PREPARING VARIANCE JUSTIFICATIONS FOR RECLAMATION CERTIFICATION OF WELLSITES AND ASSOCIATED FACILITIES ON FORESTED LAND:

2023 UPDATE

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PREFACE

In 2018, the Petroleum Technology Alliance of Canada (PTAC) initiated a multi-stage project on the reclamation certification process for sites that were constructed using imported mineral soil pads in peatlands, and upland sites with vegetation on a trajectory to approximate natural forest vegetation but with one or more reclamation deficiencies according to the forested land criteria. These sites cannot receive a reclamation certificate without additional scrutiny and professional justification under current regulatory criteria and policies. The goal of the overall project is to ensure that decisions made during the reclamation certification process result in the best possible ecological outcome (i.e., net environmental benefit) for these sites and surrounding region. This document is focused on upland sites; a separate document has been prepared for sites that were constructed using imported mineral soil pads in peatlands.

Stage 1 of the project identified that there has been inconsistent approach applied to these sites during the reclamation certification process that may not result in the best possible ecological outcome and the inconsistency has created ambiguity in terms of defining acceptable conditions for certification. There are misperceptions of the decision-making process, lack of clarity for variance requirements and often a lack of scientific-based information to support professional justification used in variance requests. This document was developed during Stage 2 of the project to encourage preparation of complete and comprehensive variance requests to allow for consistent decisions that result in the best possible ecological outcome. A third stage of the project is planned as a field research program to address knowledge gaps identified in previous stages.

The first version of this document was published in late 2020 after undergoing an initial review by a small group of stakeholders including industry, practitioners, and decision-makers (Alberta Energy Regulator and Alberta Environment and Parks). In 2021, PTAC sought verification of the document from a larger audience and stakeholders were asked to apply the document to current sites in their work portfolio. Feedback was obtained during a knowledge transfer session, field verification and working sessions). The 2022 update reflected the feedback received and included the following changes:

- Retitled and adjusted tone to avoid leading readers to interpret the document as direction from AER or AEP or regulation
- Sections 1.0 and 3.0
    - Increased emphasis on remedying deficiencies prior to deciding to request a variance
    - Added caveats to use
- Appendix D: Variance Justification Form
    - Removed redundant information and added additional sections.
    - Revised Section 4.0 to align with the Variance Justification Form

This 2023 Update includes a change in authors and minor editing and formatting.

TABLE OF CONTENTS

LIST OF FIGURES

GLOSSARY

Additional Review (OneStop)

Reclamation certificate applications submitted to the Alberta Energy Regulator (AER) through OneStop may go through two levels of review: baseline review and additional review. Applications are sent for additional review if they have unresolved landowner or interest holder complaints, filed statements of concern, requests for variances from the standard criteria that have not been preapproved by the AER, or are more complex. AER staff will undertake a more detailed review of the application, which may include conducting field inspections, before issuing a decision (Alberta Energy Regulator, 2019a). The Forested Land Criteria refers to applications in this stream as non-routine applications (Alberta Environment and Sustainable Resource Development, 2013a).

Baseline Review (OneStop)

Reclamation certificate applications submitted to the AER through OneStop may go through two levels of review: baseline review and additional review. The baseline review ensures that the application meet the validation rules (e.g., confirming the well has an abandoned status) and assessment rules (e.g., confirming that there are no outstanding landowner complaints). All applications go through the baseline review, and a notice of application is posted. If no statements of concern are received, then the certificate will be automatically issued (Alberta Energy Regulator, 2019a). The Forested Land Criteria refers to applications in this stream as routine applications (Alberta Environment and Sustainable Resource Development, 2013a).

Compatible Species

Seeded species that were part of a seed mix that was appropriate to the time period in which the site was constructed/reclaimed or as outlined in historical agreements with the Land Manager (Alberta Environment and Sustainable Resource Development, 2013a).

Control

Refers to information collected off-site against which collected information from a reclaimed site will be compared. The control information is collected off-site from adjacent or representative land (Alberta Environment and Sustainable Resource Development, 2013a).

Desirable Species

Desirable species are native species that are appropriate to the representative off-site ecosite based on vegetation assessments at control locations and ecosite guides. Compatible species may be included in the definition of desirable species in some cases depending on the reclamation period of the site (Alberta Environment and Sustainable Resource Development, 2013a).

See also Compatible Species.

Deficiency (Reclamation Deficiency)

A feature or parameter that does not meet the Forested Land Criteria (Alberta Environment and Sustainable Resource Development, 2013a).

Ecosite

Ecological units that develop under similar environmental influences (climate, moisture and nutrient regime) […] It is not tied to specific landforms or plant communities […], but is based on the combined interaction of biophysical factors that dictate the availability of moisture and nutrients for plant growth. Thus, ecosites are different in their moisture regime and/or nutrient regime (Beckingham and Archibald, 1996).

Ecosystem Function

The interactions between organisms and the physical environment, such as nutrient cycling, soil development, water budgeting, and flammability (Alberta Environment and Sustainable Resource Development, 2013a). Conceptually, other forest functions also include providing wildlife habitat, temperature regulation and carbon sequestration.

Equivalent Land Capability

The ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical (Alberta Environment and Sustainable Resource Development, 2013a; Government of Alberta, 1993).

