Alberta Environmental Site Assessment Standard

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PREFACE

This document *Alberta Environmental Site Assessment Standard* ("the Standard") is intended to provide a consistent outline of minimum requirements for environmental site assessments (ESAs) in Alberta. It has been developed to assist in the planning, implementation, and reporting for Phase 1 ESAs, Phase 2 ESAs and confirmatory investigations, and provides guidance on Alberta Environment and Parks' (AEP; "the Department") and the Alberta Energy Regulator's (AER; "the Regulator") requirements.

Some of the activities discussed in this Standard may require approval from the Department, the Regulator, other regulatory bodies, or may have other legislative requirements. Persons using this document must ensure that all appropriate approvals are obtained and the applicable requirements followed.

This document does not take into account site-specific conditions or the development of improved practices in conducting ESAs. It is not a substitute for the use of professional judgement in conducting ESAs. The sampling and ESA requirements and procedures to be followed for any particular site depend on the specific circumstances of the site and must be determined by the professional responsible for conducting the ESA.

The Department is committed to updating the information in this document, as necessary, when well established new practices for ESAs become available. Direct suggestions and comments for future revision of this document to the Department's Land, and Policy Branch, 10th Floor, Oxbridge Place, 9820-106 Street NW, Edmonton, Alberta, T5K 2J6. Email: Land.Management@gov.ab.ca

DEFINITIONS

For the purpose of the Alberta *Environmental Site Assessment Standard*, the following definitions apply.

Area(s) of Potential Environmental Concern (APEC): any area on, in or under the site and surrounding area where one or more contaminants of potential concern may be present, as identified through an initial Phase 1 or other investigation, and that has not been ruled out through subsequent Phase 2 investigations.

Contaminant(s) of Potential Concern (CoPC): any substance that is identified as potentially present on, in or under the site and surrounding area that, if released, has the potential for adverse effect.

Environmental Site Assessment (ESA): an investigation in relation to land to determine the environmental condition of property. It includes a Phase 1 environmental site assessment, a Phase 2 environmental site assessment and confirmatory investigation.

First Developed Use: the first development for human activity at the site for which there is potential for release of a contaminant of potential concern.

1.0 INTRODUCTION

1.1 Purpose of the Standard

The purpose of the *Alberta Environmental Site Assessment Standard* ("the Standard") is to provide minimum requirements for Environmental Site Assessment (ESA) site characterization and reporting at contaminated or potentially contaminated sites in Alberta. The Standard is intended to be used by site managers and contracted environmental consultants, including professionals and project managers who are responsible for planning ESA projects and carrying out the review of ESA reports as well as other environmental practitioners who are responsible for implementing site investigation programs.

The Standard supports ESA information provided in the *Contaminated Sites Policy Framework* (ESRD, 2014) and provides more details on reporting requirements where ESAs are required to be provided to the Department or the Regulator. The document informs on Director requirements under *Part 5, Substance Release* in the *Environmental Protection and Enhancement Act* (EPEA; Government of Alberta, 2006) as it relates to Section 111, Manner of Reporting.

This Standard replaces the draft *Alberta Environmental Site Assessment Guidelines* (AENV, 2008).

1.2 Scope of the Standard

This Standard is meant to be used in conjunction with Alberta's existing regulatory framework as outlined in the EPEA and Regulations. This Standard supports documents such as the *Contaminated Sites Policy Framework* (ESRD, 2014), *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (Alberta Tier 1 guidelines; AENV, 2007a, as amended), *Alberta Tier 2 Soil and Groundwater Remediation Guidelines* (Alberta Tier 2 guidelines; AENV 2007b, as amended), and individual approvals or codes of practice that may apply to a site.

The Standard addresses site evaluation and reporting processes, which include the following:

- Phase 1 ESA;
- Phase 2 ESA;
- confirmatory investigation; and
- reporting.

This Standard is not a stand-alone document and does not provide specific guidance on site characterization methods for conducting an ESA. It is up to the professional and the site owner or operator who are responsible for the project to ensure adequate documented quality assurance and quality control (QA/QC) protocols are in place so that the conceptual site model (CSM), data collection, and the final report represent an accurate reflection of the risks associated with contaminants of potential concern (CoPCs) that might be present at the site. Further guidance may be found in *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment* (CCME, 2016), or *Federal Contaminated Site Risk*

Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Version 2.0 (Health Canada, 2012).

1.3 Environmental Site Assessment Process

The ESA process is often implemented in phases. Different terminology is used to describe these phases, but more important are the underlying concepts.

The first phase, Phase 1 ESA, involves an evaluation of historical and current land use. Site reconnaissance and other information gathering techniques assess whether a site is or may be subject to potential or actual CoPCs. Areas of potential environmental concern (APECs) and associated CoPCs may be identified through a Phase 1 ESA and historical review. A Phase 1 ESA does not include a sampling and analysis component.

Subsequent intrusive phases of investigation (i.e., Phase 2 ESAs) are designed to obtain quantitative analytical information regarding the nature and extent of CoPC. In a Phase 2 ESA, delineation of APEC and quantification of CoPC concentrations are used to assess risks and design remedial options. Data collected during a Phase 2 ESA must be compared to appropriate soil, sediment, surface water, and groundwater remediation guidelines. Exceedance of guidelines is a trigger for focused remediation, risk management options or further site and risk characterization of CoPCs.

1.4 Legislation

Two acts, the EPEA, and the *Water Act* (Government of Alberta, 2000) form the legislative basis of the Department's policies on the management of contaminated soil and groundwater. Regulatory requirements related to substance release and remediation and reclamation are found in the EPEA. The EPEA allows the Minister to establish guidelines and regulations.

The EPEA prohibits the release of substances in an amount that causes, has caused or may cause adverse effect. "Release", "substance", and "adverse effect" are defined in the EPEA. Whenever a release causes, has caused or has the potential to cause an adverse effect, appropriate remedial measures must be taken. An ESA is often the first step in determining whether a substance release has the potential to cause an adverse effect and what remedial measures must be implemented in order to protect the environment.

1.4.1 Substance Release Provisions

Environmental contamination is caused by accidental or deliberate release of substances to the environment. Regulatory concerns arise whenever the released substances are capable of impairment or damage to human health, safety, or the environment.

Under Part 5 of the EPEA, observed substance spills and release events create an immediate obligation to report the release. In addition, the person responsible must repair, remedy, and confine the effects of the release. Action must be taken to determine the nature and extent of the release, its impacts, and to remediate, manage, remove, or otherwise dispose of the CoPCs in such a manner as to prevent an adverse effect, and to restore the environment to a condition satisfactory to the Director. Removing or controlling the source of the release to

confine the effect of the substance shall occur simultaneously with reporting the release to the Department or the Regulator and other appropriate agencies. Observed releases are immediately identifiable. Other situations can lead to suspected CoPCs at a site. Former industrial or commercial activities at a site discovered through historical corporate records, or physical evidence or indicators such as stressed vegetation, soil discolouration, or offensive odours may be the first indication of the presence of CoPCs on a site. Where this leads to *confirmation* of the release that may or is causing adverse effect, the duty to report is the same as found in the substance release provisions.

