Reclamation Practices and Criteria for Powerlines

MAY 2020

Alberta

Ministry of Environment and Parks, Government of Alberta
Date of publication: May 29, 2020
Title of publication: Reclamation Practices and Criteria for Powerlines
ISBN 978-1-4601-4732-0

Any comments, questions or suggestions regarding the content of this document may be directed to:
Lands Policy and Programs Branch
Lands Division
Alberta Environment and Parks
10th Floor, Oxbridge Place
9820 – 106 Street NW
Edmonton, Alberta T5K 2J6
Fax: 780-422-4192
Email: Land.Management@gov.ab.ca

Additional copies of this document may be obtained by contacting:
Information Centre
Alberta Environment and Parks
Edmonton, Alberta
Phone: 780-427-2700
Fax: 780-422-4086
Email: AEP.Info-Centre@gov.ab.ca

Table of Contents

Acronyms and Abbreviations

AENV: Alberta Environment; currently Alberta Environment and Parks

AEP: Alberta Environment and Parks, Ministry of Environment and Parks, the Department

AEUC: Alberta Electrical Utility Code

C&R: Conservation and Reclamation (Regulation)

DSA: Detailed site assessment; a final assessment of the site prior to applying for a Reclamation Certificate. The DSA evaluates the site landscape, vegetation, and soil, as compared to surrounding land.

EPEA: the *Environmental Protection and Enhancement Act*; a provincial act established to protect air, land, and water. The EPEA is one of the two main regulations governing environmental issues in Alberta. The other is the *Water Act*.

ESA: Environmental site assessment; an investigation to determine the environmental condition of a given land area.

ESRD: Alberta Environment and Sustainable Resource Development; former name of AEP (see above)

PLAR: Public Lands Administration Regulation

Note, this list is not exhaustive. For additional definitions refer to the *2010 Reclamation Criteria for Wellsites and Associated Facilities* (AEP, 2017a; ESRD, 2013a-c).

END OF SECTION

1 Overview

This Guide addresses those areas where supplementary guidance on reclamation and regulatory closure for powerline right-of-ways is required. For the purpose of this Guide, a **"powerline" (or "powerline right-of-way", "right-of-way")** includes:

- transmission line right-of-ways on private land;
- transmission line right-of-ways on public land; and
- distribution line right-of-ways on public land.

The practices and criteria presented in this document are for use by powerline operators and qualified environmental professionals when removing powerlines, and for reclaiming and assessing powerline right-of-ways and associated lands such as temporary workspaces.

The field practices for decommissioning, reclamation, and assessment on powerlines (transmission lines and distribution lines) are similar, and typically dictated by site and environmental conditions. However, the regulatory closure requirements for a powerline can differ depending on: a) whether the powerline is a transmission line or distribution line; and b) whether the powerline is on private land or public land. All transmission lines on private and/or public land are to be reclaimed and must obtain a Reclamation Certificate for regulatory closure. Distribution lines on public land are to be reclaimed and must obtain a Letter of Clearance for regulatory closure. Those distribution lines that are on private land do not require a regulatory closure document.

Operation of an electrical transmission line in Alberta is a **"specified land"** activity and therefore the line and all associated lands must be reclaimed and receive a Reclamation Certificate for regulatory closure, whether on private or public land. This is directed through the *Environmental Protection and Enhancement Act* ("EPEA") and the Conservation and Reclamation Regulation (C&R Regulation). The C&R Regulation outlines an operator's obligation to reclaim specified land to equivalent land capability. Reclamation Certificates for transmission lines are managed through Alberta Environment and Parks (AEP, the Department).

The *Public Lands Act* requires reclamation of distribution lines on public land. Holders of a distribution line disposition must reclaim and obtain a Letter of Clearance for regulatory closure (of the disposition, easement). Reclamation requirements for transmission lines and distribution lines on public lands are the same, except that transmission lines must obtain a Reclamation Certificate, whereas distribution lines must obtain a Letter of Clearance.

The published environmental protection guidelines for transmission lines provides guidance for assessment for all land types (AENV, 2011). The criteria discussed in this document for powerline right-of-ways are based on the updated reclamation criteria for wellsites and associated facilities (AEP, 2017a; ESRD, 2013a, 2013b, 2013c). The term **"reclamation criteria"** will be used to refer to this set of documents in general.

Powerlines have some unique features that affect how the reclamation criteria can be applied. Additionally, this Guide discusses some management practices for decommissioning the infrastructure associated with powerlines. Generally, powerlines are linear disturbances with associated infrastructure, covering multiple properties, and various land types. These features are associated with disturbances that are similar to

those associated with oil and gas facilities. Powerline right-of-ways often impact wetlands, which presents some unique challenges for decommissioning structures and subsequent reclamation and assessments. However, basic principles of soil, landscape, and vegetation reclamation are fairly universal in nature. For facilities such as substations and any other non-linear facilities, the reclamation criteria may be applied exactly as they are applied to wellsites.

For powerlines, for the purpose of conservation and reclamation, the *2010 Reclamation Criteria for Wellsites and Associated Facilities* ("reclamation criteria", "wellsite criteria") provides the context for how final reclamation success will be determined at the time of Reclamation Certificate application. These criteria are designed to evaluate equivalent land capability for the approved end land type and include the key aspects of landscape, soils, and vegetation. The intent is to provide transparency for the operator, stakeholders, and regulating bodies on what will be the measures for reclamation certification and closure. It is recognized that the criteria may evolve, so careful planning and assessment is essential. This Guide will be reviewed by the Department and updated as necessary.

END OF SECTION

2 Using this Document

2.1 Legislative Authority

The Government of Alberta (GOA) protects the province's land resources by ensuring land used for industrial activities is conserved and reclaimed in an environmentally sound and timely manner. For transmission line sites this is directed through the EPEA and the Conservation and Reclamation Regulation (C&R Regulation) and supporting documents.

On public lands, there will also be additional requirements for transmission and distribution line sites that operators must follow directed through the standards and conditions of the formal disposition, authorization or approval issued under the Public Lands Act and Public lands Administration Regulation. The regulatory requirements set forth in the Water Act, the Water (Ministerial) Regulation, and Codes of Practice, that are released or amended from time to time must be adhered to for activities taking place in water bodies or wetlands.

2.2 Conservation and Reclamation

2.2.1 Objective

The objective of conservation and reclamation of **"specified land"** is to return the specified land to an **"equivalent land capability"** ("ELC").

2.2.2 Specified Land

Specified land is defined under the C&R Regulation as: *land that is being or has been used or held for or in connection with activities listed under* Section 1(t) of the Regulation. This includes any supporting activities, temporary or permanent, including, but not limited to, temporary access roads, or workspaces. As such, areas used for these activities during the construction, operation, or reclamation of the transmission line right-of-way must be reclaimed to obtain a Reclamation Certificate for these areas once they are no longer required.

2.2.3 Equivalent Land Capability

Ecological health, function, and land operability are indicators of reclamation success and **equivalent land capability**. The ELC outcome is legislated through the:

- Conservation and Reclamation Regulation (C&R Regulation): where ELC means that 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.
- Public Lands Administration Regulation (PLAR): where, except in Section 127, ELC means, in respect of land that is the subject of a disposition, a condition in which the ecosystem processes on the land are capable of producing goods and services of a quality and in a quantity that is at least equivalent to that which existed before the disposition was issued to the holder.

Reclamation success is measured against the representative site conditions (e.g., adjacent, pre-disturbance, or reference plant community), to establish whether reclamation activities have resulted in the

outcome of ELC being met. Where activities on specified land have resulted in changes to land type or plant community type from pre-disturbance conditions the Department must approve the changes.

2.2.4 Regulatory Closure for Powerline Types

Transmission lines are considered specified land under the C&R Regulation. Therefore, transmission lines on both private and public land must be reclaimed and obtain a Reclamation Certificate for regulatory closure. Transmission lines must be reclaimed to ELC by meeting reclamation criteria for landscape, soils, and vegetation. As part of meeting reclamation criteria, they must also meet Tier 1 (or Tier 2) soil and groundwater remediation guidelines (AENV, 2007a; 2007b).