Evidence-based Approach

Approach requiring the collection and presentation of concrete evidence as a rationale to justify reclamation deficiencies.

Forested Land

Forested land includes any treed land, whether or not the forest vegetation is utilized for commercial purposes. Treed (bush) land in the White Area (deeded land) that is to be maintained as 'treed' shall meet the Forested Criteria (Alberta Environment and Sustainable Resource Development, 2013a).

Forested Land Criteria

The *2010 Reclamation Criteria for Wellsites and Associated Facilities for Forested Lands (Updated July 2013)* (Alberta Environment and Sustainable Resource Development, 2013a).

Incompatible Species

Species that are neither desirable species nor compatible species

See also Desirable Species and Compatible Species.

Invasive Species

The “invasive species” term has not often been formally codified as its usage is broad and subjective and can be used to refer to any number of aggressively colonizing species, particularly those that “displace the original structure of the plant community” (Powter, 2002). The “invasive” label is strongly context-dependent.

See also Problem Introduced Species and Undesirable/Problem Weed.

Land Manager

For Public Lands, this includes the Forest Officer, Lands Officer, Land Management Specialist, and/or Lands Approval Team Lead in Alberta Environment and Parks for a specific Region. For Provincial Parks and

Protected Areas, it is an Alberta Environment and Parks staff member from the Parks Division. For Private Lands, this includes the landowner, their designate, or occupant (Alberta Environment and Sustainable Resource Development, 2013a).

Macro-contours
In the context of operability conditions in the Forested Land landscape criteria, macro-contours are contours that occur on a 30 to 100 m width scale (Alberta Environment and Sustainable Resource Development, 2013a).

Merchantable Timber
Merchantable timber size standards are defined by the harvesting ground rules that apply to the timber disposition. The *Alberta Timber Harvest Planning and Operating Ground Rules Framework for Renewal* (Government of Alberta, 2016) defines several standard options; the minimum diameter is typically >15 cm at stump height (30 cm).

Meso-contours
In the context of operability conditions in the Forested Land landscape criteria, meso-contours are contours that occur on a 10 to 30 m width scale (Alberta Environment and Sustainable Resource Development, 2013a).

Micro-contours
In the context of operability conditions in the Forested Land landscape criteria, micro-contours are contours that occur on a <10 m width scale (Alberta Environment and Sustainable Resource Development, 2013a).

Native Species
Plant species that are indigenous to the ecosite (Alberta Environment and Sustainable Resource Development, 2013a).

A plant species that is part of an area's original flora (Powter, 2002).

Plant species that are listed as native in the Flora of Alberta: A Manual of Flowering Plants, Conifers, Ferns and Fern Allies Found Growing without Cultivation in the Province of Alberta, Canada (Moss, 1993).

Natural Recovery Site
Site using a natural recovery strategy for revegetation. Natural recovery is the long term re-establishment of diverse native ecosystems (e.g., forest) by establishment in the short-term of early successional species. This involves revegetation from soil seedbank and/or natural encroachment and no seeding of non-native agronomic species (Alberta Environment and Sustainable Resource Development, 2013a).

Net Environmental Benefit
Net environmental benefits are gains in value of environmental services or other ecological properties attained by remediation or [reclamation] minus the value of adverse environmental effects caused by [reclamation] (Efroymson et al., 2004).

Non-native Species
Species that are not native to Alberta.

See also Native Species.

Noxious Weeds
Plant species designated as noxious weeds in the *Weed Control Regulation* (Government of Alberta, 2010). The *Weed Control Regulation* also provides authority for a municipality to designate plants that are not listed as weeds in the *Weed Control Regulation* as noxious weeds. Noxious weeds are problematic to reclamation areas due to their highly aggressive colonization potential, ability to decrease biodiversity, and in some instances the potential to be allelopathic (i.e., inhibit other species from germinating or growing).

OneStop
The online tool used in Alberta to submit reclamation certificate applications for upstream oil and gas sites to the AER.

Operability
The Forested Land Criteria defines operability as the effort required to implement management decisions and practices to achieve a desired level of return (Alberta Environment and Sustainable Resource Development, 2013a). On forested lands, operability refers to equipment operation (especially for forestry) and land management.

Problem Introduced Species
Most often, this label encompasses agronomic species that mount considerable invasion pressure in forested areas. Alberta Environment (2003) defines problem introduced plants as forage plants that were introduced for crop or forage production purposes, and either invade or persist in native plant communities. Examples of plants that have been identified as problematic in the Central Parkland and Foothills regions include, timothy, smooth brome, and reed canary grass (although the latter is a native species, it is used as a forage species).

See also Invasive Species and Undesirable/Problem Weed.

Professional Justification
Explanation of why the site should be permitted to vary from the Forested Land Criteria and still receive certification (Alberta Energy Regulator, 2019a). Typically submitted to the AER with a variance request either in advance of (pre-approved justification) or as part of a reclamation certificate application. Professional justifications should provide a strong rationale as to why the deficiency is not expected to have adverse environmental impacts and how the site will still achieve equivalent land capability and ecosystem function despite not meeting the criteria, accompanied by detailed and comprehensive site-specific supporting information.

Professional Judgment
The application of training, knowledge, and experience in making appropriate decisions.