1.4.2 Release Reporting

The Department has published several documents relating to release reporting. Sections 110 and 111 of EPEA provide the basis for Alberta's *Release Reporting Regulation* (Government of Alberta, 1993), which stipulates what must be reported, when, how, and to whom. *A Guide to Release Reporting* (AENV, 2005) provides further information about the Department's and the Regulator's requirements.

1.4.2.1 Initial Report

Any spill, release or emergency that may cause, is causing, or has caused an adverse effect to the environment must be reported immediately to the Department or the Regulator by calling the 24-hour Environmental Hotline at 1-800-222-6514 or the Industry Reporting phone number (as per the approval clause). Affected third parties must be notified that their site could be impacted if it is suspected that a CoPC has migrated off site. *A Guide to Release Reporting* (AENV, 2005) provides further clarification.

1.4.2.2 Seven-Day Report

Within seven days of the initial report, a written report must be submitted to the Director. The Director may waive the requirement for a written report if the initial report contained sufficient information and no adverse effects are likely from the release. A waiver may be requested at the time the initial report is being made. Unless and until the Director has granted a waiver, a written report must be submitted within seven days.

1.4.2.3 Additional Information Required by the Director

Pursuant to section 4(3)(h) of the *Release Reporting Regulation*, the Director may require additional information for the release. This document forms the basis of Director requirements under the substance release provisions where additional information in the form of a Phase 2 ESA is required.

2.0 STAKEHOLDER ROLES AND RESPONSIBILITIES

2.1 Responsibilities of the Proponent

For the purpose of this document, the proponent includes the "person responsible" under the EPEA and any other person who initiates an ESA. As directed in EPEA (s. 110 to 112), the person responsible, the owner of the substance, or the person having control of the substance is required to report the substance release to the Director and other local authorities or relevant third parties; and take timely remedial measures. Where an ESA must be submitted to the Department or the Regulator, as part of a substance release report, the proponent must fulfill all responsibilities of the client as specified in the Phase 2 ESA standard published by the Canadian Standards Association (CSA) *Phase 2 Environmental Site Assessment* (2000, as amended). Where the Phase 2 ESA is part of a closure requirement for a reclamation or decommissioning application, these requirements also apply.

In addition, the proponent must:

- Ensure all Acts, Regulations, procedures, and other regulatory guidance in Alberta are followed during the work;
- select appropriate environmental professionals ("the Professional") and/or competent practitioners for the ESA, and where CoPC(s) is/are found, for subsequent remediation or risk management of sites;
- ensure full disclosure of any known condition about the site that may affect the outcome of the ESA, remediation or management work. This could include specialized knowledge or experience related to the site, disclosure of relevant records, reasons for the proponent to request an ESA performed, or any other specialized knowledge that may be important to the professional to ensure that all appropriate documents are submitted to the Department or the Regulator, and all affected third parties. The information must be accurate, consistent, and complete;
- ensure the scope of work and deliverables are defined adequately to identify all likely APECs and CoPCs;
- where CoPC(s) is/are found, ensure that the scope of work is adequate to remediate or otherwise manage risks associated with the release; and
- ensure site environmental conditions are suitable for the intended use and meet all legal conditions and requirements.

2.2 Responsibilities of the Professional

Environmental reports, such as ESAs, submitted to the Department or the Regulator required to assess a substance release require a Professional Declaration with a Professional's signature and stamp/seal or professional registration number. Reports submitted to the Department or Regulator as part of a Reclamation Certificate Application or Remediation Certificate Application require a signed/stamped *Professional Declaration* (ESRD, 2012c).

Professionals must be practicing members in good standing with an organization that has professional legislation in Alberta that explicitly allows them to conduct remediation and reclamation work as defined in *Professional Responsibilities in Completion and Assurance of Reclamation and Remediation Work in Alberta - Joint Practice Standard* (Alberta Institute of Agrologists et al., 2012).

Members of one of the following seven professional organizations must be involved in and sign-off on all ESA and remediation work:

- Alberta Institute of Agrologists (AIA)
- Alberta Society of Professional Biologists (ASPB)
- Association of the Chemical Profession of Alberta (ACPA)
- Association of Professional Engineers and Geoscientists of Alberta (APEGA)
- Association of Science and Engineering Technology Professionals in Alberta (ASET)
- College of Alberta Professional Foresters (CAPF)
- College of Alberta Professional Forest Technologists (CAPFT).

The Professional must maintain professional competency as outlined in *Professional Responsibilities in Completion and Assurance of Reclamation and Remediation Work in Alberta- Joint Practice Standard* (Alberta Institute of Agrologists et al., 2012) and have a minimum of five-years verifiable experience related to the *Competencies for Remediation and Reclamation Advisory Committee Recommendations Report* (AENV, 2006). In the execution of a Phase 1 or Phase 2 ESA, a professional shall use due care, diligence, and judgement that is consistent with the charter requirements of the seven recognized professional organizations. Persons who conduct Phase 1 or Phase 2 ESAs shall possess knowledge based on an appropriate combination of formal education, skills, experience, and training in order to provide a technically sound and rational ESA. The Professional shall remain objective and free from influence throughout the ESA process.

When an ESA must be submitted to the Department or the Regulator, the Professional must follow procedures as specified in the Phase 2 ESA standard published by the CSA *Phase 2 Environmental Site Assessment* (2000, as amended). Where a release is discovered as part of a Phase 2 ESA, the Phase 1 ESA becomes supporting documentation for the Phase 2 ESA. The Professional must follow procedures outlined in the Phase 1 ESA standard published by the CSA *Phase 1 Environmental Site Assessment* (2001, as amended).

In addition, the Professional will:

- Follow relevant regulatory requirements in provincial and municipal governments for ESA, remediation, risk management, and reclamation;
- not undertake any activity that she or he is not qualified (and/or licensed/permitted, where applicable) to perform;

- promptly communicate to the proponent any limitations imposed on the assessment resulting from the time frame and the scope of work, the environmental condition of the site as determined by the ESA, and any significant deviations from the original scope of work, prior to carrying out these new activities;
- disclose possible and perceived conflicts of interest to the client and other relevant parties before entering into agreement for work;
- provide sign-off for the work that was performed or coordinated;
- ensure that any limitations imposed on the ESA or deviations from the initial scope are clearly communicated in the report;
- carry adequate insurance throughout the duration of the ESA, including but not limited to general liability and errors and omission insurance; and
- ensure that any practitioners or contributing professionals working under the professional's supervision are qualified and adhere to all of the above requirements.

3.0 PHASE 1 ENVIRONMENTAL SITE ASSESSMENTS

3.1 Introduction

This section provides the minimum requirements for conducting Phase 1 ESAs in Alberta.

When a Phase 1 ESA must be submitted to the Department or the Regulator as part of a substance release report, the ESA must, at a minimum, meet standards set by the CSA *Phase 1 Environmental Site Assessment* (2001, as amended) and be in the appropriate format.

