

TransCanada PipeLines Limited

White Spruce Pipeline
Caribou Habitat Restoration Plan

WSPGEN-CH2M-ENV-PLN-0001 Rev1

March 19, 2019

Revision 1

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1.0 INTRODUCTION AND ORGANIZATION

1.1 INTRODUCTION

TransCanada PipeLines Limited (TransCanada) is planning to construct the White Spruce Pipeline Project (the Project), which entails an approximately 71.3 km 508 mm O.D (NPS 20") pipeline to transport synthetic crude liquid from a tie-in point on the Pembina Pipeline Corporation (Pembina) Alberta Oil Sands Pipeline Expansion and Northern Extension (Horizon Pipeline) at SE 10-95-11 W4M to the Grand Rapids Pipeline GP Ltd. MacKay Terminal at SW 34-89-14-W4M, as well as associated infrastructure (valve sites). The Project is located within the West Side of the Athabasca River (WSAR) caribou range for approximately 12.6 km (Figure 1-1). The Alberta Energy Regulator (AER) issued Decision 2018 ABAER 001 (the Decision) on February 22, 2018 granting approval for PLA160532 and PLA160531 to the conditions outlined in Appendix 1 of the Decision.

This Caribou Habitat Restoration Plan (CHRP) was prepared for the Project pursuant to Condition 6 of the Decision and outlines TransCanada's plan to restore caribou habitat both within and outside the Project footprint, to have the effect of restoring 2.0 times the area of new cut habitat affected by the Project in the WSAR caribou range. This document incorporates feedback received from Fort McKay First Nation (FMFN), regulators and technical experts, lessons learned from field experience, industry experience, emerging applied research and monitoring outcomes.

The goal of the CHRP is no net loss of caribou habitat from the Project in the WSAR caribou range. TransCanada has previously filed CHRPs for the provincially regulated Grand Rapids Pipeline Project (AER Decision 2014 ABAER 012), and intends to follow a similar format for this CHRP, with adjustments to meet the specific requirements of Decision 2018 ABAER 001. The CHRP quantifies the disturbance of caribou habitat due to the Project and the area of habitat that will be restored, and details the location and type of restoration planned for implementation along the Project right-of-way (ROW) and offset locations outside the Project ROW.

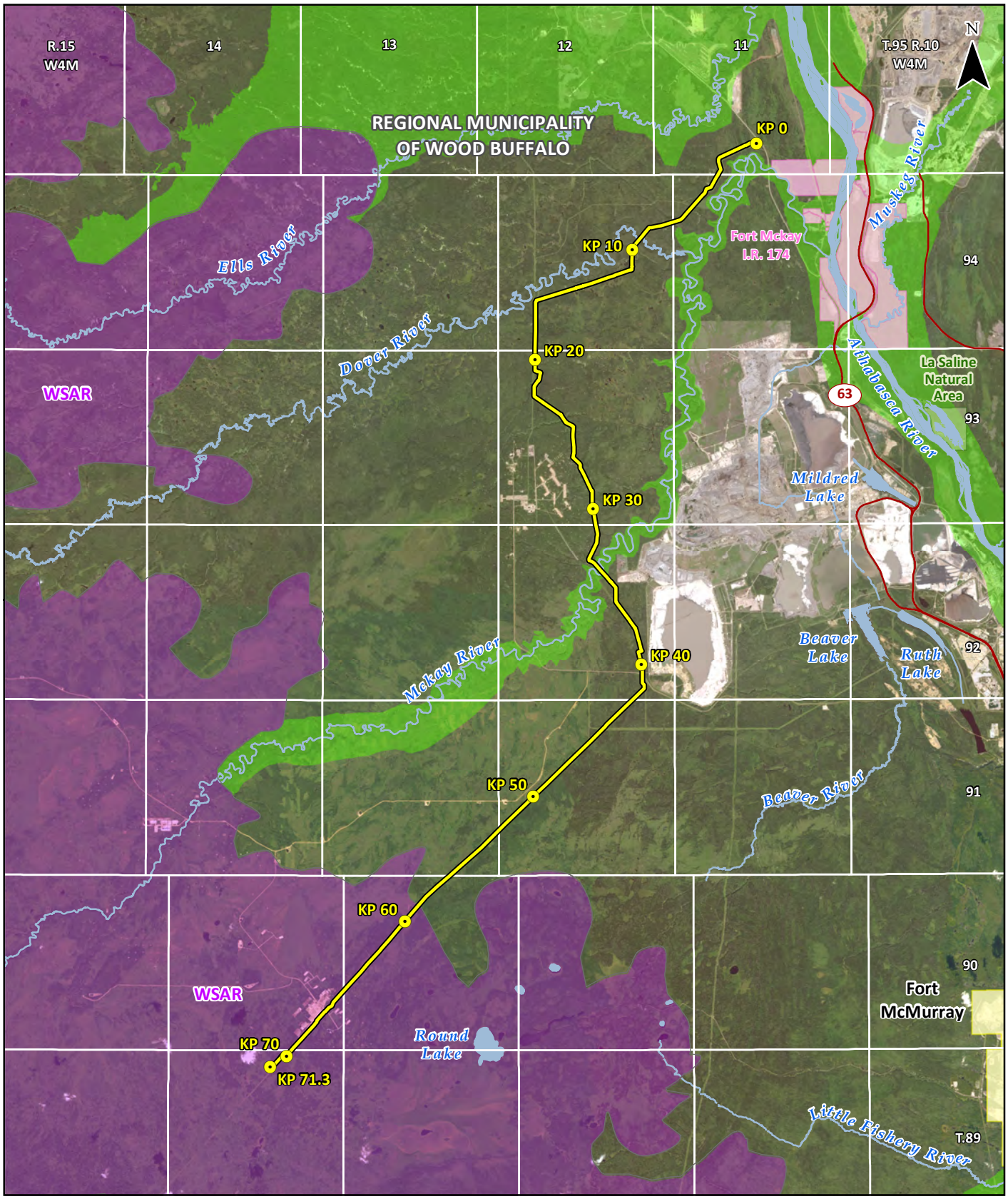
Offsetting options for the Project will consider and prioritize portions of existing TransCanada ROWs within the WSAR caribou range, which is an approach to caribou habitat offsets developed in consultation with Alberta Environment and Parks (AEP), as well as with Environment and Climate Change Canada (ECCC). A summary of TransCanada's consultation with AEP and ECCC is provided in Section 7.

