

Directive 001

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Requirements for Site-Specific Liability Assessments

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1 Introduction

1.1 Purpose of This Directive

This Alberta Energy Regulator (AER) directive sets out the requirements for completing and submitting a site-specific liability assessment (SSLA). A “liability assessment” is an assessment conducted by a licensee or approval holder to estimate the costs to suspend, abandon, remediate, and reclaim a site, as well as provide care and custody from shutdown of operations through to site reclamation.

This directive applies to all liability management programs administered under the [Oil and Gas Conservation Rules](#), [Brine-Hosed Mineral Resource Development Rules](#), and [Geothermal Resource Development Rules](#). It does *not* apply to sites administered under the specified enactments (e.g., the Mine Financial Security Program, which is authorized under the [Environmental Protection and Enhancement Act \[EPEA\]](#)).

The aim of this directive is to improve the consistency and accuracy of liability assessments submitted to the AER.

The directive does not modify requirements on how to conduct care and custody, contamination management (including remediation), suspension, abandonment, and reclamation activities.

1.2 AER Requirements

Requirements are mandatory. The term “must” indicates a requirement, and terms such as “should,” “recommends,” and “expects” indicate a recommended practice. For ease of reference, requirements are numbered. Information on compliance and enforcement can be found on the AER website.

Because oilfield waste management facilities are included in the scope of this directive, but are approved rather than licensed, the terms “licence” and “licensee” are to be read as also including oilfield waste management approvals and oilfield waste management approval holders. The term “facility” includes oilfield waste management facilities.

1.3 What’s New in This Edition

The requirements for problem sites and potential problem sites have been removed. The requirements for submitting a pre-existing liability estimate have been removed.

The requirements for when an SSLA must be used to estimate liability and frequency of updates to SSLAs have been removed and incorporated into *Directive 011: Estimated Liability*. Clarification on how SSLAs will be used has been incorporated into *Directive 011*.

The requirements for SSLAs related to oilfield landfills will be moved from the *Oil and Gas Conservation Rules*, and licensees are now required to meet the SSLA requirements within this directive.

2 When Is an SSLA Required

- 1) When directed by the AER, a licensee must conduct and submit an SSLA in accordance with this directive.

Refer to *Directive 011*, *Directive 089*, and *Directive 090* for specific scenarios where SSLAs are required.

General field evaluations of multiple facilities will not be accepted, and the regional estimated liability costs in [Directive 011](#) cannot be used for site-specific costs.

The complexity of an SSLA is proportional to a site's complexity, which is determined by such factors as size of infrastructure and site conditions, including the nature and extent of any contamination issues, as well as any other factors that the AER deems appropriate. The AER may require additional tasks and associated costs to those set out in this directive to be included as part of an SSLA.

3 Estimating Costs: General Requirements

- 2) Cost estimates must be
 - a) based on the SSLA,
 - b) developed as if a third party were conducting the work and supplying the necessary equipment, and
 - c) itemized and clearly show the subtotals for all tasks.
- 3) The associated unit rates must be based upon undiscounted, current-day, third-party standard or published prices for all services. Price discounts available to all parties may be applied, but client-specific discounts, such as those for preferred client status or coordinated regional cleanups of multiple sites, may not be applied.
- 4) A cost estimate must not apply a net present value for work to be conducted in the future.
- 5) The following management and administration costs must be provided for every project:

| | |
|---|---|
| <ol style="list-style-type: none"> a) initial planning b) regulatory applications and approvals c) on-site supervision | <ol style="list-style-type: none"> d) reporting e) overall project coordination f) subcontractors and third-party services |
|---|---|

- | | |
|--|---|
| g) equipment rental | j) subsistence |
| h) consumable supplies (e.g., safety supplies) | k) general contingency for unforeseen circumstances |
| i) mobilization time and travel expenses | |