Reclamation Certification Process
Steps taken to obtain/issue a reclamation certificate for a site including: planning, reclamation, detailed site assessment, variance request, preparation and submission of a reclamation certificate application, application review, inspection and audit (as required), and issuance of a reclamation certificate.

Site (Upland Site)
An upstream oil and gas wellsite and/or associated facilities (e.g., log deck, access road) required to meet Alberta's reclamation criteria to achieve reclamation certification. In this document, the term site is used to refer to a site on forested land (whether in the Green Area or the White Area), or a site to which the Forested Land Criteria applies, on which the well has been properly and fully abandoned, and where contamination is absent or has been remediated (risk managed sites are out of scope). Furthermore, a site in this document has one or more reclamation deficiencies as per the Forested Land Criteria, but additional reclamation activities to correct these deficiencies would damage the developing forest ecosystem on the site (or its associated access road) to the extent that the impacts outweigh benefits.

Sites with a Low Risk of Safety Hazards
Sites can be considered to have a low risk of safety hazards if they meet both of the following:

- Sites with an access road that is blocked by an access deterrent which may include (but is not limited to): large trees and/or shrubs, boulders, large soil mounds or coarse woody debris.
- Sites that are not currently within a grazing lease.

Undesirable/Problem Weed
The "undesirable/problem weeds" category, as with other weed labels, is context-dependent and based on the reclamation area's location, the species in question, the native plant community, and historical management practices. In the context of reclaiming a forested ecosystem, if an invading species is not listed as a prohibited noxious or noxious weed and is not agronomic in nature then the species can be considered "undesirable" or a problem weed. Specific counties or regions can consider species to be undesirable/problematic weeds, even if they are not listed as noxious or prohibited noxious in legislation. Relevant native plant community guides and local authorities can be consulted to understand if the species of concern is labeled as undesirable in a specific area.

See also Invasive Species and Problem Introduced Species.

Third-party Impacts
Third-party impacts are those that occur as a result of activities conducted on the site by someone other than the operator (or their contractors), who may not be known to the operator. Examples include recreational or traditional users (e.g., ATV/UTV trails, camping), other industrial traffic (e.g., seismic construction), the Land Manager or the Landowner (e.g., livestock grazing, hay bale storage), wildlife and any other unauthorized access (Alberta Environment, 1997).

Topsoil
Undisturbed forested soil profiles are comprised of organic forest floor horizons (L, F, H and O) above mineral Ae, Ahe or Ah horizons followed by the subsoil (mineral B horizons) as defined in the Canadian System of Soil Classification – Third Edition (Soil Classification Working Group, 1998). The Forested Land Criteria (Alberta Environment and Sustainable Resource Development, 2013a) uses the terms topsoil and surface soil interchangeably and defines them as the "uppermost mineral material, valued as a growing medium" or the "uppermost mineral or organic material, valued as a growing medium" (these two definitions are found in different sections of the Forested Land Criteria). The Forested Land Criteria also specifically defines topsoil as the "A horizon, including the Ah, Ahe and Ae horizons." It is this last

definition of topsoil that is used in evaluating topsoil depth and distribution. The off-site average topsoil depth is assessed as the combined depth of Ah, Ahe and Ae horizons but does not include LFH. Depending on how the forest floor and topsoil horizons were salvaged during construction, the replaced layer of topsoil on-site after reclamation is often a combination of the LFH and A horizons.

Variance (Criteria Variance)
A deviation from the standard criteria or assessment process described in the relevant wellsite criteria document which must be approved by the AER. The term variance is used in SED 002 (Alberta Energy Regulator, 2019a) but not in the Forested Land Criteria (Alberta Environment and Sustainable Resource Development, 2013a). A variance request containing a professional justification must be submitted to the AER to obtain a variance.

Variance Request
A formal request submitted to the AER for a deviation from the standard criteria or assessment process described in the Forested Land Criteria. A variance request must contain a professional justification. For sites that require a variance request, the application process is termed a "non-routine application" or "additional review" (unless pre-approval is obtained).

See also Additional Review.

Vegetation Override
A specific type of variance to the wellsite certification criteria, where reasonable forest cover (i.e., amount, species, and distribution) is present, and where additional activities required to meet the conditions described in the criteria pose a risk to existing ecosystem function (Alberta Environment and Sustainable Resource Development, 2013a). The term vegetation override is used in the Forested Land Criteria but not in SED 002 (Alberta Energy Regulator, 2019a).

Weed
Refer to definitions of noxious weed, invasive species, problem introduced species, undesirable/problem weed.

ACRONYMS

The following acronyms are used in this report or the cited references.

AEP	Alberta Environment and Parks
AER	Alberta Energy Regulator
ATV	All-terrain Vehicle
AUPRF	Alberta Upstream Petroleum Research Fund
EPEA	*Environmental Protection and Enhancement Act*
CAT	Combined Assessment Tool

DSA	Detailed Site Assessment
LFH	Litter, Fibric, Humic
LSD	Legal Subdivision
PTAC	Petroleum Technology Alliance Canada
OSE	Oil Sands Exploration (operation)
RoO	Record of Observations
SED	Specified Enactment Direction
UTV	Utility Vehicle

1.0 INTRODUCTION

1.1 PURPOSE

This document was developed to support preparation of complete and comprehensive variance requests to allow for consistent decisions that result in the best possible ecological outcome during the reclamation certificate application process. Nonetheless, **variances are to remain the exception and not the rule**. This document is not intended to encourage or promote the use of variances to avoid conducting reclamation activities or to justify poor reclamation practices. Operators should conduct timely reclamation rather than waiting for conditions to develop on-site that could be used to justify deficiencies.