When a potential substance release has been confirmed and exceeds the Alberta Tier 1 guidelines (AENV, 2007a, as amended) or Alberta Tier 2 guidelines (AENV, 2007b, as amended), the results of any supporting Phase 1 ESA previously conducted become part of the reporting requirements for the substance release, since they provide information regarding the scope of the Phase 2 investigation. As such, a Phase 1 ESA may be required by the Department or the Regulator to support a Phase 2 ESA, an application for a remediation certificate, or an application for a reclamation certificate.

When the Phase 2 report was prepared as part of a release-reporting requirement and the substance release was not discovered through the normal course of a Phase 1 and Phase 2 investigation process, the requirement to conduct a Phase 1 does not automatically become part of the reporting requirements. Information that is submitted as part of the release reporting would be considered sufficient for identifying the scope and area(s) of potential environmental concern.

When a Phase 2 ESA is intended to assess all APECs and CoPCs, the Phase 1 ESA becomes necessary to determine the necessary scope of the Phase 2 investigation, and becomes part of the assessment requirements.

When a Phase 1 ESA is submitted as part of a reclamation application, it must, at a minimum, meet the standard specified in the *Wellsite Reclamation Certificate Application Form* (AENV, 2010). This section is intended to be generic to all Phase 1 ESAs. It does not replace forms or guidance that have been developed for specific industrial applications such as the *Wellsite Reclamation Certificate Application Form* or the *Requirements for Operational Soil Monitoring Program Proposal*, as described in the *Soil Monitoring Directive* (AENV 2009b).

3.2 Phase 1 ESA Required Components

The primary objective of a Phase 1 ESA is to determine whether a particular site is, or may be, contaminated. It is carried out by the proper collection and evaluation of sufficient information for the APECs. A complete Phase 1 ESA is critical for a successful Phase 2 ESA and any subsequent remediation activity.

The main required components of a Phase 1 ESA are:

- Scope;
- a records review;
- a site visit;

- interviews; and
- reporting.

3.2.1 Scope

The scope must be included in any report submitted to the Department or the Regulator as part of an ESA. The scope of a Phase 1 ESA shall involve undertaking an investigation and interpreting and reporting on the information gathered. As a minimum, the scope will identify:

- The party for whom the Phase 1 ESA is being prepared;
- the subject site; and
- the activities to be completed for the components of the Phase 1 ESA.

3.2.2 Records Review

The records review shall be designed to collect data on past activities on the site that may have contributed to potential contamination. Efforts must be made to obtain available records related to known or possible contamination of the property from the first developed use to the time of the Phase 1 ESA. Information gathered from a records review must be reviewed and reported in the Phase 1 ESA back to the first developed use for the site.

Since neighbouring properties may affect or be affected by the site being assessed, appropriate search distances must be determined and documented by considering:

- Current and historical land use on the subject site and on neighbouring properties;
- known or suspected contamination on the subject site and on neighbouring properties; and
- where known, consideration shall be given to include planned future use of the site, rezoning applications, or official plans for development.

Table 1 provides a summary of requirements that are common for a Phase 1 ESA. For a Phase 1 that is required, the following records shall be reviewed and documented within the Phase 1 ESA.

3.2.2.1 General Records Review

A general records review for the subject property will include, as a minimum, the following records from the first developed use to the time of the Phase 1 ESA:

- **Land title search**: Land title searches provide information on the chronology of ownership and any interests on title, such as upstream oil and gas surface leases or utility right(s)-of-way. Land Title searches summarize information on the current and past owners of the site. A Land title search must be performed to contribute to assessing the environmental condition of a site.

- **Other environmental site assessment reports or relevant information**: All relevant previous reports, including any relevant Phase 1, Phase 2, risk assessment, risk management or confirmatory reports, will be reviewed and information taken into consideration when preparing the final report. The amount of time since the previous report was prepared, changes in the conditions of the site since the assessment was conducted, types of activities that occurred at the site, conditions in the areas surrounding the site, and changes in environmental legislation will need to be considered when evaluating whether information is relevant to the current Phase 1. Information is to be summarized and referenced as part of the Phase 1 ESA.
- **Site plans:** Site and building plans of past and current property use. Where there are activities that are relevant to areas of potential concern that are documented in other records available in historically archived sources, these are to be included here. Locations of sumps, hydraulic lifts, vehicle or equipment maintenance areas, chemical storage areas, etc., are included in this inventory.
- **Fire insurance plans:** Fire insurance plans are to be included for any information relevant to CoPCs and APECs.

The following records will be reviewed for the property of interest and the adjacent properties

- **Municipal Land Use Plans**.

3.2.2.2 Physical Settings Reviews

The following information will be reviewed for the site that is the subject of the Phase 1 investigation and to a minimum of 300 m from the property:

- **Aerial Photographs**: Photographs must be of the appropriate scale and date, based on the information required. For sites where there are significant changes or disturbance, special attention must be paid to ensure any changes are reflected in aerial photographs from periods prior to development, initial development, and current day.
- **Soil, Hydrogeological, Geological and Geotechnical Reports:** Appropriate physical reports including existing soil, geological and geotechnical reports and maps, topographic maps shall be obtained and reviewed.
- **Well Records:** Any pertinent well records, including Provincial Well records.

3.2.2.3 Source Information

Source information may include any information that is relevant for identifying specific sources of CoPCs that are part of official records. As a minimum, the following sources shall be reviewed for the property of interest and a minimum of 300 m from the property.

- **National Pollutant Release Inventory**.
- **Landfills**: Any information on existing or historical landfills.

The following information shall be reviewed for the property of interest.

- **Regulatory records:** This includes past, pending and outstanding or continuing prosecutions, violations of environmental statutes, regulations, by-laws, approvals, and permits that may impact the condition of the site, Environmental Protection Orders, Environmental Orders, release reports, complaints related to environmental compliance that may impact the condition of the site spills, discharges of contaminants or inspections or any other reports submitted to relevant regulatory agencies.
- **Waste management records**.
- **Official Instruments:** Any official instruments including approvals, registration, certificates including remediation, reclamation certificates, storage tank registrations, plant operating permits or other official certificates that pertain to activities at the site and that may impact the condition of the site.

3.2.2.4 Operation or Company Records

For commercial and industrial properties, company records shall be examined. Exact documents will be dependent on the operation. Useful documents include, but are not limited to:

- building plans;
- permit records;
- landowner lease agreements;
- oil and gas well files, including drilling, production and abandonment records;
- production and maintenance records (e.g., process control diagrams);
- spill reporting records;
- asbestos surveys;
- site utility drawings;
- emergency response or contingency plans, including spill reporting plans;
- inventories of chemicals and their usage (e.g., WHMIS, MSDS);
- environmental monitoring data;
- environmental audit reports;
- liability assessments; and
- current and previous land use.

3.2.2.5 Other Records

Other records, such as site use records, tax rolls, municipal archives, photographs, or telephone directories, and newspapers, may also provide useful information for the Phase 1 ESA.