Distribution lines on public land must be reclaimed as per the *Public Lands Act*. Holders of a distribution line disposition must reclaim and obtain a Letter of Clearance for closure of the disposition. Distibution lines on public land must be reclaimed to ELC by meeting reclamation criteria for landscape, soils, and vegetation, similar to those requirements for transmission lines. The procedures outlined in this document must be followed in order to obtain a Letter of Clearance. While distribution lines are not specified land, under the *Public Lands Act* and Public Lands Administration Regulation, at the time of closure, transmission and distribution lines on public lands must follow all the requirements in this Guide to achieve reclamation requirements. This also includes all additional requirements and terms within the formal disposition (easement). These must be met as part of the application. The applicant cannot merely report whether the detailed site assessment (DSA) parameters have met applicable reclamation criteria.

Summary of powerline reclamation and regulatory closure requirements based on land type:

- Private Land:
    - Operators of transmission lines must reclaim and apply for a Reclamation Certificate.
    - Operators of distribution lines should reclaim, but do not need to apply for regulatory closure unless the distribution line is part of a larger activity considered specified land.
- Public Land:
    - Operators of transmission lines must reclaim and apply for a Reclamation Certificate.
    - Operators of distribution lines must reclaim and apply for a Letter of Clearance.

Transmission Lines versus Distribution Lines

Transmission lines and their associated facilities are sometimes downgraded or re-assigned as **distribution lines**. It is important to note, if a site or portion of a site is used, or has ever been used as part of a transmission line or associated facility, which are defined as **specified land,** the site will remain as **specified land**, and therefore ***must*** still be reclaimed to equivalent land capability and a Reclamation Certificate or Letter of Clearance obtained.

2.3 Policy Alignment

2.3.1 Regional Plans, Legislation, and Regulations

Alberta's Land Use Framework (GOA, 2008) sets out regional land-use plans to support land-use management and decision making on the landscape. Operators must ensure they are aligned with regional and sub-regional planning when developing project applications by complying with any applicable:

- Approved regional or sub-regional plan covering the area in which the operator is active, as amended from time to time;
- Legislation and regulations, as amended from time to time, such as, but not limited to: the *Environmental Protection and Enhancement Act, Water Act; Weed Control Act,* Water (Ministerial) Regulation, Conservation and Reclamation Regulation, Public Lands Administration Regulation, and the Code of Practice for Powerline Works Impacting Wetlands (AEP, 2019).
- Regional and local planning requirements (e.g., municipal bylaws, municipal zoning), as amended from time to time.

2.3.2 Directives, Standards, and Criteria

Unless alternate requirements were previously approved by the Department, operators must also follow applicable regulatory and policy guidance such as, but not limited to: directives, standards, criteria, codes of practice, and best management practices (when directed), as amended from time to time, when planning and carrying out activities. These include, but are not limited to:

- 2010 Reclamation Criteria for Wellsites and Associated Facilities for:
    - Cultivated Lands (GOA: ESRD, 2013a);
    - Forested Lands (GOA: ESRD, 2013b);
    - Native Grasslands (GOA: ESRD, 2013c); and,
    - Peatlands. (GOA: AEP, 2017a).
- Alberta Wetland Mitigation Directive (GOA, 2018)
- Alberta Wetland Identification and Delineation Directive (GOA, 2015)
- Conservation Assessments in Native Grasslands: Strategic Siting and Pre-disturbance site assessment Methodology for Industrial Activities in Native Grasslands (GOA: AEP, 2018).
- Wildlife Directive for Alberta Wind Energy Projects (GOA: AEP, 2017b).
- Wildlife Directive for Alberta Solar Energy Projects (GOA: AEP, 2017c).

2.3.2.1 Contamination

Guidance on contaminated sites is provided in Alberta's Remediation Regulation and *Contaminated Sites Policy Framework* (ESRD, 2014a). In wetlands, poles must be made of non-reactive/inert materials (AEP, 2019).

2.3.2.2 Best Management Practices

Having a qualified environmental professional onsite during conservation and reclamation activities (e.g., salvaging and placement of materials) is one of the best practices to attain reclamation success.

For best management practices (BMPs) to be effective they need to be adaptive and evolve continually as additional learnings, monitoring, and research are incorporated. Principles from the following BMPs, and others, should be used to aid in this process to prevent and reduce potential adverse impacts targeted towards site-specific concerns throughout the lifecycle of the powerline. These include, but are not limited to, the following:

- Alberta Clubroot Management Plan
- Beneficial Management Practices for Renewable Energy Projects – Reducing the Footprint in Alberta's Native Grassland, Parkland and Wetland Ecosystems (Gramineae, 2017)
- Environmental Protection Guidelines for Transmission Lines (AENV, 2011)
- Recovery Strategies for Industrial Development in Native Grassland/Prairie:
    - Dry Mixedgrass Natural Subregion (Gramineae, 2013).
    - Mixedgrass Natural Subregion (Neville et al. 2014).
    - Northern Fescue Natural Subregion (Lancaster et al. 2017).
    - Foothills Fescue, Foothills Parkland and Montane (Lancaster et al. 2018).
- Principles for Minimizing Surface Disturbance in Native Grasslands (AEP, 2016).

2.4 Qualified Professionals

Reclamation Certificate (or Letter of Clearance) applications prepared and submitted to the Department must be prepared and signed off by one or more qualified environmental professional(s). These professionals need competencies as outlined in the *Professional Responsibilities in Completion and Assurance of Reclamation and Remediation Work in Alberta Joint Practice Standard*, (PRO, 2012).

The Department recognizes the following professional regulatory organizations (PROs) whose scopes of practice include land reclamation and remediation:

- Alberta Institute of Agrologists;
- Alberta Society of Professional Biologists;
- Association of Professional Engineers and Geoscientists of Alberta;
- Association of the Chemical Profession of Alberta;
- Association of Alberta Forest Management Professionals, or the,
- Association of Science and Engineering Professional Technologists of Alberta.

Sign-off eligibility requires the signatory professional to be a member in good standing of one of the PROs, and to have a minimum of five years of relevant experience in reclamation and to carry professional liability insurance (errors and omissions) unless they are undertaking work on behalf of their employer. The professional organizations are responsible for the development of competency measures for their members. Sign-off must include the professional's signature, and either:

- Registration/membership number, or
- Stamp/seal.

Competent practitioners with a coordinating qualified environmental professional sign-off can complete appropriate components of the work as directed in the *Professional Responsibilities in Completion and Assurance of Reclamation and Remediation Work in Alberta Joint Practice Standard* (2012). In

circumstances involving wetlands, an authenticating wetland professional must meet all the stipulations outlined in the *Professional Practice Standard, Professional Responsibilities in Completion and Assurance of Wetland Science, Design and Engineering Work in Alberta* (2014b).

Poorly completed, uninformed and inaccurate desktop or field-level assessments can be recognized by skilled reviewers and regulators, resulting in delays, audits, or failures of project applications.

END OF SECTION

3 Background

The electrical transmission and distribution system in Alberta services residential, commercial, and industrial developments. The transmission line system in Alberta is connected to electrical distribution systems through substations with transformers that reduce the voltage to deliver electricity to consumers. These service rural communities and connect cities to remote generation facilities.

For the purpose of this document, transmission lines are defined in the EPEA and its supporting regulations.

3.1 Powerline Structures and Right-of-Ways

Powerline structures and right-of-way requirements vary depending on the line voltage and other factors, such as landscape. Single wooden poles support the smallest powerlines. When single poles are used, it can be difficult to distinguish between transmission and distribution lines, so this should be confirmed using reliable records.

Another common configuration is the “H-frame”, consisting of a pair of adjacent poles with cross beams joining them together. The oldest powerlines used wooden pole structures. In recent years, there has been an increase in use of steel monopoles and composite poles.