This document applies solely to forested upstream oil and gas wellsites (and associated facilities) that have vegetation on a trajectory to approximate natural forest vegetation but have one or more reclamation deficiencies according to Alberta's Forested Land Criteria (Alberta Environment and Sustainable Resource Development, 2013a).[1] The vegetation on the sites can originate through a planned natural recovery revegetation strategy or in combination with planting. Common reclamation deficiencies[2] on these sites include subsidence, hill cuts, variable topsoil depths or a lack of topsoil, admixing, woody debris that has not been rolled back, sparse desirable herbaceous vegetation cover and noxious weeds and other problem species.

During the reclamation certification process, the main question that arises with these sites is whether to:

- disturb existing vegetation to modify deficient features to meet reclamation criteria; or
- certify these sites without removing existing vegetation and re-starting the traditional reclamation process.

It has been recognized that in certain instances, sites with a deficiency(ies) can be on a trajectory towards developing a sustainable plant community and having equivalent land capability. Removing the existing vegetation and re-starting reclamation to address the deficiency can have unintended negative outcomes such as establishment of problematic species, damaging sensitive soils and creating access for third-party recreational use. However, in the long-term, re-starting the traditional reclamation process, could allow the site to provide more diverse, abundant, and resilient ecological services and pose less of a risk to future land users.

Based on current regulatory guidance (Forested Land Criteria and Specified Enactment Direction (SED) 002: Application Submission Requirements and Guidance for Reclamation Certificates for Well Sites and Associated Facilities (Alberta Energy Regulator, 2019a)), sites that do not meet the Forested Land Criteria can still receive a reclamation certificate if:

- equivalent land capability is demonstrated, and

[1] Citations for government documents will be provided the first time the document is referenced but will not be repeated each subsequent time the document is mentioned as they are cited frequently in this report.
[2] The definition of this and other terms are provided in the glossary.

- a comprehensive description of the site is presented to the AER.

However, to date, there is limited information on the decision process for pursuing variance requests and the content that should be included in professional justifications.

To support preparation of complete and comprehensive variance requests this document includes the following information:

- The reclamation certificate application process (Section 2.0)
- General considerations before proceeding with a variance request (Section 3.0)
- Formulation of a justification (i.e., what information and what level of detail to provide) (Section 4.0).
- Detailed information for common deficiencies (Appendix A and B)
- References to relevant information to support justifications (Appendix C)
- Example variance justification form based on the document (Appendix D)

1.2 CAVEATS

The following caveats must be recognized before using this document:

- Variance requests should be avoided by using all possible reclamation techniques to meet Forested Land Criteria.
- Following this document does not guarantee approval of variance requests as approvals are made on a site-by-site basis and there may be additional regional considerations.
- Information from this document must not be copied and pasted to populate a variance justification form – site-specific information is required.
- This document does not contain regulatory guidance; however, it has been developed based on feedback from the AER and Alberta Environment and Parks (AEP)[3].
- This document does not replace SED 002, which provides the current reclamation certificate application submission requirements and guidelines.
- This document applies to all sites constructed/reclaimed during any timeframe as all sites can be eligible for a variance. However, the expectation is that the need for variances should be reduced for sites constructed and reclaimed after June 2007 as reclamation practices are expected to have improved with the updated Criteria.
- This document does not apply to contaminated sites that cannot be certified through the *Alberta Framework for the Management of Contaminated Sites* (Government of Alberta, 2019).

[3] NOTE: In late 2022 Alberta Environment and Parks (AEP) was renamed Alberta Environment and Protected Areas (AEPA).

2.0 RECLAMATION CERTIFICATE APPLICATION PROCESS OVERVIEW

2.1 RECLAMATION CERTIFICATE APPLICATION SUBMISSION

A site becomes eligible for a reclamation certificate when it meets all the Forested Land Criteria for reclamation. At this time, reclamation certificate applications are submitted to the AER for approval, following the procedures described in SED 002.

Sites that do not meet all the Forested Land Criteria may still be eligible for a reclamation certificate. According to SED 002:

> *A reclamation certificate application that includes a variance request in response to assessment parameters failing to meet the applicable criteria or guidelines may still be submitted if the application is accompanied by professional justification.*

The AER is entirely responsible for making decisions regarding certification, including those sites which require professional justification for a variance request[4]. Variance requests can be submitted to the AER in two ways (Alberta Energy Regulator, 2019a):

- **Option 1**: the variance request can be submitted to the AER for pre-approval prior to submitting the reclamation certificate application – a signed document confirming pre-approval is then submitted with the reclamation certificate application.
- **Option 2**: the variance request can be submitted with the reclamation certificate application.

The option selected to submit a variance request has implications for the review stream that the application is subject to within the AER's online application submission system (OneStop); submitted applications may be subject to two levels of review (review streams) (Alberta Energy Regulator, 2019a):

- Baseline review – certificates are automatically issued if the online tool verifies all validation and assessment rules have been met and no statements of concern have been received. Option 1 applications go through this stream. The Forested Land Criteria refers to applications in this stream as routine applications.
- Additional review – more detailed review of the application by AER staff before the certificate is issued. Option 2 applications go through this stream. The Forested Land Criteria refers to applications in this stream as non-routine applications.