3.2.2.6 Regulatory Information

In the event that an agency does not respond by the report date, documented proof shall be provided demonstrating that a reasonable attempt was made to obtain the information.

3.2.3 Site Visit

A site visit shall be conducted as part of the Phase 1. Ideally, this is after completion of the records review, so the site visit can be targeted based on the records review.

Disturbed areas, as revealed in an aerial photograph, must be visually inspected for evidence of contamination. Direct observation of the subject site shall be conducted. The methods used to make the observations, general limitations (including those imposed by physical obstructions like adjacent buildings, bodies of water, and paved areas) and limiting conditions (e.g., snow or rain, denied access, inaccessible areas, and safety considerations) shall be documented.).

Observations shall include current uses or evidence of past uses of the site that involve such activities as the use, treatment, storage, disposal, and generation of hazardous materials, landfilling, or the storage of wastewater in impoundments. The current or past uses of the adjoining and surrounding site shall also be considered.

Where observed, hazardous materials (including wastes) and unidentified substances shall be listed, and relative quantities of material, types of containers, and storage conditions listed and described. The approximate age, size, and, where possible, contents of storage tanks and containers (e.g., drums, totes, and pails) shall be identified. Abandoned, former and current aboveground and underground storage tanks, vent pipes, fill pipes, access ways, secondary containment, and other infrastructure associated with tank installations shall be identified and described.

Odours, discolouration, and their possible sources shall be described. Sources of potable water and sewage disposal for the site shall be visually inspected and described. Potential receptors, distance to receptors, and impact to receptors shall be identified and described.

3.2.3.1 General Description of Structures

A general description of structures and other improvements to the site shall be provided. This description shall include a description of the number of buildings, as well as the estimated age, size, number of storeys and location, and are to be confirmed with information from the records review.

3.2.3.2 Interior Observations

The interior of structures on the site shall be inspected for indicators of contamination, such as heavy stains, vapours from volatile chemicals, or large cracks on the floor or sump where process chemicals are used or stored. Buildings on industrial sites shall be inspected for spill containment and separation from the soil (e.g., concrete floors with grated sewers). Unless access is available, it is not necessary to look under floors, above ceilings, or behind walls. Within reason, all accessible rooms within the structures shall be inspected.

3.2.3.3 Heating and Cooling Systems

Heating and cooling systems shall be identified and described in terms of the energy (fuel source) and methods used to release or dispose of waste products (e.g., combustion gases and ash).

3.2.3.4 Staining

Stains on floors, walls, or ceilings shall be identified and described. Where practical, the areal extent of the staining shall be identified and the likely spill source shall be described. The presence of cracks, proximity of floor drains and catch basins, or any other opportunities for CoPCs to migrate away from a source shall be described. Stained materials (e.g., soil and asphalt) shall be identified and described.

3.2.3.5 Drains and Sumps

The location and condition of current and former floor drains and sumps shall be noted. The frequency of sediment removal from drains and sumps and the location of discharge shall also be described where known.

3.2.3.6 Mechanical Equipment

The presence and, where possible, the condition of equipment, such as hydraulic hoses, elevators, or in-ground vehicle hoists, shall be identified and described.

3.2.3.7 Exterior Observations

The exterior structures on the site shall be observed for indication of contamination. This inspection shall include an inspection of the exterior surfaces of structures (e.g., the base of wall surfaces, the roof in some cases) and of the grounds in most cases.

3.2.3.8 Observation of Adjoining Properties

The grounds of the adjoining properties and associated structures shall be observed from the site and from publicly accessible vantage points.

3.2.3.9 Topographic, Geological and Hydrogeological Conditions

The topographic conditions of the site and surrounding area shall be observed and noted. Where exposure of the subsurface exists (e.g., berms, trenches, pits, and ponds), these shall be described and compared with a general description of the geologic and hydrogeological conditions, and drainage patterns provided.

3.2.3.10 Wells

Visible abandoned boreholes, test pits, wells, and existing wells (e.g., water, oil, gas, and disposal) shall be identified and described on site and off site. Evidence of drilling waste or soil cuttings shall be identified.

3.2.3.11 Storage Tanks and Process Vessels

All existing, abandoned or removed infrastructure, such as storage tanks or process vessels used for chemicals, process water, fuel, pesticides, drilling mud, and wastes, shall be identified and described.

3.2.3.12 Waste and Sewage Disposal

The method of waste and sewage disposal shall be identified and described. This includes the locations and conditions of the waste and sewage systems, such as landfills, septic systems, or cesspools on the site.

3.2.3.13 Pits and Lagoons

Pits and lagoons on the site and on adjoining properties shall be identified and described, particularly if they have been used in connection with waste disposal or waste treatment. It must also be noted if these structures have been constructed with geo-membranes or other containment techniques. This information may be corroborated from/with site file review information and/or interviews.

3.2.3.14 Stressed Vegetation

The locations and extent of stressed vegetation shall be identified and described. Stressed vegetation shall be inspected on adjacent properties, where applicable, as the nature of subsurface CoPCs may affect off-site properties and not affect any vegetation on the site.

3.2.3.15 Fill

Areas that appear to have been filled or graded by non-natural causes (or filled with material of unknown origin) shall be identified and described and supported with analytical results confirming that any soil imported to the property meets applicable criteria and/or guidelines.

3.2.3.16 Wastewater

Wastewater or other liquid discharge shall be identified and described.

3.2.3.17 Watercourses, Ditches, or Standing Water

Surface water features (e.g., ditches, streams, rivers, ponds, and lakes) on and off site shall be identified and described (i.e., whether they are permanent or intermittent). Ephemeral water bodies or low areas and depressions in the ground surface shall be noted, often using high water marks or vegetation growth patterns.

3.2.3.18 Roads, Parking Facilities, and Rights-of-Way

Public thoroughfares, crossing or bordering the site, shall be identified.

3.2.3.19 Special Attention Items

CoPCs, including, but not limited to, shall be identified:

- Polychlorinated biphenyls (PCBs);
- naturally occurring radioactive materials (NORMs);
- asbestos-containing materials (ACMs);
- lead;
- mercury;
- ozone-depleting materials; and
- urea foam formaldehyde insulation (UFFI).

These substances and other conditions (e.g., radon, mould, noise, electric and magnetic fields, and vibration) require special attention because of heightened public concern or specific environmental legislation.

3.2.4 Interviews

Interviews are used to corroborate the information gathered in the records review and site visit or provide information useful for planning the site visit. Efforts shall be made to interview a representative number of persons knowledgeable about the nature and history of the site. These interviews must include, at a minimum, but are not limited to: the current landowner, occupant, and a facility operator who is familiar with the site. Additional interview participants may be included to gain additional information regarding current and past activities and events that may affect environmental conditions at the site.

The questions to be asked in interviews pertain to current and past activities and events that may affect environmental conditions at the site.

Questions may be asked in person, by telephone, or in writing, at the discretion of the professional. However, face-to-face communication is the preferred method, as this reduces the possibility of misinterpretation.