The largest powerlines are supported by large steel lattice structures. Steel structures are supported by concrete footings that extend deep into the ground, or they are embedded directly into the ground in a manner similar to wooden poles. These structures might also be supported with wires (guide wires, guy wires) secured to an anchor embedded into the ground.

The Alberta Electrical Utility Code (AEUC) sets requirements for powerlines between supporting structures, which include, but are not limited to:

- Minimum clearances between the lines/wires and the ground, and any structures and vegetation;
- Land used within the right-of-way for facilities and buildings is restricted; and,
- Vegetation is controlled as necessary to prevent trees from coming too close to the lines/wires.

In agricultural areas, the land within the right-of-way is typically farmed with the rest of the field. The operator uses the right-of-way to gain access for: inspecting the line, vegetation management, or maintenance on the line, as well as during decommissioning and reclamation activities.

3.2 Typical Conservation and Reclamation Issues

Conservation and reclamation issues along right-of-ways arise from:

- Siting in difficult or challenging terrain;
- Lack of soil conservation during construction/salvage practices;
- Original construction of the line;
- Operations during the life of the line; and/or
- Decommissioning and reclamation activities.

Some typical reclamation issues that occur on right-of-ways include the following:

- Cut and fills in hilly terrain and along water courses, characterized by steep slopes, erosion, lack of topsoil and sometimes poor vegetation growth;
- Introduction of regulated weeds and undesirable plant species;
- Eroded areas often associated with off-road vehicle traffic and long slopes that allow soil erosion resulting in topsoil removal, deposition, and gullies;
- Blowouts associated with sandy soil and lack of vegetation, which can be worsened by off-road traffic preventing natural (re)vegetation;
- Roadways or access trails, which can be present on, or approaching, right-of-ways;
- Rutting and compaction at structure locations from equipment used for construction, maintenance, or structure removal;
- Holes caused by subsidence of fill material where poles or other underground structures have been removed; and,
- Gravel at surface from over-filling holes.

END OF SECTION

4 Best Practices for Decommissioning

This section outlines guidance on the best practices for decommissioning powerlines as they relate to potential environmental impacts and meeting reclamation criteria. These practices do not provide comprehensive procedures for decommissioning or reclamation, but are used to inform the fieldwork and planning required, and may be updated from time to time as policies and methods evolve.

In conjunction with the decommissioning planning, a preliminary assessment of the powerline right-of-way must be completed to identify and prioritize all reclamation issues. In most cases, this will require reviewing aerial images, file information, and completing site (field) visits. This is sometimes done as part of a Phase 1 Environmental Site Assessment (Phase 1 ESA).

Identifying issues early will facilitate decommissioning and reclamation planning for the right-of-way and avoid delays in achieving reclamation criteria and applying for a Reclamation Certificate or Letter of Clearance. During decommissioning, equipment, infrastructure, and material must be removed from the site, including (but not limited to) debris such as small metal parts, wires, insulators, and garbage.

The entire powerline structure, including the below-ground portion, should be salvaged where possible (AENV, 2011). However, as discussed in subsequent sections below, there are circumstances where leaving part of a structure in place may be justified.

Decommissioning practices will vary depending on land type and the particular environment where work is being conducted, including all associated work areas and lands used to access the right-of-way. An important distinction to identify is between upland and wetland environments. The first step is to determine which areas are within wetlands. This determination must be made in accordance with the *Alberta Wetland Classification System* (2015). This determination will help to ensure compliance with regulations and will determine when and how to remove structures appropriately, without creating further disturbance to landscapes, wetlands, or water bodies.

It is highly advisable to discuss decommissioning and reclamation strategies with the landowner, land manager, and/or Public Lands Officer to identify potential issues and plan mitigative measures. It is also advisable to discuss work with the landowner, land manager, and/or Public Lands Officer again, when work is set to commence (e.g., at kick off) and maintain routine communication throughout the decommissioning and reclamation stages, well before project completion and/or report finalization and application submission. This will lessen bottlenecks such as project stoppages or regulatory deficiencies, while they are still mitigatable during ongoing project work.

When working on public lands, a regional Public Lands Officer must be notified of decommissioning and reclamation project work proposed on public land, as the Officer acts as the landowner representative on behalf of the Crown.

When working on private land, a regional Environmental Protection Officer (EPO; sometimes called a Conservation and Reclamation inspector, or C&R inspector) and the land owner(s) (and/or land manager(s)) must be notified of the decommissioning and reclamation project.

4.1 Land Types

Successful conservation and reclamation is measured against the pre-disturbance conditions and/or adjacent site conditions that are representative of a site's natural variability. For the purposes of this document, the Department has identified the following land types:

- Cultivated Lands,
- Forested Lands,
- Native Grasslands,
- Peatlands, and
- Mineral Wetlands.

Landscapes are highly variable in nature and are not uniform or homogeneous. For projects that cover great expanses, such as powerline right-of-ways, there is the potential to encounter much variability. Powerlines traverse dry upland areas, wetter low-lying areas, wetlands, riparian areas, and transitional areas in between. As well, factors such as, but not limited to, climate and topography can greatly influence landscape expression by creating variable or transitory moisture regimes and seasonal changes.

4.2 Uplands

The majority of powerline facilities tend to be within upland areas. The main concerns are:

- Preventing disturbances during removal of the line that hinder future reclamation,
- Backfilling holes properly, and
- Establishing appropriate vegetation.

4.2.1 Powerline Decommissioning

Powerline decommissioning begins with the removal of conductor wires followed by taking down support structures. The greatest portion of the decommissioning work takes place in adjacent areas surrounding the support structures and involves use of heavy equipment. The following is a list of some practices to prevent or minimize soil damage by equipment activity:

- Conduct work only during dry, firm, or frozen conditions.
- Use rig matting if the site is vulnerable to rutting or compaction.
- Select the least sensitive and shortest routes of travel to minimize impacts to land used to access work locations. Use additional precautions such as employing rig matting along the route or in work areas.
- Prevent contamination (e.g., oil, fuel, and glycol spills) from heavy equipment, vehicles, and infrastructure while working and while parked.
- Collect and dispose of all pieces of salvaged infrastructure, debris, and/or garbage in and around the work area before leaving a work site.

4.2.2 Pole and Support Structure Removal

Generally, entire support structures shall be removed. Wooden poles are pulled out and removed completely, or are cut off and the bottom portion left in place. If infrastructure (e.g., wooden poles, concrete pilings) is being left in place it must be removed to a minimum depth of 1.2 metres below ground surface and must not cause an adverse effect or, restrict future land use, including, but not limited to, cultivation or installation of a building or a basement. The decision to leave any part of a structure in place must be justified on a site-specific basis, taking future land use into account, and must be approved by the regulator (e.g.: Public Lands Officer, Environmental Protection Officer) and landowner.

4.2.3 Backfilling

When infrastructure such as poles are removed, holes approximately the same diameter as the pole remain. The depth of the holes will be approximately the same depth as the installation depth that poles are set at. The holes generally range in size from 0.3 to 0.6 metres in diameter and 2.5 to 4 metres deep, although this will vary. There will also be associated disturbances that must be addressed as well.

Any holes from pole and infrastructure removal activities must be backfilled. This includes, but is not limited to: holes, depressions, divots, ruts, pits, and excavations. There is a potential for these types of holes and depressions to act as hazards (traps) for humans, wildlife (e.g., ungulates, rodents, amphibians, reptiles, etc.), livestock, and vehicle traffic. Larger holes resulting, for example, from excavations to remove material such as pilings, anchors, or supports must be backfilled in accordance with the reclamation criteria, i.e., compatible soil texture and quality (e.g.: no more than one textural class difference in the soil textural triangle), and similar topsoil depth.