4 Estimating Suspension and Abandonment Costs, Including Care and Custody

- 6) In estimating costs for suspension, discontinuation, and abandonment, including providing care and custody, an evaluation of the development, as well as all associated infrastructure and supporting equipment included in the licence or approval, must be conducted.
- 7) An assessment of, suspension, discontinuation, and abandonment costs, including providing care and custody, must be based on a site-specific plan to meet or exceed applicable AER requirements using generally accepted engineering practices.
- 8) An estimate of site-specific costs must include providing a minimum of three years of care and custody and site security.
- 9) An estimate for suspension, including care and custody, must include the following, when applicable:

Wells

- maintaining, replacing, or retrofitting the wellhead as required
- removing and transporting all product, chemicals, oilfield waste, and stored sulphur inventories to facilities approved by the AER or Alberta Environment and Protected Areas (AEPA)
- installing and maintaining downhole equipment
- introducing and maintaining the level of wellbore fluids as required
- testing wellhead and casing integrity, and repairing as needed
- testing for, reporting, and eliminating surface casing vent flow, gas migration, and other casing integrity issues
- *Directive 013* reporting
- conducting initial and follow-up lease inspections
- managing hazards on site to protect public safety and the environment
- providing site security

Facilities

- depressurizing or de-energizing all facility equipment (vessels and tanks) and interconnected piping
- removing and transporting all product, chemical, oilfield waste, and stored sulphur inventories to AER- or AEPA-approved facilities
- securing the site, all buildings, and equipment to prevent unauthorized access or use, including installing fences, locks, and signs
- providing weekly on-site security inspections and monthly reporting to the AER
- maintaining utilities, such as electrical power, water, and natural gas
- maintaining vegetation control
- maintaining good housekeeping
- managing hazards to protect public safety and the environment (e.g., maintaining monitoring programs, management of released substances, etc.)
- winterizing the facility and related infrastructure

Pipelines

- physically isolating or disconnecting the pipeline from any operating well or facility
- cleaning the pipeline, if necessary
- purging the pipeline with fresh water, air, or inert gas
- managing hazards on site to protect public safety and the environment
- maintaining corrosion control measures

10) An estimate for abandonment, including care and custody, must include the following, when applicable:

Wells

- removing all downhole equipment, such as rods and tubing
- abandoning all completed formations
- testing for, reporting, and eliminating surface casing vent flow, gas migration, and other casing integrity issues
- removing surface equipment (e.g., tanks, pumping units), cement pads, and debris as required by [Directive 020: Well Abandonment](#)
- maintaining vegetation control

- maintaining good housekeeping
- disposing of any remaining drilling waste contained in on-site and remote sumps
- protecting groundwater
- managing hazards on site to protect public safety and the environment
- conducting the surface abandonment

Facilities

- identifying and managing dangerous materials (e.g., asbestos and natural occurring radioactive materials)
- shutting down, draining, and purging all lines, vessels, and ponds
- testing pond liquids and sludge
- removing and transporting products, dangerous goods, and oilfield waste for off-site management
- dismantling and removing all equipment, vessels, structures, and utilities
- removing and disposing of pads, berms, ponds, foundations, piles, concrete, and other base and surfacing materials
- abandoning or removing pipe
- managing hazards on site to protect public safety and the environment
- removing utilidors and cathode beds

Pipelines

- reviewing files and locating the line
- removing aboveground structures
- physically isolating or disconnecting the pipeline
- cleaning, if necessary
- purging with fresh water, air, or inert gas
- addressing residual contamination from spills
- plugging or capping all open ends
- intermediate cutting and blocking
- removing underground pipelines, where required
- managing hazards on site to protect public safety and the environment

- 11) The estimate of abandonment costs of pipelines must indicate whether the pipe is being abandoned in place or removed.
- 12) Abandonment cost estimates must not include any credit or discount for salvage value related to the resale of equipment. A credit for scrap metal for recycling can be included with supporting information.
- 13) The Care and Custody, Suspension, and Abandonment Cost Estimate Form, available from the [Directive 001](#) landing page, must be completed and submitted to the AER.