Figure 1 presents a flow chart for proceeding through the application process for sites that require a variance.

[4] Sites that require a land use change (i.e., a change in the assessment criteria used) have additional approval requirements; these sites are beyond the scope of this document.

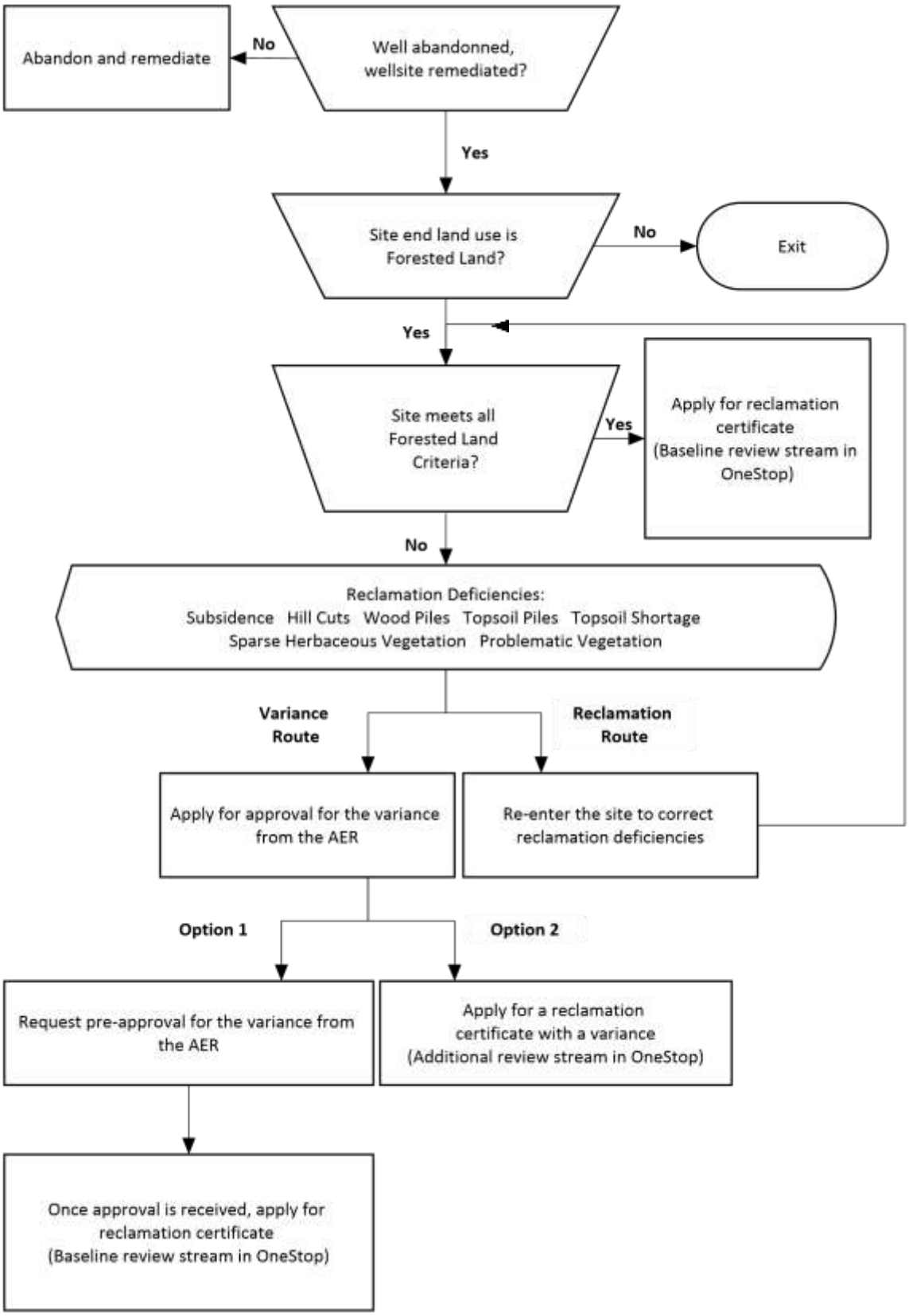

Figure 1. Reclamation certification application process.

2.2 PROFESSIONAL JUSTIFICATION FOR VARIANCE REQUESTS

Professional judgement is used to determine whether a site that does not meet the Forested Land Criteria is eligible for a variance, or whether additional reclamation work is required to correct reclamation deficiencies[5]. Professional justifications submitted with a variance request must include a "rationale for [the] decision, supported by acceptable references" (Alberta Energy Regulator, 2019a)[6].

There are terminology differences between the Forested Land Criteria and SED 002 with regards to variances that create potential for confusion. In particular, SED 002 uses the term *variance* to refer to formal approval for deviations from the standard criteria, but this term is not used in the Forested Land Criteria. Instead, the Forested Land Criteria use the term *vegetation override* to describe a specific situation where the criteria may not be met, as follows; this term is not used in the SED 002:

> *Where reasonable forest cover (i.e., amount, species, and distribution) is present, and where additional activities required to meet the conditions described in these criteria pose a risk to existing ecosystem function, a vegetation override may be appropriate. Equivalent capability for forested landscapes must be demonstrated.*

A vegetation override is just one type of variance. At this time, several different types of variances can be selected for forested sites in OneStop (listed below; those that will be discussed in this document are highlighted in blue), including an option for vegetation override (AER, 2019b).