According to previous guidance (AENV, 2011), holes from power poles should be “filled with clean compacted sand and replace subsoil and topsoil over the holes.” Industry practice is to use gravel rather than sand in some situations because it is easier to handle under frozen conditions and it eliminates the need for compacting to prevent potential subsidence.

- Fill Material: Sand is the preferred fill material. Gravel may be used where warranted. Backfilled holes must be filled up to a level no greater than 0.5 metres below ground surface. Furthermore, the fill material must not interfere with, or alter local hydrology. The upper 0.5 metre of the holes must be filled with topsoil having a texture compatible with the surrounding soil (e.g., no more than one textural class difference) to provide a suitable rooting medium and to avoid preferential surface water infiltration at pole locations.
    - The preference should always be to use locally-sourced materials (rather than imported materials), from adjacent or nearby locations, to foster compatibility with the site and prevent issues such as weeds.
- Cover Material: Topsoil additions must be used if site conditions (or DSA) indicate additional topsoil would be needed to ensure adequate vegetation establishment and growth, such as on areas with larger surface disturbances, or where natural recovery (AENV, 2003) through encroachment will not occur (e.g., cultivated land).
    - The preference should always be to use locally-sourced materials (rather than imported materials), from adjacent or nearby locations, to foster compatibility with the site and

prevent issues such as weeds. One possible way to achieve this is by using topsoil that has been salvaged from adjacent areas.
    - Topsoil should only be used to fill the upper portion of the hole, to a depth similar to the topsoil depth around the hole.
    - Justification for not adding topsoil must be made on a site-specific basis using professional judgement following discussion with the landowner and/or manager, or Public Lands Officer.

Regardless of how the site soils and landscapes are backfilled and contoured, the site should be monitored until it is evident there are no soil or landscape issues such as erosion, compaction, subsidence, etc.

Consideration must be given to the potential of introducing regulated weeds or plant disease with any imported topsoil or fill material. Approval of any imported materials (e.g., topsoil, fill, gravel) is required from the landowner or, in the case of Public Lands, from the regional Public Lands Officer.

4.2.4 Vegetation

Following soil and landscape reclamation, revegetation of all disturbed areas is expected and must be monitored and assessed to determine a successful, sustainable trajectory that coincides with the respective reclamation criteria for vegetation for each land type (agricultural, forested, grasslands, peatlands, etc.).

- Native grasslands, forested lands, and peatlands: **natural recovery** (e.g., encroachment) (AENV, 2003) is the preferred strategy. Seed mixes should only be considered when natural encroachment is inhibited, invasive species are adjacent or severe erosion concerns are present. Any proposed seed mixes must be approved by the landowner and/or Public Lands Officer prior to use. In cases where only the pole footprint area is left bare, seeding is likely not required. This should be confirmed with a regional Environmental Protection Officer or Public Lands Officer.
- Cultivated lands (agricultural land): annual or tame pasture crops that may be seeded by the landowner on the disturbed areas along with the rest of the field in the upcoming growing season. In situations where seeding by the operator is required, seed type and/or mixes should be discussed with the landowner and/or manager prior to seeding.

Periodic monitoring is used to track progress to determine if reclamation is on a successful trajectory or if criteria (for landscape, soils, and vegetation) are, or have been met. Assessment data must be provided with the Reclamation Certificate or Letter of Clearance application.

This information will help demonstrate to the Environmental Protection Officer or Public Lands Officer whether a site is ready for a Reclamation Certificate or Letter of Clearance.

4.3 Wetlands and other Water Bodies

There are currently policies in place that govern working in wetlands and that discourage the building of structures within wetlands. In the past, although there was a tendency to avoid wetlands for practical reasons, there was limited guidance for mitigating environmental impacts during construction. Consequently, some older powerlines have structures that were installed in or near wetlands, and the work required for their removal must be conducted in accordance with current policies.

According to the Alberta *Water Act*, an activity taking place in a water body requires an Approval. Removing works is considered an activity. A streamlined approach is available for powerline activities occurring within wetlands under the Code of Practice for Powerline Works Impacting Wetlands (AEP, 2019). It is recommended that proponents consult the Code of Practice to determine if their proposed removal projects falls within the scope of the Code and is therefore subject to a streamlined regulatory process.

An authenticating wetland professional must not only determine if there are wetlands associated with a powerline right-of-way, but must also classify all the wetlands potentially impacted, following the *Alberta Wetland Policy* (ESRD, 2013d).

The *Alberta Wetland Classification System* (2015) recognizes five wetland classes (bog, fen, swamp, shallow open water, and marsh), each with its own characteristics driven by specific vegetation, soil characteristics, hydrologic regime, and water quality (salinity and acidity/alkalinity) characteristics.

During decommissioning and reclamation, the main goals when conducting activities that may disturb wetland areas are to: minimize the disturbance during removal of the line, backfill holes properly, and establish appropriate vegetation. These goals are discussed in the following sections and are outlined in Table 1, and in flow diagrams on Figure 1 for mineral soils, and Figure 2 for peatlands.

4.3.1 Evaluation of Wetlands

An authenticating wetland professional must authenticate when wetlands are determined to be associated with a powerline right-of-way, and classify all the wetlands potentially impacted as well. Portions of the right-of-way that cross permanent or semi-permanent wetlands are likely to be underwater during the assessment; therefore, observations for assessing these areas are likely to be limited. When these types of wetlands are assessed, the time of year should be noted and an explanation must be provided on the water level in correlation; i.e. a spring assessment may translate to the water level being observed at the high water mark. These areas must not be assessed when they are covered by snow or ice.

The assessment should also verify and document the following:

- If the structure location is covered by water:
    - a description of the vegetation in the surrounding area
    - characteristics used to determine the wetland classification.
- Whether there is debris from the pole floating or protruding from the water
    - any wildlife platforms that are constructed and in usable condition.
- Observed waterfowl, presence of amphibians, and water quality.

Information related to working around wetlands is described in: *Alberta Wetland Mitigation Directive* (2018), *Alberta Wetland Identification and Delineation Directive* (2015) *Alberta Wetland Policy* (2013d), and the *Alberta Wetland Classification System* (2015). Water Act authorization information can be obtained in the Code of Practice for Powerline Works Impacting Wetlands (2019).

4.3.2 Structure Removal Strategies

The goal is minimizing or preventing impacts to sensitive areas such as wetlands and wetland habitat during the process of removing poles and infrastructure from wetlands, i.e., meeting the *Alberta Wetland Policy*'s (ESRD, 2013d) mitigation hierarchy objectives. The main means by which impacts may be minimized is by timing the work to the appropriate season or by leaving portions of structures in place.

In the event that a pole or structure proposed for removal exists within a wetland it is likely that an Approval is also required and should encompass the structure access and the pole as per Section 36 of the *Alberta Water Act*. Removal and reclamation of a structure may also occur under the Code of Practice for Powerline Works Impacting Wetlands (2019). When the Code is applicable to those structures, no Approval is required. Contact Alberta Environment and Parks for further information for additional site clarification.

Where possible, it is advantageous to remove poles and subsurface support structures when the wetlands are dry or frozen to avoid any sedimentation concerns in standing water. Firm or frozen conditions also allow for ease of access, improved backfilling, and final grading activities.

However as not all salvage activities can occur within the winter months, power pole removal should adhere to the following season preferences:

- Marshes, shallow open water wetlands, and swamps including:
    - Ephemeral and temporary wetlands: generally, year round; except during the spring freshet and heavy precipitation events.
    - Seasonal wetlands: in summer, fall, or winter months; consideration should be given for winter thaw conditions and the spring freshet; as well as heavy, summer precipitation events.
    - Semi-permanent and permanent wetlands: in winter months, due to their more persistent hydrologic regimes.
- Peatlands
    - Bogs and fens: in winter months only; to minimize impacts to vegetation, hydrology and minimize the compaction potential of subsurface groundwater flow.