In the event that the interview is incomplete or no response is provided, a reasonable effort shall be made to obtain a response with a follow-up telephone call or written request. Incomplete or nil answers shall be identified in the Phase 1 ESA report.

3.2.5 Reporting

The Phase 1 ESA report shall consist of a written document with a summary of the objectives, approach, findings, and conclusions and recommendations.

The report shall include an evaluation of the findings obtained in the records review, site visit, and interviews. The information shall be presented in a manner designed to help the reader (e.g., client, reviewer) understand the significance of the findings by:

- identifying all APECs on the site that are associated with current and historical activities at the site and on neighbouring properties. The CoPCs associated with each APEC must also be identified;
- clearly identifying areas of actual or potential contamination (APECs) and the basis for all findings, including nil findings;

- identifying potential receptors at risk both on and off the site; and
- recommending whether a Phase 2 ESA is necessary or not.

The report shall include detailed documentation and evaluation of the data and shall be complete, so that it is a stand-alone document. The report shall document:

- rationale explaining any deviations from the main components of a Phase 1 ESA,
- any enhancements, as agreed upon in the scope of work, and
- all limitations encountered in the Phase 1 ESA, including those tasks that were not performed due to limiting conditions.

3.2.5.1 List of Professionals

A list of all professionals who oversaw or performed components of the Phase 1 ESA, including role undertaken, qualifications, organization, and contact information shall be provided.

3.2.5.2 Signatures and Qualifications

The original signature and stamp or professional registration number for the professional responsible for the Phase 1 ESA, confirming the findings and conclusions contained therein, shall be provided.

3.2.5.3 References and Supporting Documentation

The documentation, including references and key exhibits, to support the findings and conclusions contained in the report, shall be provided. Applicable federal, provincial, and municipal legislation and published guidelines used as a basis for findings or conclusions in a Phase 1 ESA shall be referenced in the ESA report.

Examples of supporting information may include, but are not limited to: drawings, figures, tables, photographs, plans, logs, and appendices, as needed to describe and verify the information contained in the ESA report.

Table 1: Summary of records review information related to the property of concern and surrounding properties.

Records	Area Covered		
	Phase 1 Property	Adjacent Properties	Within 300 metres from Phase 1 property
General			
Land title search	x		
Other Environmental Site Assessment reports or relevant information	x		
Site plans, other relevant information for APECs	x		
Fire insurance plans	x		
Municipal land use plans	x	x	
Source Information			
National Pollutant Release Inventory	x	x	x
Records concerning environmental incidents, orders, offences, spills, discharges of contaminants or inspections	x		
Waste management records	x		
Any reports submitted to relevant regulatory agency	x		
Petroleum Tank Management Association of Alberta registration, retail fuel storage tank information	x		
Landfill information	x	x	x
Official instruments including remediation certificates or other certificates	x	x	
Physical Settings Review			
Aerial photographs	x	x	x
Topographic maps	x	x	x
Physiographic maps	x	x	x
Geological maps	x	x	x
Well records	x	x	x
Operation records			
Regulatory permits or records related to APECs	x		
Material safety data sheets	x		
Underground utility drawings	x		
Inventories of chemical uses and chemical storage areas	x		
Inventory of aboveground and underground storage tanks	x		
Environmental monitoring data including soil or groundwater monitoring reports, as required	x		
Waste management records	x		
Process, production and maintenance documents related to APECs	x		
Any records of spills or discharges of CoPCs	x		
Emergency response or contingency plans	x		
Environmental inspection or audit reports	x		

4.0 PHASE 2 ENVIRONMENTAL SITE ASSESSMENTS

4.1 Introduction

Information provided under this section applies to the ESA components that include initial intrusive screening level sampling, comprehensive delineation of contaminated areas, and confirmatory sampling investigation after remediation.

Where a release has occurred, the Phase 2 ESA report is often a requirement for delineation of the release and determining potential for adverse effect and as such, becomes part of the Director requirement for reporting under Part 5 of the EPEA.

The steps required for full delineation will vary but the requirement for full delineation does not change. The site assessment process may be conducted in phases. Alternatively, aspects of remediation, source control or exposure control may be undertaken concurrently or prior to complete delineation. While these approaches are consistent with this standard, the site assessment cannot be assumed to complete the requirements for delineation and risk assessment until contaminant delineation has been completed. For instance, where excavation is conducted as part of remediation prior to complete site assessment but post-excavation samples fail to comply with Alberta Tier 1 or Alberta Tier 2 guidelines, full delineation of the remaining contamination must be undertaken and used to develop further remediation, risk assessment or exposure control actions related to the remaining contaminants. Adequate delineation provides information needed to support appropriate decisions about contaminant remediation and management.

4.2 Purpose of Phase 2 ESAs

A Phase 2 ESA must determine, through intrusive sampling, the presence or absence of CoPC(s) at a site, and the type, extent, degree, and approximate volume of contamination at the APEC(s). Where CoPC(s) and APEC(s) are identified through an initial Phase 2 investigation, a more detailed Phase 2 ESA involving full delineation of the contaminated area(s) is required as defined in Alberta Tier 1 and Tier 2 guidelines (AENV, 2007a; AENV, 2007b, as amended).

Delineation programs must be extensive enough in both horizontal and vertical directions to enable the proper assessment of all applicable exposure pathways and receptors. Where this includes risk to the groundwater pathway or surface water receptors, delineation will include characterization of the significant surficial and bedrock geology unit contributing to lateral or vertical groundwater flow to a depth consistent with the scale of the hydrogeological assessment required. Delineation is considered complete when measured concentrations are consistently less than Alberta Tier 1 guidelines or Alberta Tier 2 guidelines developed using the pathway exclusion approach.

Where contaminant concentrations in soil or groundwater exceed the risk-based endpoints at the property boundary, delineation will only be considered complete when the extent of the contamination is assessed past the property boundary and sampling points in the appropriate media demonstrate compliance with the governing applicable Alberta Tier 1 or Tier 2 guidelines.

Once complete, the environmental site assessment must be extensive enough to review the site information, summarize the site conditions, and update the conceptual site model. The report must summarize the relevant site information from a risk perspective, identify issues that may pose unacceptable risks, and facilitate the evaluation of the exposure scenarios. This would include an evaluation of all CoPCs, APECs, human and ecological receptors, and exposure routes, including preferential pathways. At the completion of a Phase 2 ESA, the Professional must be able to conclude, at a minimum, that either:

- The ESA has provided sufficient information to support that there is no reasonable basis to suspect a substance release has occurred at the site that has caused, is causing, or may cause adverse effect; or
- the ESA has confirmed a substance release has occurred at the site, and further assessment, remedial measures or exposure control measures are required.

If the information collected through the ESA is insufficient for the professional to reach either of these conclusions, the professional, the Department and/or the Regulator may recommend additional intrusive assessment.

4.3 Scope

The Phase 2 ESA must include a scope or a description of the work to be performed. The scope shall be developed by the professional and will establish the methods and work tasks that achieve the Phase 2 ESA objectives. The description must provide the rationale for sampling locations and testing parameters along with identification of selected methods and appropriate QA/QC measures.