- Variance – Landscape
- Vegetation override – Forested
- Incompatible vegetation – Noxious weeds
- Incompatible vegetation – Invasive species
- Incompatible vegetation – Problem introduced species
- Incompatible vegetation – Undesirable/problem weeds
- Variance – Other
- Aerial Assessment – Forested; damage concerns
- Aerial Assessment – Forested; safety concerns
- Criteria waived due to development zoning
- Third party impact – Private lands
- Third party impact – Public lands

[5] Professional judgement is also used when adjacent lands cannot be used as representative controls for the assessment (e.g., in situations where access to off-site areas was restricted or representative controls were not available).

[6] SED 002 also recommends that "operators should first discuss options with the AER prior to conducting the detailed site assessment."

3.0 CONSIDERATIONS PRIOR TO PROCEEDING WITH A VARIANCE REQUEST

3.1 ALTERNATIVES TO A VARIANCE REQUEST

Prior to proceeding with a variance request, all reclamation techniques that could be used to remedy the deficiency(ies) must be considered. Techniques can range from fully redisturbing and reclaiming a site to low-impact methods that may fully or partially remedy the deficiency. To make a final decision, the net environmental benefit of each technique should be compared to leaving the deficiency(ies) "as-is". A variance request should only be made if the net-environmental benefit of a variance-request out-weighs all other options. For sites with multiple deficiencies, practitioners should consider the cumulative effects of these deficiencies on net-environmental benefit.

Net environmental benefits can be defined as gains in value of environmental services or other ecological properties attained by remediation or reclamation minus the value of adverse environmental effects caused by reclamation (Efroymson et al., 2004) (i.e., the approach used results in the best possible ecological outcome). Net environmental gains should be considered at a decade to century timeframe. Information to quantitively assess the gains and losses associated with reclamation techniques to determine the net environmental benefit is currently limited, but reasonable qualitative estimates can be made.

Gains in environmental services could include:

- Increased biodiversity
- Increased cover of native understory vegetation
- Faster or more sustainable tree growth
- Improved wildlife habitat
- Greater traditional use opportunities
- Reduction or removal of problematic species
- Reduced risk of slope instability and erosion and sedimentation
- Reduced risk of wildfire
- Removal of barriers to wildlife movement
- Removal of hazardous terrain for wildlife and land users

Adverse environmental effects to remedy deficiencies could include:

- Damage to existing vegetation on the access road, especially for sites that have:
    - Long access roads.
    - Access roads that cross through sensitive ecosystems (e.g., peatlands and wetlands) or habitat (e.g., caribou).
    - Access roads that require creek crossings, especially over fish-bearing streams.

- Access roads that have an established canopy of trees and shrubs.

- Damage/destruction of existing vegetation on-site and soil re-disturbance resulting in ecological recovery delayed by decades to centuries (10 years or less may not constitute an adverse environmental effect). The disturbance to correct deficiencies would represent the second disturbance that the site has undergone, the first being the original disturbance to construct and then reclaim site during which soils were salvaged, stockpiled, and then replaced. Soil disturbance (and subsequent re-disturbance) degrades topsoil quality and vegetation propagule abundance. Recovery from a second disturbance may not be as rapid as the first (for further reading on this subject refer to Tokay et al., 2019). Sites that are more vulnerable to re-disturbance include:
  - Sites with lower total abundances of propagules.
  - Sites with more limiting soil properties conditions.
  - Sites with a history of multiple disturbances.
  - Sites that require a larger disturbance area to correct the deficiency.
- Rutting and compaction. Sites that are more impacted by this include:
  - Sites with wet soils.
  - Sites with fine-textured soils.
  - Sites that require a larger disturbance area to correct the deficiency.
- Greenhouse gas emissions associated with equipment used during reclamation.
- Re-opening of access to recreational users, resulting in increased frequency of disturbance and third-party impacts on the site.
- Use of imported topsoil material, resulting in introduction of weeds and diseases or a change in nutrient or moisture regime (e.g., if nutrient-rich agricultural soils are imported), in addition to creating further environmental disturbance at the donor site.
- Weed establishment and potential need for chemical weed control (i.e., noxious weeds and/or any weed that requires control to pass the Forested Land vegetation criteria). Sites that are more susceptible to weed establishment include:
  - Sites that are near active facilities, industrial traffic, agricultural areas, or main roadways.
  - Sites with weeds or non-native species in the understory or that have a history of these species (i.e., these species are present in the seed bank).
  - Sites that require a larger disturbance area to correct the deficiency, as this will create a larger receptive seed bed for weeds to establish.

3.2 EQUIVALENT LAND CAPABILITY

Equivalent land capability must be demonstrated for a variance request to be considered. If equivalent land capability cannot be demonstrated, all site deficiencies must be remedied. Equivalent land capability is defined in the Forested Land Criteria as:

> *The ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical.*

Ultimately, what this means is re-creating landscape, soil and vegetation conditions that will result in future forested ecosystem functions and land uses that may include wildlife utilization and habitat, recreational and traditional uses, and/or commercial forestry[7].