5 Estimating Remediation and Reclamation Costs

- 14) A licensee of an oilfield landfill must estimate the costs associated with remediation and surface land reclamation in a way that meets *Directive 058: Oilfield Waste Management Requirements for the Upstream Petroleum Industry* requirements and includes the applicable information detailed in [Standards for Landfills in Alberta](#) pertaining to final cover and final landfill closure and post-closure care.
- 15) Costs for all other SSLAs must be estimated in accordance with this section and its subsections.
- 16) In estimating remediation and reclamation costs, all land and water directly affected by the construction, operation, or abandonment of the development licensed or approved by the AER must be assessed.

Licensees should be aware that all facilities, infrastructure, and equipment included in an AER licence or approval require a reclamation certificate unless specifically exempted under *EPEA*. This includes the following:

- access roads
- air strips
- bone yards
- borrow pits
- campsites
- dams
- earthen structures
- fire training areas
- land treatment areas
- lay-down areas
- railways
- remote drilling waste sumps
- storage areas
- sulphur handling facilities
- warehouses

- 17) An estimate of costs must include the remediation and reclamation in a predictable and expedient manner of all directly affected land to a state where the site may be eligible for a reclamation certificate. For a site not eligible to obtain a reclamation certificate, such as a waste management facility, a cost estimate to complete a comparable degree of remediation and

reclamation is required. Remediation and reclamation costs must include managing hazards on site to protect public safety and the environment.

Do not submit contamination management reports or remedial action plans with an SSLA. Do include the OneStop submission ID numbers for the Phase 1 ESA and the Record of Site Condition in the supporting documentation for an SSLA.

For further information on OneStop Phase 1 ESA and record of site condition submissions and the AER's review processes, please refer to [Manual 021: Contamination Management](#) and the [OneStop quick reference guides](#).

5.1 Phase 1 and 2 Environmental Site Assessments (ESAs)

18) Phase 1 and 2 ESA reports must be standalone documents prepared by a qualified professional and include a signed or stamped professional declaration, as outlined in sections 3.2.5 and 4.4.6 of the Government of Alberta's [Alberta Environmental Site Assessment Standard \(ESA Standard\)](#).

5.1.1 Phase 1 ESA

19) Remediation issues must be identified and initially evaluated through a Phase 1 ESA done in accordance with the *ESA Standard*.

The Phase 1 ESA report is to document and evaluate historical development and current site conditions in order to identify areas of potential environmental concerns (APECs) warranting further assessment.

20) If historical files or similar data are not available, the significance of the missing information must be evaluated and a contingency amount provided in the SSLA cost estimate.

5.1.2 Phase 2 ESA

21) APECs identified in the Phase 1 ESA must be further evaluated and documented in a Phase 2 ESA report prepared in accordance with the *ESA Standard*.

22) All APECs must be assessed for contaminants of potential concern. Where identified, contaminants must be vertically and horizontally delineated in all affected media on and off site.

23) The delineation of contamination must be achieved using results of laboratory analysis of representative samples from boreholes, test pits, or other intrusive sampling techniques.

Nonintrusive techniques, including field screening, may be used to supplement the intrusive sampling and laboratory analysis if needed to delineate the contamination.

- 24) If groundwater contamination of the uppermost aquifer is apparent, an assessment of the next lower water-bearing zone must be conducted. This includes evaluation of communication between aquifers and characterization of the lower groundwater quality and flow characteristics.

Refer to the [*Alberta Tier 1 Soil and Groundwater Remediation Guidelines*](#) and the *ESA Standard* for further information and requirements on delineation.

- 25) The results of the Phase 2 ESA must be used to develop a remediation plan that is sufficient to estimate soil and groundwater remediation costs.
- 26) If some liability issues cannot be sufficiently evaluated, the significance of the missing information must be evaluated and, where appropriate, a contingency amount provided in the cost estimate.

5.1.2.1 Determining Affected Soil and Groundwater Quantities for Accessible Areas

Where an intrusive ESA is possible, the following are required in order to estimate remediation costs.