The Code of Practice for Powerline Works Impacting Wetlands (2019) states that any materials used in powerline works that come into contact, or are expected to come into contact, with the ground, groundwater, or surface water within a wetland are nonreactive/inert. Therefore, in some instances, subsurface support structures, including butts of wood poles, screw piles, and concrete supports, can remain in place providing they are inert, do not create a hazard, and do not restrict future land use.

- In permanent, and some semi-permanent wetlands, wooden poles may be cut above the water surface with the remnant converted to a waterfowl nesting structure, e.g., for geese, mallards, or wood ducks (NRCS 2001; DUC 2008).
- In other types of wetlands, the subsurface support structures may be cut at least 1.2 metres below ground surface and filled with mineral soil, graded to blend into the contours of the surrounding terrain such that the natural hydrology of the wetland will not be impacted.

Leaving subsurface support structures in place may have a positive impact to the wetland, but it should not be assumed that this is always the case. In the event that waterfowl have previously used the structure for

resting or nesting, the familiar perch can continue to be useful. The subsurface support may also have merged into the groundwater flow regime or, allowed vegetation to establish around the perimeter. The removal of the structure may result in disturbance of the micro-ecosystem that has naturalized around the substructure.

An authenticating wetland professional must provide a recommendation on how poles may be left in place at particular structure locations. In addition, the future potential of residual impacts from pole preservatives may need to be considered.

If there are uncertainties about a site or related regulations, contact a regional Environmental Protection Officer or Public Lands Officer for additional information. An Officer can provide information on Approval requirements under the *Water Act* and/or the *Environmental Protection and Enhancement Act*, as well as regional information that is more site-specific in nature.

4.3.3 Backfilling

Backfilling requirements vary depending on the type of wetland. Given the generally dry nature of ephemeral, temporary, and seasonal wetlands, it is recommended to backfill the power pole or subsurface support structure excavation/removal sites using the same procedure as indicated above for upland areas.

For permanent and semi-permanent wetlands, backfilling may not always be feasible, depending on site-specific conditions and the time of year. Given the hydrologic regimes and soil characteristics of these types of wetlands, once the pole has been removed from the soil substrate, water-saturated soil may slough into the extraction hole, thereby leaving only a minimal disturbance footprint that will be almost indistinguishable from the surrounding wetland area. Sites where this has occurred must be documented. Records must be maintained detailing how the area was stabilized after soil sloughed into the void left by pole removal. and these records are to be included in the Reclamation Certificate application.

For seasonal wetlands, or areas around the fringe of semi-permanent wetlands, where the water level can be below surface, pole removal and backfilling should be completed when the areas is relatively dry or in winter when it is frozen. If backfilling is not possible at the time of pole removal due to a high water level, these holes may require backfilling once location becomes dry at the surface and the hole is exposed. The backfilled material should be graded such that ground elevations are equivalent to the surrounding terrain and will not impact the natural hydrology of the wetland. This will encourage the growth of natural revegetation of the wetland.

In peatlands, it is recommended to remove poles and small subsurface support structures, such as anchors, if present, but leave large subsurface support structures, such as concrete pilings in place to avoid extensive disturbances. Backfilling may not be necessary, as the hydrologic regimes and soil characteristics of peatlands will likely result in natural sloughing of the water saturated soil into the excavation hole. If an excavation hole persists, it may be filled with natural substrata sourced from the vicinity of the excavation site, e.g., tree trunks, branches, or other organic materials.

If holes are not backfilled at the time of infrastructure removal, measures must be taken to prevent holes from becoming hazards or traps for livestock and/or wildlife. The locations of holes should be marked and recorded to form part of the report and for future monitoring.

When working in wetlands, the reclamation plan and Reclamation Certificate or Letter of Clearance application must include descriptions of the backfilling methods used at these locations. The origin of the

donor material must also be recorded to provide some assurance that the material is weed or chemical free.

4.3.4 Vegetation

The disturbed wetland area will naturally revegetate via encroachment of the surrounding vegetation in most wetlands, particularly in marshes, shallow open water wetlands, and swamps. Only when the pole removal disturbance is large, e.g., following the removal of large concrete subsurface support structures, may it be necessary to plant native wetland vegetation species or seed the disturbed area with an approved native wetland seed mix to encourage and accelerate the revegetation of the disturbed area.

END OF SECTION

5 Reclamation Criteria and Assessment

The *Environmental Protection Guidelines for Transmission Lines* outlines that the reclamation criteria for wellsites will provide guidance for the type of assessment required (AENV, 2011). This document provides greater detail on how to adapt the *2010 Reclamation Criteria for Wellsites and Associated Facilities* (reclamation criteria).

The *Reclamation Criteria for Wellsites and Associated Facilities* (2010) are comprised of separate documents for cultivated lands (ESRD, 2013a), forested lands (ESRD, 2013b), and native grasslands (ESRD, 2013c) with reclamation criteria for peatlands released in 2017 (AEP, 2017a). Definitions for these land types can be found in the reclamation criteria. For areas within mineral wetlands, refer to the "Water Act and Riparian Areas" appendices within the reclamation criteria under each applicable land type.

Detailed site assessments (DSA) are required for determining whether a reclaimed power line meets the reclamation criteria. DSAs are comprised of three components: landscape, soil, and vegetation assessments. For DSAs on cultivated lands, forested lands, and native grasslands, refer to the Record of Observation spreadsheet tool. For DSAs on peatland criteria, refer to the section on "Required Information for Detailed Site Assessments" in the peatland reclamation criteria (AEP, 2017a).

The reclamation criteria have been adapted to be reflective of the degree of surface disturbance associated with powerlines. For all disturbances associated with powerlines (e.g. substations, roadways, stations, and work areas) the criteria for each land type apply and no modifications are required.

All components and requirements of the reclamation criteria for each land type still apply and must be followed. Deviations from the reclamation criteria need prior approval from the land manager and the regulating body before conducting the assessment.

5.1 Disturbed versus Undisturbed Areas

The reclamation criteria differentiate between disturbed and undisturbed management zones. Disturbed and undisturbed areas are defined for each land type. The reclamation criteria require a soil assessment for disturbed portions of the site; whereas, undisturbed areas may require only landscape and vegetation assessments.

Areas of soils and landscape are considered disturbed under reclamation criteria when there are impacts from vehicle traffic (e.g., surface compaction, rutting); or where native plant communities have been cleared, over-seeded, or when introduced undesirable species/weeds occur.

For powerlines, areas where poles were located likely have the most extensive soil disturbance and are thus considered "disturbed" as per the reclamation criteria. While areas the right-of-way may appear to be undisturbed, it is more likely that they are still impacted by reduced disturbance, and are considered "disturbed" nonetheless.

5.2 Evaluation of Bare Areas

Bare areas (i.e., areas devoid of vegetation) are assessed as part of the landscape assessment. In most cases, for a site to pass, any bare areas onsite are expected to be matched by bare areas of similar size and extent offsite; however, where poles are removed and the holes filled, there are likely to be small

areas devoid of vegetation without similar bare areas offsite. In the context of powerline right-of-ways, these bare areas may be considered acceptable, provided the following conditions are met:

- They are limited to less than 1 metre across where the hole was filled.
- The soil has a texture and consistency conducive to the establishment of vegetation.
- There is evidence on peatlands, forested, and grasslands (or pasture lands) of vegetation encroachment into the bare area.
- There is no bare area where an annual crop has been seeded on cultivated land.

5.3 Sampling Intensity

The sampling intensity for the DSA has two main functions for the right-of-way:

- To determine if the right-of-way meets the undisturbed or disturbed reclamation criteria for each land type.
- To assess the structure locations within the right-of-way.

For longer, narrow, linear features such as access roads and in this case, utility right-of-ways, the required sampling intensity in the reclamation criteria varies somewhat depending on the land type. However, the same concepts are applied across all land types:

- Paired assessment points: one within the disturbed area and one at a comparable off-site control location with respect to key assessment parameters.
- Control assessment points: locations selected to be as near as possible to the disturbed area(s) being assessed, and to be similar in all respects other than not being affected by transmission line activities.