4.4 Phase 2 ESA Required Components

The main components of a Phase 2 ESA are:

- Reviewing existing Phase 1 ESA and previous Phase 2 ESAs, if any, and other background information;
- developing a Conceptual Site Model (CSM);
- planning a site investigation, including development of sampling plans;
- conducting site investigations;
- interpreting and evaluating of the data gathered during investigations; and
- summarizing conclusions and, at a minimum, providing interpretations of the data that will justify one of the two conclusions noted in section 4.2.

4.4.1 Review of Existing Information

The following information must be reviewed during the planning phase of a Phase 2 ESA:

- Previous ESAs (the Phase 1 ESA and any previous Phase 2 ESAs) and any previous site remediation reports (information may require validation, and any limitations or inaccuracies in the previous information must be identified); and

- any other relevant information not included in previous ESAs or remediation reports.

Sampling is conducted during the Phase 2 ESA in all areas where the Phase 1 ESA identified APECs, and/or has not been able to rule out CoPCs or areas of potential environmental concern.

4.4.2 Development of a Conceptual Site Model

The first step of the site characterization process is the development of a conceptual site model (CSM). The CSM must be considered dynamic in nature and must be continually updated and shared as new information becomes available (USEPA, 1996; USEPA, 2002).

A CSM is a visual representation and narrative description of the physical, chemical, and biological processes occurring, or that have occurred, at a site as related to the CoPCs and CoPCs migration. The CSM must be able to tell the story of how the site became contaminated, how the contamination was and is transported, where the contamination will ultimately end up, and whom or what it may affect. A well-developed CSM provides decision makers with an effective tool that helps to organize, communicate, and interpret existing data, while also identifying areas where additional data is required.

The conceptual site model development will be an iterative process. In the early stages of an investigation, the CSM may contain little information beyond the CoPCs based on facility-specific substances and APECs. However, less detailed conceptual site models will always result in more conservative assumptions regarding the risks associated with the site. For instance, an initial Phase 2 investigation may allow for some description of the CoPCs and APECs; it generally does not allow for detailed information on the source and extent of contamination at the site or transport mechanisms that are in play. At this stage, therefore, it will be difficult to rule out any potential pathways or receptors. The CSM at this stage of the investigation will be very generic and will assume more generic assumptions that already form the basis of the *Alberta Tier 1 Soil and Groundwater Guidelines* (AENV, 2007a). As site information becomes more detailed, the CSM must be progressively refined to provide information on the sources, types and total extent of the contamination (vertically and horizontally), release and transport mechanisms, possible subsurface migration pathways, and potential receptors and the routes of exposure.

The specific elements of the CSM shall include:

- An overview of historical, current, and planned future land uses (e.g., land use types, zoning);
- a detailed description of the site and its physical setting that is used to form hypotheses about the release and ultimate fate of contamination at the site;
- sources of contamination at the site, CoPC(s), and the media (e.g., soil, groundwater, surface water, soil vapour, indoor air) that may be affected;
- the distribution of chemicals within each medium, including information on the concentration, mass or flux;
- how CoPCs may be migrating from the sources, the media and pathways through which migration and exposure of potential human or environmental receptors could occur, and information needed to

interpret CoPC migration, such as soil properties, geology, hydrogeology, hydrology and possible preferential pathways;

- information on climate and meteorological conditions that may influence contamination distribution and migration;
- where relevant, information pertinent to soil vapour intrusion into buildings, including construction features of buildings (e.g., size, age, foundation depth and type, presence of foundation cracks, entry points for utilities), building heating, ventilation and air conditioning (HVAC) design and operation, and subsurface utilities; and
- information on human and ecological receptors and land usage.

The CSM must show sufficient details and be drawn to scale to realistically portray the characteristics of the site. For further information on development of CSMs, refer to *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment* (CCME, 2016).

4.4.3 Receptor and Exposure Evaluation

The Phase 2 ESA must be designed to collect information that will refine the CSM and site characterization, and will define the extent and concentration of any CoPCs.

The Phase 2 ESA must consider, at a minimum, all of the following information:

- Current and future end land use and zoning;
- proximity to receptors (e.g., surface water, DUAs) and setbacks;
- soil texture, groundwater and geology; and
- presence of conditions requiring a mandatory Tier 2 approach;

Where a Phase 2 is not specific enough to evaluate certain pathways or receptors, such as the DUA, the CSM will need to be general enough to assume these are active at the site. The more detailed the Phase 2 ESA, the more likely the CSM can be modified based on site-specific information.

4.4.4 Sampling and Analysis

The sampling and analysis of soil, surface water, groundwater, and sediment must be carried out using proper field methods, analytical procedures, and with the use of an accredited laboratory. For further information refer to: *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment* (CCME, 2016).

4.4.4.1 Media Sampling

A Phase 2 ESA must include all pertinent media. At a minimum, soil sampling and analysis must be included. Sampling and analysis of groundwater and sediment must be conducted if CoPCs migration to the groundwater

or sediment cannot be clearly ruled out or if CoPCs concentrations exceed Alberta Tier 1 guidelines for any of the groundwater or surface water pathways.

The media to be sampled, the locations, and number of samples to be obtained and analyzed must be identified. The location (and depth), number of samples, and suite of chemical analyses will depend upon site characteristics and must be sufficient to identify APECs and define the distribution of CoPCs (i.e., delineate areas of impact and concentrations).

4.4.4.2 Field Methodologies and Investigation Tools

All field sampling methodologies including field screening, borehole drilling, monitoring well installation, trenching, and other activities used for soil, surface water, groundwater and sediment sampling must be identified. Field methodologies must be appropriate to the CoPC in order to minimize loss of the CoPC during sampling. For further information, refer to *Standard Practice for Design and Installation of Groundwater Monitoring Wells* (ASTM, 2010) and *Design and Installation of Monitoring Wells* (USEPA, 2008).

4.4.4.3 Sampling Rationale and Design

Sampling designs must be tailored to accommodate specific objectives of the Phase 2 ESA and the site conditions to be investigated. Clear rationale must be provided in all investigations for the medium being sampled and for each sample location. A sufficient number of sampling points must be established to clearly delineate each APEC. Sampling must extend beyond the APEC in order to achieve vertical and horizontal CoPC delineation.

Where there are other sampling policies or procedures for specific activities in Alberta, those must be followed in addition to information contained in this document.

4.4.4.4 Laboratory Analysis

Sample collection, preservation, and other handling practices must be described and appropriate techniques must be used in order to minimize any changes to sample composition or concentration prior to analysis. Sampling and analysis must be consistent with any available Department protocols.

The handling and analysis of samples must be done in accordance with standard chain-of-custody procedures to ensure that the samples are properly handled, shipped, analyzed for the appropriate parameters, received by the laboratory, and analyzed within the prescribed holding times. Sampling requirements must be discussed with the laboratory prior to sampling and incorporated into the work plan.