- 27) Based on the assessment of soil and groundwater chemistry, a polygon diagram must be created to represent the surface expression of the impacted areas. Geology, groundwater flow, contaminant source, and other factors should be considered when creating these shapes.

The results of vertical delineation from the intrusive sampling are then applied to produce three-dimensional polyhedrons of affected soil and groundwater and, where applicable, unaffected soil overburden. The polyhedrons may be subdivided as needed to estimate volume. The volumes of all subpolyhedrons are then totalled as preliminary estimates of affected and unaffected soil and groundwater volumes.

- 28) Professional judgement must be applied to adjust preliminary soil and groundwater volume estimates to account for the irregular and curvilinear nature of plume boundaries (plume fingers). The plume irregularity factor or similar methodology used to estimate in situ soil volumes must be documented and the basis for it provided.
- 29) A distinct excavation-bulking factor must be applied to the estimated in situ soil volumes to account for the increase in volume when naturally compacted soil is excavated. While professional judgement may be applied when estimating this excavated soil volume, experience has shown that the volume of soil typically increases between 1.2 and 1.4 times when excavated. The basis for the excavation-bulking factor must be documented and any deviation from the range provided must be substantiated.

- 30) Topsoil and unaffected subsoil (overburden) volumes requiring handling during remediation must also be estimated as described above.
- 31) An outline of the affected areas overlaid on the site drawing showing the sample points must accompany the volume estimate.

Conversion of an in-place estimated volume of affected soil to a mass of material requiring transportation to an approved waste management facility is a critical factor that may greatly influence estimated remediation costs.

- 32) When estimating costs to dispose of affected material off site, soil density and moisture content of the material requiring disposal must be estimated.
- 33) The method used to determine the density and moisture content of the soil requiring disposal must be described.

Soil density does not need to be assessed if costs are estimated for on-site treatment of affected soil.

5.1.2.2 Determining Affected Soil and Groundwater Volumes for Sites with Restricted Access

- 34) In situations where safety concerns restrict the scope of a Phase 2 ESA, the licensee must do the following:
 - a) Document the rationale for the restricted scope of work and provide sufficient budget contingency to address the remediation costs expected for the areas not assessed. The contingency allocated for likely but unconfirmed issues in areas not assessed must be distinct from the contingency provided to address uncertainty in estimating the costs of confirmed issues.
 - b) Develop an appropriate estimate of potentially affected soil and groundwater volumes and areas requiring remediation using professional experience and information from sources like the following:
 - i) findings of the Phase 1 ESA
 - ii) documented prior experience at comparable sites
 - iii) regional information and site information collected prior to construction
 - iv) partial or limited intrusive assessments
 - v) assessments from the periphery of the site
 - vi) nonintrusive investigative methods that are not affected by buried infrastructure

5.2 Remediation

35) When developing a remediation plan, the licensee must consider the following factors:

- a) contaminants and properties (solubility, density, treatability, reactivity)
- b) soil types and properties (heterogeneity, permeability, porosity, density)
- c) water/aquifer properties (depth, flow rate, groundwater table)
- d) climate factors (precipitation, snowfall, seasonal net water flow, drought)
- e) remediation guideline or site-specific remediation objectives

36) The remediation plan must be based on an approach that has been demonstrated to be effective in Alberta in remediating affected soil, water, groundwater, or bedrock to meet applicable guidelines, criteria, or standards.

Under section 2.3 of the [Remediation Regulation](#), a substance release to soil or groundwater must be remediated to meet the requirements of the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*.

Alternatively, under section 2.4 of the *Remediation Regulation*, an area may be remediated in accordance with the [Alberta Tier 2 Soil and Groundwater Remediation Guidelines](#) if the AER is satisfied that a level of protection equivalent to the Tier 1 guidelines can be reached.

37) The assessment work under the Tier 2 guidelines must be completed and submitted to the AER through OneStop before a licensee may apply the Tier 2 approach in the SSLA.

Advice on how to efficiently demonstrate to the AER that remediation guidelines have been appropriately developed and applied is provided in *Manual 021*.