Ecosystem function is defined in the Forested Land Criteria as "the interactions between organisms and the physical environment, such as nutrient cycling, soil development, water budgeting, and flammability." Conceptually, other forest functions also include providing wildlife habitat, temperature regulation and carbon sequestration. Forest ecosystems are made up of several structural vegetation layers, most notably the overstory tree canopy and a variety of understory strata (e.g., shrubs, herbaceous plants, mosses, lichens). Biodiversity in these layers and the interactions between vegetation layers and the forest soils they are supported by allow forests to be self-sustaining and resilient to stressors and disturbance (Pyper et al., 2013), both of which are cornerstones of functional ecosystems.

Equivalent land capability can be demonstrated by:

- meeting or exceeding the Forested Land Criteria,
- being comparable to pre-disturbance conditions, or condition in the surrounding area,
- providing annual monitoring data with a trend/trajectory towards a functional ecosystem,
- proving that the landscape and soil are suitable for supporting ecosystem function, and/or
- proving that the deficiency does not cause long-term impacts to ecosystem function.

Sites that are impacted by third-party activity may also be eligible for a variance if an evidence-based approach is used to document the activities and show that the wellsite is not the cause of the impacts (third-party impacts, other than those related to weeds, are outside of the scope of this document).

[7] Ecosystem function is considered a component of equivalent land capability, but the concept of equivalent land capability is broader. Ecosystem function represents the current ecological state of the site while equivalent land capability incorporates current, future, and alternate land uses.

4.0 PREPARING PROFESSIONAL JUSTIFICATIONS

If a variance will result in the best ecological outcome and the site has equivalent land capability, the request including a complete and comprehensive professional justification can be prepared and submitted to the AER for approval. **Following the recommendations in this report will not guarantee approval by the AER; the AER will make the final decision for each variance request.**

This section outlines the content that a professional justification should include and discusses additional data collection that may be required. Information specific to seven common deficiencies (subsided areas, hill cuts, soil stockpiles, woody debris piles, topsoil depth and distribution, desirable herbaceous species cover and problematic species) can be found in Appendix A.

4.1 DEVELOPING A PROFESSIONAL JUSTIFICATION

According to SED 002:

> *an operator may provide justification as to why a site should be permitted to vary from the criteria and still receive certification. […]. If a variance is being requested, the operator must provide the rationale for its decision, supported by acceptable references.*

Professional justifications should be developed using an evidence-based approach and contain detailed and comprehensive site-specific supporting information. Justifications should include:

- relevant background information,
- rationale or evidence that a variance request will result in the best ecological outcome,
- explanation of why the deficiency is not expected to have adverse environmental impacts, and
- demonstration of equivalent land capability and ecosystem function despite not meeting the Forested Land Criteria.

As discussed in Section 2.1, operators have the option to submit a justification for pre-approval prior to submitting a reclamation certificate application (Option 1), or they can submit the justification with the reclamation certificate application (Option 2). A justification form is available for use as part of the Combined Assessment Tool (CAT) and Record of Observations (RoO) (Alberta Energy Regulator, 2019c) used for a detailed site assessment (DSA). However, this form is not ideal for use as part of a pre-approval request for a variance because it does not include background site history and ecological information. The form presented in Appendix D is proposed as a standardized form for submitting variance requests. It includes an optional section for pre-approval requests in which background information can be provided.

The form in Appendix D details the comprehensive information that should be included in a justification[8]. The first page of the form can be repeated for each facility and deficiency, and text boxes can be expanded to include additional information. If a section is "Not applicable", it is recommended to provide an explanation of why it is "Not Applicable". The following describes the sections of the form and the information to include:

- Facility(ies)
    - Include separate pages for each facility. In some instances, two or more facilities that are in close proximity and have the same deficiency could be grouped to avoid redundancy; however, information should not be generalized.
- Deficiency Type(s)
    - All the deficiencies that occur on the site must be listed in this section, as the combined impacts of all deficiencies must be weighed together to determine if any one deficiency can receive a variance. Submission of a variance request for a site that has already received a variance for one deficiency is discouraged.
- Description of the Deficiency
    - The description of the deficiency should be as detailed as possible and include the dimensions and the location on the site (i.e., site diagram and coordinates).
        - For topsoil depth, the description should include the measured on-site and off-site topsoil depths (including both an average and the range).
        - For problematic species (e.g., weeds), the description should include the species, locations of patches or populations on-site, and number of plants or percent cover within the grid or site. Data from multiple years is encouraged to show trends over time.
    - Describe when the deficiency was identified (or why the deficiency may not have been identified) and why it wasn't and corrected previously. Include information on any attempts to correct the deficiency in the section labelled "Actions Taken to Address Deficiency".
- Pre-existing Conditions and Pre-disturbance Biophysical Information
    - Review information from pre-disturbance assessments, environmental field reports or other documents, if available. Historical aerial imagery could provide coarse scale information if other sources of information are lacking.