Laboratories to be used for chemical analysis of soil, groundwater and sediment samples must be accredited in accordance with *the International Standard ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories* (1999, as amended) and any laboratory standards that have been developed by the conformance assessment body under *Conformity Assessment – General Requirements for Accreditation Bodies Accrediting Conformity Assessment ISO/IEC 17011* (2004, as amended).

4.4.4.5 Quality Assurance/Quality Control

Quality assurance (QA) consists of the measures or checks that are put in place to confirm that the quality control (QC) activities are effective. A QA/QC program is described as the overall "management system" that ensures defined standards of quality are met within a stated level of confidence. Quality control (QC) consists of the day-to-day activities (in the field or laboratory) used to control the quality of the product or service so that the needs of the users are met.

Effective QA/QC principles and practices must be used throughout the major stages of the ESA and must address all aspects of the project, including: project management responsibilities and resources, data quality objectives, sampling and analysis plans, data collection protocols, data quality control plans, data assessment procedures and requirements, and project quality output. A QA/QC program should be developed on a site-specific basis.

A high quality sampling program benefits from the use of field-duplicate samples. A field-duplicate sample is a second sample taken from a sample location and submitted along with the initial sample. Field duplicates are collected and submitted to assess the potential for laboratory data inconsistency and the adequacy of the sampling and handling procedures. A duplicate sample is collected from the same source utilizing identical collection procedures.

The results of the duplicate sampling may be used to assess the adequacy of the field sampling, the heterogeneity of the sample matrix, and the laboratory analytical precision.

4.4.4.6 Data Validation and Interpretation

All findings, including nil findings, resulting from the investigations performed shall be included in the report. The report shall state the dates of the findings.

The professional must interpret the data in a clear and logical manner. Data must be compared to applicable guidelines such as Alberta Tier 1 or Tier 2 and, if required, background concentrations. CoPC concentrations exceeding Alberta Tier 1 or 2 guidelines must be highlighted and discussed. Data shall be presented both in tabular format and on a detailed site plan or CSM, or photo mosaic or aerial photograph at 1:5000 scale or finer resolution. Sampling locations where CoPCs exceed applicable guidelines shall be identified in red and sampling points that achieve applicable guidelines identified in green on the site plan. Cross-sectional views depicting all relevant conceptual site model data including lateral and vertical delineation points and groundwater monitoring wells shall be presented. The report must include a discussion on the QA/QC procedures, and identify and discuss any anomalies in the data.

Hydrogeological reporting must also include a brief discussion and interpretation of the hydrogeological site setting, including a description of local aquifers, local groundwater flow direction (vertical and horizontal) and velocity, and groundwater quality. The potential for CoPC off-site migration through any pathway must be assessed and discussed.

In some cases, sampling and/or laboratory analyses of samples may indicate other impacts from potential off site CoPCs originating from a site other than the one under investigation (particularly in groundwater). If this is the case, the extent of possible off-site impacts must be identified and described in the Phase 2 ESA report(s) and the report must clearly identify how the potential off-site source is shown to be distinct from sources on site. Where evidence does not clearly show the site CoPC is distinct from an off-site impact, the report can only identify the possibility of an off-site source.

4.4.5. Conclusions

The conclusions shall be supported by findings, including nil findings, which are documented to facilitate an understanding of the environmental quality, including the extent and degree of contamination encountered on the site. The report shall present conclusions in a manner designed to help the client understand the significance of the findings and methods used to reduce uncertainty in not detecting contamination when it may have been present and, where contamination is present, follow-up actions.

The conclusion section must reveal that the Phase 2 ESA showed:

- No evidence of CoPCs in connection with the site;
- evidence of actual CoPCs in connection with the site (listed and described) and potential risk to receptor(s) both on and off the property; or
- if the information collected through the ESA is insufficient for the professional to reach either of these conclusions, further follow up to meet the site assessment objectives.

At the completion of a Phase 2 ESA, the professional must be able to conclude, at a minimum, that either:

- The ESA has provided sufficient information to support that there is no reasonable basis to suspect a substance release has occurred at the property that has caused, is causing, or may cause adverse effect; or
- the ESA has confirmed a substance release has occurred at the site, and further assessment, remedial measures and/or risk management on site and off site are required.

4.4.6. Report Content

The Phase 2 ESA report must be a stand-alone document that describes all aspects of the Phase 2 ESA program. Where the report is submitted to the Department or the Regulator as part of a Record of Site Condition (RSC; AENV, 2009a), the requirements of the RSC must also be followed.

As a minimum, all items in the *Phase 2 Environmental Site Assessment Checklist* (ESRD, 2013a) must be included and addressed in the report. The date to which the conclusions relate shall be specified in the report.

4.5 Record of Site Condition

The Record of Site Condition form is used for release reporting under Section 111 of the EPEA. This form is a summary document to track major environmental characteristics for an assessed site (ESRD, 2012d). Pursuant

to section 4(3) h of the *Release Reporting Regulation*, the RSC form and its declaration are required by the Director as a regulatory reporting requirement for all Phase 2 ESA, remediation and risk management projects submitted to the Department. The record of site condition must be completed and updated for every subsequent report to reflect the current known status of the site.

4.6 Other Regulatory Considerations

Where other specific activities have additional regulatory requirements, these must be followed in addition to the requirements contained within this document. For facilities operating under EPEA Approvals and Codes of Practice, further reporting requirements in the *Soil Monitoring Directive* (AENV, 2009b, as amended) or the *Ground Water Monitoring Directive* (ESRD, 2013b, under development) must be met.

5.0 REMEDIATION AND CONFIRMATORY SAMPLING

5.1 Purpose and Scope

The end points for site remediation in Alberta are established by the Alberta Tier 1 and 2 guidelines (AENV, 2007a; 2007b, as amended). The satisfactory completion of remediation work must be supported by verification data, such as confirmatory sampling of soils and groundwater. Documentation must be sufficient to demonstrate that the remediation objectives were achieved.

At the completion of a remediation stage, confirmatory sampling that demonstrates the success of remediation and acceptability of the site for a given land use must be conducted and reported. The purpose of confirmatory sampling is to ensure that potential human health and ecological endpoints have been successfully met. Investigation using confirmatory sampling is similar to that described for a Phase 2 ESA. Specific characteristics of confirmatory sampling that may not be part of a typical Phase 2 ESA are described in this section.

5.2 Confirmatory Sampling

Once a site has been remediated, the effectiveness of the remediation measures in meeting the applicable guidelines for the site must be verified. Confirmatory samples are used to verify whether or not remediation objectives have been met in each media type (e.g., soil, surface water, groundwater, sediment, etc.) where exceedances above Alberta Tier 1 or Tier 2 guidelines were identified. Samples must be analyzed using certified laboratories and laboratory analytical methods.