38) The remediation plan must not result in residual contamination being left in place that would restrict subsequent land capability relative to previous land use.

39) The remediation cost estimate must be based on a remediation plan that

- a) excavates, to the extent possible, all affected soil and subsoil to meet or exceed applicable guidelines and
- b) distinguishes between soil treated on site and disposed of off site.

40) Where contaminants cannot be excavated, the time and costs to actively remediate contamination in place until remediation is complete must be estimated and supporting documentation provided.

41) The following must be provided where on-site treatment of affected soils is proposed:

- a) the approach and infrastructure needed

- b) the assessment of site suitability
 - c) the results of soil treatability testing
 - d) the estimated volume requiring remediation and the rationale used to predict duration of treatment
- 42) Where groundwater remediation is proposed, a licensee must provide information on the following:
- a) contaminant source removal
 - b) the remediation approach applied
 - c) the basis for duration of groundwater treatment or monitoring required
 - d) the estimated total volume of affected groundwater
- 43) At a minimum, the following costs for remediation must be provided:
- a) for each distinct area requiring decontamination,
 - i) characterizing affected materials for disposal or treatment (cost per sample collection and laboratory analysis, number of samples),
 - ii) excavating time and costs (excavator type, estimated time for excavation, cost per unit time, mobilization and demobilization costs),
 - iii) handling unaffected overburden and topsoil (stripping and stockpiling of material to be reused, replaced, and mechanically compacted, as well as any additional soil replacement), and
 - iv) conducting confirmatory sample collection and laboratory analysis (cost per sample, number of samples)
 - b) transporting waste and disposing of it off site (mass of affected soil and subsoil, volume of liquid waste or affected water, number of shipments, transportation distance, transportation and disposal unit rates, and transportation and disposal cost subtotal), or characterizing the waste and treating it on site (volume of affected soil and subsoil to be treated, area available for land treatment, contaminant loading rates, treatment capital costs, treatment operating costs per year, estimated duration of treatment, and on-site waste treatment cost subtotal)
 - c) importing backfill to replace soil disposed of off site (volume required, costs to characterize, purchase, transport, replace, and compact, and backfill cost subtotal)
 - d) miscellaneous expenses, such as safety supplies and vehicle use

- 44) The cost of importing backfill to replace soil disposed of off site must be separated from the costs of handling unaffected overburden and topsoil.
- 45) For an on-site remediation system, in addition to initial capital costs for installing and commissioning the system, operating and maintenance costs must be estimated for the full expected duration of treatment or monitoring. To that end, the cost estimate for remediation must include the following:
- a) type of remediation system (e.g., bio-cell, drainage tile, vertical wells, horizontal wells)
 - b) dimensions of system (e.g., length of trench, number and depth of wells)
 - c) installation costs, including system infrastructure (e.g., piping, electrical, buildings)
 - d) duration of operational treatment time predicted
 - e) water disposal/treatment costs on an annual basis multiplied by duration of treatment predicted
 - f) operation and monitoring costs
 - g) system abandonment costs
 - h) any other life-cycle costs, such as project management, utilities, taxes, insurance, and lease payments

5.3 Reclamation

- 46) An estimate of reclamation costs must be based on an approach that returns the ability of the land to support land uses that are similar, but not necessarily identical, to that which existed before development of the site.

Some of the specific data needed to develop a surface reclamation plan and estimate associated costs will be contained within Phase 1 and Phase 2 ESA reports.