[8] For justifications related to third party activity, include the information and descriptions recommended by the Conservation and Reclamation Information Letter: Third Party Impact on Reclamation (Alberta Environment, 1997), including a description of the impact, details on actions taken to prevent the impact, a description of the operator's actions to mitigate any environmental damage that has occurred because of the third party and a description of the operator's efforts to deter any further impacts.

- Summarize and interpret this data to determine if the pre-disturbance conditions may have contributed to the deficiency and/or demonstrate how the pre-disturbance conditions were equivalent to the reclaimed conditions.

- Surrounding Area – Land Use(s) and Biophysical Information
  - Review information on the current and historical land uses and biophysical conditions from field assessment data, historical aerial imagery, provincial databases or other sources.
  - Summarize and interpret this data to determine if the surrounding land use may have contributed to the deficiency and/or demonstrate there are conditions comparable to the deficiency in the surrounding area (natural analogs).
    - Surrounding land use may also influence the risk caused by the deficiency; the risk can be described in the "Limitations or Hazards to Future Land Users Caused by Deficiency" section of the form.
  - Provide the locations and sizes of any natural analogs and include photographs.
  - Provide the names and distances to nearby populated areas (if relevant).
- Construction/Reclamation Limitations
  - Summarize information on the site's history of construction and initial reclamation and determine if there were any factors during construction and initial reclamation that may have caused the deficiency.
- Actions Taken to Address Deficiency
  - Summarize any work completed in attempt to address the deficiency in part or in full (e.g., low-impact reclamation work, herbicide application).
  - Describe the outcome of this work.
- Alternatives to Justification Considered
  - List the possible techniques that could be used to remedy the deficiency
  - Describe why leaving the deficiency "as-is" will result in the best ecological outcome (net-environmental benefit).
- Annual Monitoring Results and Current Site Conditions
  - Summarize the results of annual monitoring (e.g., detailed site assessment(s)) and describe the historical trajectory of the site and current state of the site.
- Limitations or Hazards Caused by Deficiency
  - List and describe the probability (i.e., likelihood of occurrence) and severity (i.e., consequences of occurrence) of any risks that not remedying the deficiency could cause to future land users and wildlife (including risk of wildfire).
  - Describe any steps taken to limit the risk.

- Rationale for Variance
    - Summarize information from the previous sections of the justification form to explain why:
        - the site still meets equivalent land capability and is on a trajectory towards a forested ecosystem even with the deficiency left in place, and
        - leaving the deficiency "as-is" results in the best possible ecological outcome (i.e., environmental cost-benefits analysis).
    - Include data from the DSA to support explanations.
    - Include additional supporting information (refer to Section 4.2 and Appendix A).
    - When justifying multiple deficiencies, do not provide contradictory evidence; a statement that supports one deficiency should not be disproven in the arguments for another deficiency. For example, a hill cut cannot be justified by a statement that it is well vegetated if the site is also failing for sparse desirable herbaceous cover throughout the site.
    - Support the rationale with relevant literature (Appendix C).

The following information should also be attached to support the justification:

- Photographs of each deficiency and for each facility
- Site diagram (including overlapping dispositions)
- Survey plans
- DSA, including CAT and RoO datasheets and any supporting reports
- Aerial photos
- Construction records
- Pre-disturbance biophysical information
- Any other relevant information

Background information that should be included if the variance justification form is not accompanied by a CAT and RoO includes:

- Site overview, ecological and land use information, and any overlapping dispositions
- Facility location and size
- Site history (dates and descriptions of activities and conditions)

4.2 ADDITIONAL DATA COLLECTION

When reclamation deficiencies are present on-site, additional data collection during site assessment is beneficial to develop more in-depth professional justifications for variance requests. Additional data collection helps to provide improved context for the reclamation goals than may be provided by the

normal number of control points or other data requirements in the Forested Land Criteria. Recommended data to collect beyond the data collected in the DSA could include the following, as applicable for the site:

- Dimensions (width, length, and height), location and photographs of subsided areas, hill cuts, soil stockpiles and woody debris piles on-site and a description of any slumping, ponding, and erosion.
- Evidence of depressions, windthrow or other natural analogs for subsided areas off-site, including dimensions, location (e.g., coordinates), photographs and a description of any slumping, ponding, and erosion.
- Distance of woody debris piles from the edge of the site.
- On-site and off-site contour (i.e., slope class).
- Off-site vegetation measurements (i.e., herbaceous, and woody species cover, leader length and height for trees and shrubs).
- On-site tree data to support mean annual increment assessment (as per the *Regeneration Standards of Alberta*; Alberta Agriculture and Forestry, 2018a).
- Off-site ecosite phase and photographs.
- Soil suitability data and samples for analysis (as per the *Soil Quality Relative to Disturbance and Reclamation*; Alberta Soils Advisory Committee, 1987).
- Topsoil pile samples for analysis of organic matter, nutrients, and seed bank.
- Species, location, number of plants and patch size for each patch of noxious weeds, invasive species, problem introduced species and undesirable/problem weeds on-site and off-site.
- Percent cover of noxious weeds, invasive species, problem introduced species and undesirable/problem weeds by species (either in each grid or on the site as a whole).
- Evidence of ATV/UTV/snowmobile/light vehicle trails on-site and on the access road, including dimensions, location (e.g., sketch, coordinates) and photographs.
- Evidence of wildlife use of the site, including descriptions, locations (e.g., sketch, coordinates) and photographs.

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