Sampling Intensity for Powerlines

For all disturbances associated with powerlines (e.g. substations, roadways, stations, work areas) the sampling intensity and reclamation criteria for each land type applies.

The 2010 reclamation criteria provide guidance on how frequently assessments along access roads must be conducted. The intensity depends on the length of the access road and the particular land type. The key purpose of the assessment is to ensure adequate representation of different soil types and environments along the access road.

A similar approach may be used for powerline right-of-ways; however, because the level of disturbance is usually less than is typical for a wellsite access road, the sampling intensity is somewhat less. Representative support structure locations and all areas that are most likely to be impacted, must have a DSA; whereas, the rest of the right-of-way and trails used to access the structures must at a minimum have a visual assessment to identify obvious problem areas, and target them for DSA.

The assessment points along the right-of-way shall be placed to assess conditions at points where the greatest levels of impacts likely affect the site. Based on landscape variability more control locations may be required. The basic sampling unit is typically a circular plot with a 1.78 metres radius, totaling 10 square metres (10 m^2). For the right-of-way, the soil and vegetation assessments will be made using paired comparisons (one offsite representative control and one onsite), with soils being assessed to a depth of 50 cm. Assessing the right-of-way shall be as follows:

- For right-of-ways less than 400 metres, assessment points shall be located at a maximum spacing of 100 metres.
- For right-of-ways greater than 400 metres, assessment points shall be located to reflect different mapping units, (i.e., topographic, vegetation and/or soils variability) with a minimum of one (1) assessment point per map unit or a minimum of one (1) assessment point per 800 metres.

5.3.1 Right-of-Way Assessment

The sampling intensity for the right-of-way for the DSA is outlined in the linear assessment methodology and sampling intensity from the reclamation criteria by land type. However it is only required for any portions of the right-of-way where the landscape, soils or vegetation has been disturbed as outlined below. Visual assessment (walking or driving along the site, or analyzing current, high resolution aerial imagery (obtained using low flying aircraft or drones) is required to identify disturbed areas where:

- vegetation type has been changed on the right-of-way compared to offsite (e.g. grasses in the forested region, change in plant community on native grasslands or shift in wetland type)
- bare areas larger than 1 metre across;
- soil erosion (caused by wind or water);
- large ruts or areas of potential soil compaction;
- weed infestations;
- unusual vegetation patterns;
- residual effects of herbicide use; and/or,
- debris left behind

To utilize this methodology the assessor must be able to:

- Determine the right-of-way portions that are likely to be disturbed or undisturbed as outlined in the respective reclamation criteria for cultivated lands (ESRD, 2013a), forested lands (ESRD, 2013b), native grasslands lands (ESRD, 2013c), or peatlands (AEP, 2017a). Utilize file information on construction, revegetation, and any historic monitoring combined with aerial imagery.
- Stratify the right-of-way into major landscape units (forest, peatland, native grassland, wetlands). This may include pre-planning or stratifying fields, landscape polygons (based on soil and/or vegetation), or areas/locations. This will determine the number of assessment points required for the linear assessment sampling intensity.

5.3.2 Structure Assessment

The DSA must include all properties that contain one or more structures, and must represent all land uses and soil types within each landowner's property. The DSA is limited to selected structure locations and any

problem areas after the issues have been rectified. Powerline structures are typically about 100 metres apart along right-of-ways and the number of structures present on a property or quarter section along the right-of-way might vary from none to several.

The DSA must include all properties that contain one or more structures, and must represent all land uses and soil types within a property. Use the following to select the minimum number of structure locations:

- Ensure each landscape map unit or land use is assessed, with at least 1 (one) structure location per map unit/land use combination.
- The particular structure locations to assess may be determined arbitrarily or locations judged more likely to be impacted may be selected.

The structure assessment verifies that components of reclamation criteria have been met:

- Removal of all industrial debris;
- Bare areas, particularly those larger than 1 metre across;
- Topsoil depth, texture and consistency/presence of rooting restrictions;
- Soil erosion (caused by wind or water);
- Large ruts or areas of potential soil compaction at or nearby the structure;
- Regulated weeds;
- Undesirable species (as defined in the reclamation criteria);
- Unusual vegetation patterns;
- Residual effects of herbicide use; and

The Department reserves the right to request additional information as required to make the Pass/Fail decision for Reclamation Certificate/Letter of Clearance.

5.4 Aerial Assessment Option

Assessing powerline reclamation from the air may be preferred for long powerlines, remote areas, and sites such as wetlands where ground disturbance may cause damage, or access is limited. The following aerial and ground assessment methodologies are intended to be utilized together.

Aerial assessments may be completed using imagery collected through platforms such as satellites, planes, helicopters, or remotely piloted aircraft system (RPAS) (e.g., drones). While there is no restriction on the platform used, the spatial resolution of the sensors used must not have a spatial resolution that exceeds, or is greater than, ten (10) metres. Use of remote sensing (or earth observation) data sources are encouraged, but Operators must also ensure when using licensed products that the applicable licensing agreements are followed. Other remote sensing technology such as high-resolution air photos or satellite images can also be used to augment the aerial assessment. Regardless of the method(s) chosen for aerial assessment, each method must clearly display desired attributes of the site necessary for reliable assessment of the landscape, soils, and vegetation. This will aid in determining which locations to conduct ground assessments.

The information below must be gathered during aerial assessments to verify the reclamation criteria have been met. For complex sites more information may be required. The Department may have additional information and methodology requirements that must be adhered to:

- Landscape assessment as outlined in the applicable reclamation criteria;
- List of dominant species or genus by structural layer as directed by the applicable reclamation criteria;
- Total percent canopy cover by ground layer (e.g., herbaceous and shrubs);
- The presence/absence of: regulated weeds or undesirable species, erosion/slumping, and/or bare areas within the linear or non-linear surface disturbance;
- Identification of areas where the plant community on- and offsite (clearly in the same landscape unit) are different and justifications/and or approval provided;
- Aerial photographs including landscape surrounding the site and low level views of the vegetation cover, clearly annotated to the DSA data; and
- Aerial assessments on right-of-ways (>400 metres) must visually assess variability along the linear feature and adjacent impacts. Aerial photos and the location selection must at a minimum cover all landscape units that are transected by the right-of-way (e.g., bog, circumneutral fen, alkaline fen, upland eco-sites, riparian areas, croplands, pastures, etc.).
- Assessment areas must be completed as outlined above and the assessment points be included on a corresponding diagram in the DSA.

5.4.1 Ground-Based Assessment

The purpose of the ground-based assessment is to verify the aerial assessment of powerline structure locations and the right-of-way. Vegetation must be present at the time of assessment. Ground assessments of landscape, soils, and vegetation are required for:

- At least one structure location per landscape map unit on native grasslands, peatlands and forests;
- Peatland sites that do not pass the Undisturbed Assessment in the reclamation criteria during aerial assessment;
- Grassland sites where the ecological range site has changed in comparison to offsite, or when invasive species are present that are not found offsite; and
- Cultivated sites being managed with the surrounding area, where the surface footprint is still evident.

END OF SECTION

6 References

Alberta Environment (AENV). 2011. Environmental Protection Guidelines for Transmission Lines. R&R/11 03. Fact Sheet. Edmonton, Alberta. May 25, 2011. 5 pp. 2011.

Alberta Environment. 2003. Sites Reclaimed Using Natural Recovery Methods: Guidance on Site Assessment. R&R/03-06. Fact Sheet. Edmonton, Alberta. September 2003. 8pp. 2003.

Alberta Environment (AENV), 2007a, as amended. Alberta Tier 1 Soil and Groundwater Remediation Guidelines.

Alberta Environment (AENV), 2007b, as amended. Alberta Tier 2 Soil and Groundwater Remediation Guidelines.

Alberta Environment and Parks (AEP). 2019. Code of Practice for Powerline Works Impacting Wetlands. Made under the Water Act and the Water (Ministerial) Regulation. Edmonton, Alberta. December 23, 2019.

