISK MANAGED SITES

There is no current mechanism for closure for a site that has identified requirements for on-going risk management controls to protect human health and the environment after other remedial actions are complete.

The following will be required by ECC prior to acceptance of a RMP:

- written commitment from the RP to maintain and operate any engineered systems as long as necessary to fulfill their intended function and preserve human health and environmental risks at acceptable levels; and,
- written acceptance that the controls are necessary and implemented, from all affected stakeholders including the RP, the landowner and any party entitled to use the site.

10.3 REGULATORY CLOSURE FOR THIRD PARTY PROPERTIES

ECC may issue a Closure Letter for an impacted third-party property where it has been demonstrated that the remediation meets the requirements of the Guideline.

11.0 CONCLUSION

This Guideline is intended to provide information on contaminated site assessment and remediation. Upon reviewing this Guideline and verifying the existence of a contaminated site, the RP must contact ECC before proceeding through the Guideline Process.

For more information, contact:

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Appendix 1

Legislative Framework

Appendix 2

Glossary of Terms

Appendix 3

Various Industrial Activities and Contaminants of Potential Concern

Appendix 4

Best Practices for Environmental Site Assessment

Appendix 5

Tier 1 and Tier 2 Remediation Criteria for Soil

Appendix 6

Remediation Criteria for Arsenic in Soil for Yellowknife and Inuvik