When developing a confirmatory sampling program for an excavation, the following minimum field requirements must be met:

- discrete samples must be collected from each excavation face (i.e., walls and base);
- samples must be collected a minimum of 0.05 metres from the exposed wall face. The sample must be collected from within a 0.2-metre perpendicular distance from the excavation surface;
- discrete confirmatory samples must be collected and analyzed such that there is at least one sample within a grid based on 10-metre increments (5-metre increments for hazardous waste);
- more closely spaced confirmatory sampling is required where there are thin identifiable soil layers that are suspected to be contaminated; and
- sampling techniques must minimize the loss of CoPC. This will particularly be true for volatile CoPCs or for CoPCs that have ability to degrade or transform during shipping and handling where coring techniques must be used that obtain undisturbed cores and minimal handling is to be employed to ensure against contaminant loss during field sampling. Where this is not possible, documentation must be provided describing the reason for deviation and steps taken to minimize loss during sampling.

For confirmatory sampling of contaminated groundwater, a groundwater monitoring and sampling program must be designed to confirm that CoPCs have been remediated to an acceptable Tier 1 or Tier 2 objective (AENV, 2007a; AENV, 2007b, as amended) over a period of time after site remediation or source removal. The

frequency and duration of confirmatory groundwater sampling will vary depending on the CoPC and site characteristics.

The Department's minimum expectation to confirm applicable groundwater criteria have been achieved post-remediation is three groundwater sampling events which span at least two years and reflect seasonal differences. The professional must develop a sampling program that is acceptable to the Department or the Regulator and will confirm that the objectives of the remedial investigation have been achieved.

The duration of confirmatory groundwater sampling will extend to a minimum of three consecutive groundwater sampling events showing that samples have met the applicable criteria in different seasons and spanning at least two years. The sampling frequency may be reduced if COPCs concentrations decrease, until the applicable criteria are met. Where remediation is conducted through the introduction of a substance into one or more wells (e.g., chemical oxidation, bio-stimulation, etc.) confirmatory samples should be taken from monitoring wells other than those used for injection.

5.3 Remediation Report Content

A report describing the site remediation activities must be prepared on completion of the site remediation. The *Phase 2 Environmental Site Assessment Checklist* (ESRD, 2013a) is used as a reference guide for remediation report content but it is noted that much of the information required within the checklist may have already been submitted to the department in previous reports. As a minimum, reference to previous reports that supply this background information need to be included in the report. The remediation report must include a summary of this information that allows the reader to quickly understand the findings in previous investigations and how this was addressed in the remedial phase. The date to which the conclusions relate shall be specified in the report.

The following information shall be provided, summarized and referenced to information from previous reports already submitted to the Department or Regulator:

- **Administrative information**, including clear identification of confirmatory investigation in the title of the report, the business name of the proponent, the name and location of the site including the legal land location, the date of the report, and the name of the environmental consulting firm conducting the remediation.
- **Regional and site characteristics**, including, at a minimum:
    - a description and map at the appropriate scale indicating the regional setting, topography, surficial geology, soil types, vegetation, water bodies and major land use;
    - a description of the site, including topography, surface drainage, parent geological materials, soil types, fill material, vegetation, hydrogeology, depth to groundwater, groundwater flow direction, adjacent water bodies, and land use;

- a detailed site plan, photo mosaic or aerial photograph at a scale of 1:5000 or larger, indicating major facility areas and relevant surface features; and

- Clear identification of the **remedial objective or clean-up level achieved**. Closure is clearly defined using Tier 1 or Tier 2 guidelines or site-specific risk assessment options.
- A **summary of remedial actions** taken for the APECs onsite and offsite
- A **summary of sampling and analysis** including:
  - a table identifying the APECs, sampling rationale and method(s), and analytical suite for each sampling location;
  - the rationale for choosing the sampling procedure and depth-increments;
  - a description of the QA/QC protocol followed for sampling and handling soil and other sample media during the program; and
  - the rationale for selecting the analytical methods used and a description of relevant analytical QA/QC procedures.
- **Results and discussion** that include:
  - tables presenting all laboratory analytical results for all sampling locations, highlighting values that are greater than baseline or valid background values and any applicable guidelines;
  - rationale for selection of sampling locations, including background (control) locations;
  - a detailed site plan, photo mosaic or aerial photograph at a scale of 1:5000 scale or larger, indicating sampling locations and area remediated on the site plan;
  - a detailed site plan in cross sectional view depicting all relevant conceptual site model data including excavation limits, confirmatory data, lateral and vertical delineation points and groundwater monitoring wells;
  - a discussion on the hydrogeology and geology of the site and within an appropriate vicinity of the site;
  - a discussion of analytical results as compared to those of valid background samples and applicable guidelines for the applicable media;
  - the remediation system design and operation;
  - quantity and volume of contaminated soil and other media remediated and left on the site and/or removed from the site;
  - description of the location(s) where impacted media (e.g., soil, water) was moved to if taken from the site; and
  - quantity, volume, and source of soil brought to the site for use as fill as well as laboratory analytical results confirming that any soil imported to the site meets applicable guidelines.
- **Conclusion** that confirms all contamination has been identified and removed or remediated and that the site now meets all the specific applicable environmental guidelines or provides a summary and maps that identify areas that still require further assessment, remediation and/or management as identified through this or previous investigations.

- **Appendices** that include, but are not limited to, borehole/soil logs for confirmatory sampling locations, and a copy of laboratory analytical data sheets.

5.4 Remediation Certificates

The Remediation Certificate Regulation was created to formalize a system that offers closure of regulatory liability. Remediation certificates provide a mechanism to demonstrate when the clean-up of substance releases under Part 5 of the EPEA have been addressed to the satisfaction of the Department and/or the Regulator for a defined land use. The Remediation certificate process is voluntary and offers regulatory liability closure for a remediated area. If the remediated area is compliant with Alberta Tier 1 guidelines (AENV, 2007a, as amended) or Alberta Tier 2 guidelines (AENV, 2007b, as amended), a remediation certificate may be issued. A remediation certificate provides assurance that additional remediation is not required if guidelines are amended or updated.

Only remediated areas of a property can be certified. Areas assessed where concentrations of substances are below the Alberta Tier 1 or Tier 2 guidelines and did therefore did not require remediation, are not eligible for a Remediation Certificate, although they still meet applicable risk-based endpoints.

Section 117 of the EPEA provides the basis for refusing an application or issuing, amending, and cancelling remediation certificates. Section 118 of EPEA provides closure of regulatory liability for a release that has been properly assessed, remediated, and has received a remediation certificate. In cases where conditions on a site change to a more sensitive use, further remediation or management may be required. The person making the land use change will need to take appropriate measures to ensure that the site will meet the applicable guidelines for the proposed land use.

A remediation certificate will not be issued for the off-site portion of a release under exposure control or risk management. Risk management plans may only be developed for residential, commercial, or industrial lands. Contaminated areas within "natural" or "agricultural" land uses as outlined in Alberta Tier 1 guidelines (AENV, 2007a, as amended), require complete remediation of off-site portions to be eligible for a remediation certificate.

For more information on remediation certificates, refer to A *Guide to Remediation Certificates for Contaminated Sites* (AENV, 2012a) or *A Guide to Remediation Certificates for Upstream Oil and Gas Sites* (AENV, 2012b).

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