Alberta Environment and Parks (AEP). 2018. Conservation Assessments in Native Grasslands: Strategic Siting and Pre-disturbance site assessment Methodology for Industrial Activities in Native Grasslands. Edmonton, Alberta.

Alberta Environment and Parks (AEP). 2017a. Reclamation Criteria for Wellsites and Associated Facilities for Peatlands. Edmonton, Alberta. March 2017.

Alberta Environment and Parks (AEP). 2017b. Wildlife Directive for Alberta Wind Energy Projects. Fish and Wildlife Policy. Edmonton, Alberta.

Alberta Environment and Parks (AEP). 2017c. Wildlife Directive for Alberta Solar Energy Projects. Fish and Wildlife Policy. Edmonton, Alberta.

Alberta Environment and Parks (AEP). 2014. Professional Responsibilities in Completion and Assurance of Wetland Science, Design and Engineering Work in Alberta. Edmonton, Alberta. May 2014.

Alberta Environment and Parks (AEP). 2016. Principles for Minimizing Surface Disturbance in Native Grasslands. Edmonton, Alberta. September 2016.

Alberta Environment and Sustainable Resource Development (ESRD). 2015. Alberta Wetland Classification System. Water Policy Branch, Policy and Planning Division. Edmonton, Alberta. Effective June 1, 2015.

Alberta Environment and Sustainable Resource Development (ESRD). 2014a. Contaminated Sites Policy Framework. Edmonton, Alberta. October 31, 2014.

Alberta Environment and Sustainable Resource Development (ESRD). 2014b. Professional Responsibilities in Completion and Assurance of Wetland Science, Design and Engineering Work in Alberta. Edmonton, Alberta. May 2014.

Alberta Environment and Sustainable Resource Development (ESRD). 2013a. 2010 Reclamation Criteria for Wellsites and Associated Facilities for Cultivated Lands. Updated July 2013.

Alberta Environment and Sustainable Resource Development (ESRD). 2013b. 2010 Reclamation Criteria for Wellsites and Associated Facilities for Forested Lands. Updated July 2013.

Alberta Environment and Sustainable Resource Development (ESRD). 2013c. 2010 Reclamation Criteria for Wellsites and Associated Facilities for Native Grasslands. Updated July 2013.

Alberta Environment and Sustainable Resource Development (ESRD). 2013d. Alberta Wetland Policy. 25 pp. ISBN: 978-1-4601-1287-8. September 2013.

Ducks Unlimited Canada (DUC). 2008. Nest Box Guide for Waterfowl. ISBN: 978-0-9692943-8-2. 2008.

Government of Alberta (GOA). 2008. Land-use Framework. 58 pp.

Government of Alberta (GOA). 2018. Alberta Wetland Mitigation Directive. Water Policy Branch, Alberta Environment and Parks. Edmonton, Alberta.

Government of Alberta (GOA). 2018. Conservation and Reclamation Regulation. Alberta Regulation 115/1993. Current as of Alberta Regulation 103/2016.

Government of Alberta (GOA). 2017a. Environmental Protection and Enhancement Act (EPEA), Revised Statutes of Alberta 2000. Chapter E-12. Current as of March 31, 2017. Alberta Queen's Printer.

Government of Alberta (GOA). 2015. Alberta Wetland Identification and Delineation Directive. Water Policy Branch, Alberta Environment and Parks. Edmonton, Alberta. June 1, 2015.

Gramineae Services Ltd. (Gramineae). 2017. Beneficial Management Practices for Renewable Energy Projects – Reducing the Footprint in Alberta's native Grassland, Parkland, and Wetland Ecosystems. Prepared for the Alberta Prairie Conservation Forum. June 5th, 2017. 71 pp.

Gramineae Services Ltd (Gramineae). 2013. Recovery Strategies for Industrial Development in Native Prairie – The Dry Mixedgrass Natural Subregion of Alberta. February 2013. 138 pp.

Lancaster, J., B. Adams, P. Desserud, R. Adams, and M. Neville. 2017. Recovery Strategies for Industrial Development in Native Prairie – The Northern Fescue Natural Subregion of Alberta. March 2017. 133 pp.

Lancaster, J., B. Adams, P. Desserud, R. Adams, and M. Neville. 2018. Recovery Strategies for Industrial Development in Native Prairie – The Foothills Fescue, Foothills Parkland and Montane Natural Subregions of Alberta. Revised April 2018. 154 pp.

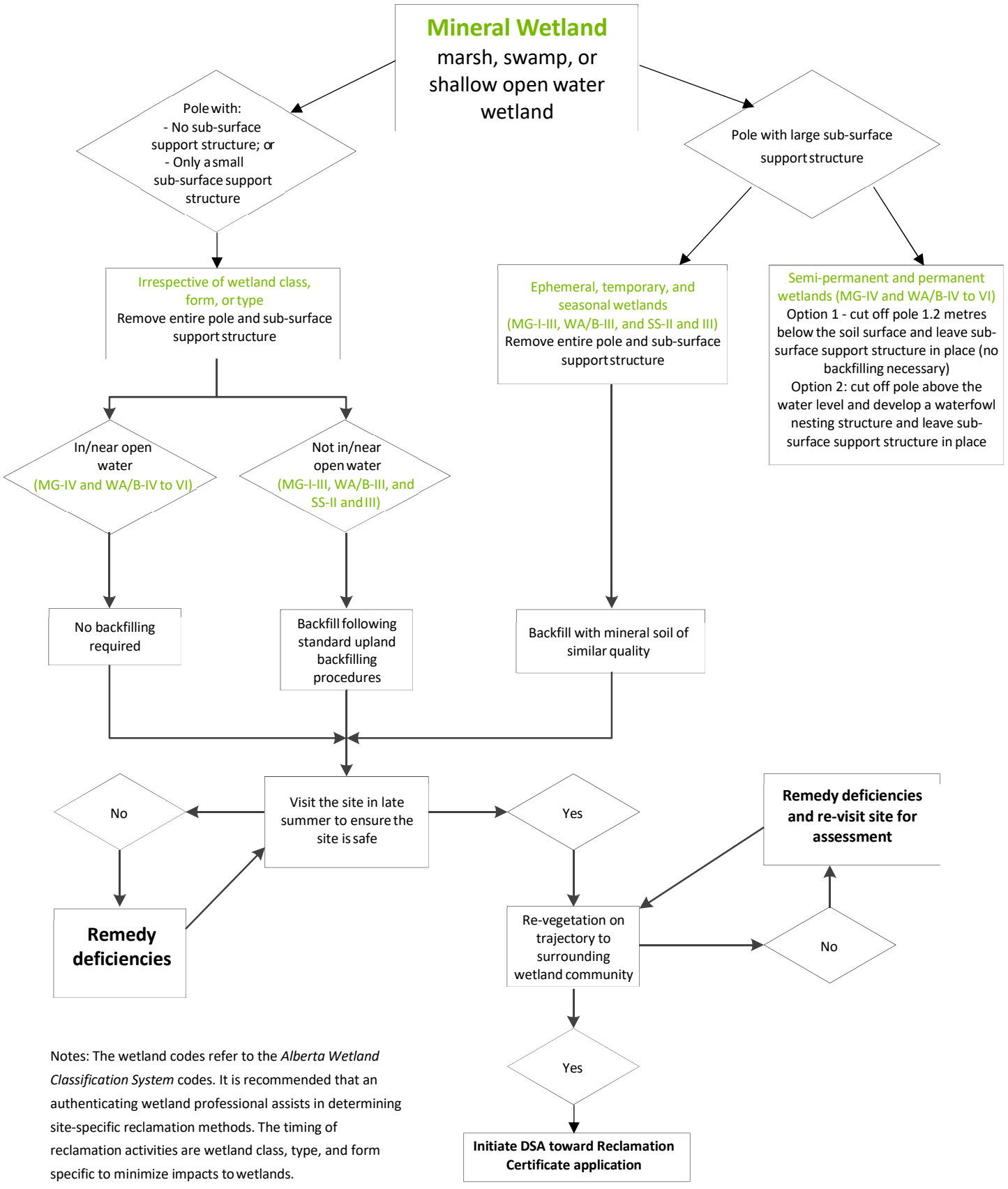
Natural Resources Conservation Service (NRCS). 2001. Artificial Nesting Structures. Fish and Wildlife Habitat Management Leaflet. Wildlife Habitat Council. Number 20. January 2001.