- 47) The reclamation cost estimate must be based on a reclamation plan that includes the following:
- a) maintaining the land and removing the access road and directly related infrastructure (cattle guards, culverts, fences, dams, bridges, etc.)
 - b) removing gravel and other surface materials, including an estimation of volumes
 - c) replacing subsoil and topsoil, including an estimation of required volumes that were previously salvaged and are stockpiled on site, and those that need to be imported
 - d) addressing any soil structure, soil sterilant, hydrophobicity, and similar issues
 - e) recontouring and stabilizing slopes
 - f) restoring surface drainage patterns

- g) planting, maintaining, and monitoring vegetation (fertilizing and weed control)
- h) preparing a detailed site assessment
- i) completing the reclamation certificate process
- j) all administrative and related tasks needed to obtain a reclamation certificate

6 Reporting Requirements for All SSLAs

- 48) A liability assessment report must document and summarize, in a distinct section, any deviation from the specified assessment standard or conditions that limit the scope of the assessment or the accuracy of the cost estimate. This includes the availability of historical information or personnel familiar with the history of the site and site conditions, such as snow cover and access to the subsurface.
- 49) If historical site information is lacking or the assessment is otherwise impeded, an appropriate contingency amount must be included as a distinct item in the cost estimate. The methods used to search for the missing data or conduct the on-site assessment must be described and the rationale provided to substantiate the contingency amount included.
- 50) A liability assessment submitted to the AER must be based on a site assessment conducted only by appropriately trained and experienced personnel.
- 51) The assessment report must clearly document, in a distinct section, the specific role of all personnel involved, their technical training, and their previous experience conducting assessments and developing cost estimates.
- 52) The assessment must be supervised and signed by a lead assessor who has completed postsecondary education in a directly related discipline and has prior experience estimating site-specific costs for care and custody, suspension, abandonment, remediation, and reclamation.
- 53) The lead assessor must also be a member in good standing of an association regulated by a professions or societies act of Alberta or be certified in Canada to conduct ESAs by an agency that provides a comparable degree of professional accountability. This includes appropriately trained and experienced members of the following:
 - Alberta Institute of Agrologists
 - Alberta Society of Engineering Technologists
 - Alberta Society of Professional Biologists
 - Association of the Chemical Profession of Alberta
 - Association of Professional Engineers and Geoscientists of Alberta

- College of Alberta Professional Foresters
- 54) The lead assessor must certify that they have prepared or supervised the liability assessment and placed their professional seal or stamp on the SSLA.
 - 55) The report must be signed by the professional and include their professional designation or certification.
 - 56) The signatory statement must stipulate that the report was completed in accordance with the specified standard and that the report clearly documents all conditions that materially limit the scope of the assessment or the accuracy of the cost estimate.
 - 57) A statement limiting the use of the report by other parties is permitted; however, the AER and AEPA must be specifically cited as authorized users of the report.

7 SSLA Submission Requirements

- 58) Licensees must submit to ssla@aer.ca a complete SSLA consisting of the following:
 - a) suspension plan
 - b) discontinuation plan (for pipeline only)
 - c) abandonment plan
 - d) Phase 1 ESA and Phase 2 ESA with RoSC (OneStop submission ID numbers of ESA reports)
 - e) remediation plan (OneStop submission ID numbers of any remedial action plans)
 - f) reclamation plan
 - g) *Directive 001* forms:
 - i) Liability Declaration Form
 - ii) Cost Estimate Forms
 - Care and Custody, Suspension, and Abandonment Cost Estimate Form (Form 001-A)
 - Remediation and Surface Land Reclamation Cost Estimate Form (Form 001-B)
 - iii) Acknowledgement Statement for SSLAs
 - Care and Custody, Suspension, and Abandonment Acknowledgement Statement for Site-Specific Liability Assessments
 - Remediation and Surface Land Reclamation Acknowledgement Statement for Site-Specific Liability Assessments

- h) detailed estimated costs for completing care and custody, suspension, abandonment, remediation, and reclamation at the site, as set out in this directive
- i) any additional supporting information used in the development of the SSLA (e.g., hazardous materials surveys)
- j) all third-party rate sheets, including those used in the development of the SSLA (e.g., project management, landfill disposal, analytical, equipment, if credit applied for metal used as scrap)
- k) SSLA cost estimate updates into the AER's Digital Data Submission (DDS) system (Confirmation of the DDS submission)

The SSLA, supporting data, and ESA reports may be audited by the AER at any time to ensure that all requirements in this directive have been met.