Neville, M., J. Lancaster, B. Adams, and P. Desserud. 2014. Recovery Strategies for Industrial Development in Native Prairie – The Mixedgrass Natural Subregion of Alberta. March 2014. 138 pp.

Professional Regulatory Organizations (PRO). 2012. Professional Responsibilities in Completion and Assurance of Reclamation and Remediation Work in Alberta – Joint Practice Standard (v1.1). 45 pp.

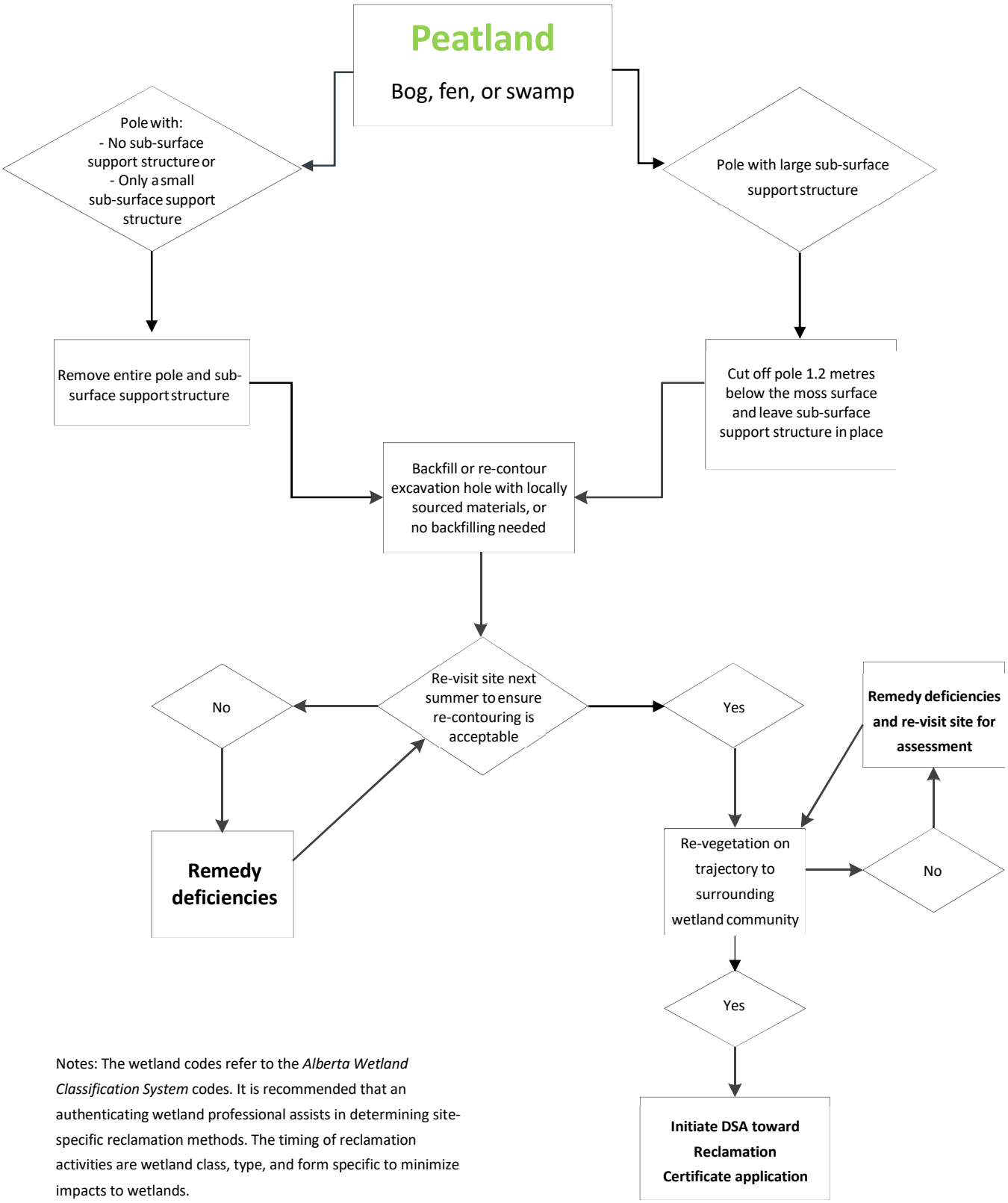
Safety Codes Council. 2016. Alberta Electrical Utility Code, 5th Edition, April 2016 (effective May 1, 2017). ISBN 9780779792467. 84 pp.

Figure 1: Support Structure Removal and Backfilling in Wetlands - Mineral Soils



Notes: The wetland codes refer to the *Alberta Wetland Classification System* codes. It is recommended that an authenticating wetland professional assists in determining site-specific reclamation methods. The timing of reclamation activities are wetland class, type, and form specific to minimize impacts to wetlands.

Figure 2: Support Structure Removal and Backfilling in Wetlands - Peatlands



Notes: The wetland codes refer to the *Alberta Wetland Classification System* codes. It is recommended that an authenticating wetland professional assists in determining site-specific reclamation methods. The timing of reclamation activities are wetland class, type, and form specific to minimize impacts to wetlands.

Table 1: Summary of Power Pole Removal Strategies in Wetlands

Wetland Class	Wetland Type	Timing	Backfill	Comments
Marshes	Ephemeral	Any time throughout year except, when wet following spring freshet or heavy precipitation events	Gravel or compacted sand	Remove power pole and all subsurface support structures
	Temporary	Any time throughout year, except when wet following spring freshet or heavy precipitation events	Gravel or compacted sand	Remove power pole and all subsurface support structures
	Seasonal	End of summer, fall, and winter months, when dry	Gravel or compacted sand	Remove power pole and all subsurface support structures
	Semi-permanent	Winter months, when frozen	Gravel or compacted sand, or no backfilling necessary	Remove power pole and all subsurface support structures; natural re-vegetation encouraged
Shallow Open Water	Seasonal	End of summer, fall, and winter months, when dry	Gravel or compacted sand, or no backfilling necessary	Remove power pole and all subsurface support structures; natural re-vegetation encouraged
	Semi-permanent	Winter months, when frozen	Gravel or compacted sand, or no backfilling necessary	Remove power pole and all subsurface support structures; natural re-vegetation encouraged
	Permanent	Winter months, when frozen	Gravel or compacted sand, or no backfilling necessary	Remove power pole and all subsurface support structures or cut off pole and keep sub-surface support structures in wetland; natural re-vegetation encouraged
	Intermittent	End of summer, fall, and winter months, when dry	Gravel or compacted sand	Remove power pole and all subsurface support structures; natural re-vegetation encouraged
Swamps	Temporary	Any time throughout year, except when wet following spring freshet or heavy precipitation events	Gravel or compacted sand	Remove power pole and all subsurface support structures; planting of woody vegetation species or seeding of herbaceous vegetation species may be required
	Seasonal	End of summer, fall, and winter months, when dry	Gravel or compacted sand	Remove power pole and all subsurface support structures; planting of woody vegetation species or seeding of herbaceous vegetation species may be required
Fens	---	Winter months, when frozen	Natural substrata from vicinity of excavation, or no backfilling	Remove power pole and all subsurface support structures
Bogs	---	Winter months, when frozen	Natural substrata from vicinity of excavation, or no backfilling	Remove power pole and all subsurface support structures; natural re-vegetation encouraged

END OF DOCUMENT.