1.2 ORGANIZATION OF THE CARIBOU HABITAT RESTORATION PLAN

This CHRP is organized to reflect the process logic of TransCanada caribou habitat restoration and offset planning, and experience from past AER conditions regarding caribou for TransCanada projects. This CHRP is organized in 7 sections plus 5 appendices, as follows:

- **Section 1:** introduction and organization of the plan
- **Section 2:** strategic outcome, objective, and goals
- **Section 3:** caribou habitat restoration implementation plan
- **Section 4:** proposed implementation schedule for habitat restoration activities
- **Section 5:** proposed offset implementation plan
- **Section 6:** process and timeline for assessing the effectiveness and value of the restoration measures implemented under the CHRP
- **Section 7:** summary of caribou-specific consultation with federal and provincial regulators and FMFN
- **Section 8:** cites references used throughout the document
- **Appendix A:** maps showing the site-specific locations of the candidate habitat restoration measures on the White Spruce Pipeline footprint
- **Appendix B:** maps showing the site-specific locations of the candidate habitat restoration offsets in the WSAR caribou range
- **Appendix C:** specification drawings for restoration methods
- **Appendix D:** photographs of examples of habitat restoration measures
- **Appendix E:** summary of consultation

The CHRP is organized to meet the requirements of AER Decision 2018 ABAER 001 Condition 6.



Kilometre Post (KP)
Pipeline Route
Highway
Hydrology
Waterbody
Populated Area
Indian Reserve
Park/Protected Area
Identified Wildlife Areas
Caribou Range
Key Wildlife and Biodiversity Zone

FIGURE 1-1

WHITE SPRUCE PIPELINE PROJECT RELATIVE TO THE WSAR CARIBOU RANGE

CARIBOU HABITAT RESTORATION PLAN FOR THE TRANSCANADA PIPELINES LIMITED WHITE SPRUCE PIPELINE PROJECT

ch2m

UTM Zone 12N
2013 SPOT6 ©2016 CNES, Licensed by BlackBridge Geomatics Corp, www.blackbridge.com;
KP, Pipeline Route: TCPL 2016; Highway: NRCan 2015;
Hydrology, Waterbody: AltaLIS 2014; NRCan 2007-2011; Alberta Municipal Boundaries: AltaLIS 2017;
Indian Reserve: Government of Canada 2018; Park/Protected Area: ATPR 2012;
Identified Wildlife Areas: ATPR 2016; Alberta Township System: AltaLIS 2009.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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SCALE: 1:300,000
0 2 4 6 8 km
(All Locations Approximate)

June 2018	672406
Mapped By: DR	Checked By: JB

672406_WildlifeCPP_Figure1_1_WSAR_Rev0.mxd

2.0 OUTCOME AND OBJECTIVE

In accordance with Condition 6 of the Decision, the ultimate goal or outcome of the CHRP is to ensure that there is, at a minimum, no net loss of caribou habitat from the project in the WSAR caribou range. This section identifies TransCanada's strategic outcome, as well as the objective and goals for the habitat restoration and offset measures discussed throughout the CHRP. These elements have been refined with experience gained across projects and will be used to assess the effectiveness and value of TransCanada's caribou habitat restoration measures.

The objective and goals of the CHRP are intended to guide TransCanada in the selection and implementation of caribou habitat restoration and offset measures, and reflect an evolution from earlier plans driven by a commitment to continuous improvement.

2.1 STRATEGIC OUTCOME

Combined with the collective habitat restoration and recovery efforts implemented by other industry and government parties, TransCanada's caribou habitat restoration measures contribute meaningfully to the conservation and recovery of woodland caribou in Alberta.

2.2 OBJECTIVE

TransCanada's caribou habitat restoration measures reduce the Project's potential impacts to caribou habitat and supports the objectives of the Government of Alberta's recovery strategies and plans.

2.3 GOALS

Goal (G1) TransCanada's caribou habitat restoration measures are ecologically relevant and practically located to minimize potential for redisturbance by human activity.

Goal (G2) TransCanada's caribou habitat restoration measures establish self-sustaining and ecologically appropriate vegetation communities that are on trajectory to, and compatible with the surrounding landscape.

3.0 RESTORATION IMPLEMENTATION PLAN

This section outlines the quantification and qualitative assessment of the area of caribou habitat that will be restored and how these restoration sites are equivalent to 2.0 times the new cut area disturbed by the Project in the WSAR caribou range. It describes the restoration measures that will be implemented, and explains how TransCanada implements a series of decision frameworks to select and apply habitat restoration measures according to site-specific conditions.

3.1 PROJECT INTERACTION WITH CARIBOU HABITAT

The Project is located within the WSAR caribou range for approximately 12.6 km (AEP, 2016). The WSAR caribou herd is designated as Threatened on Schedule 1 of the *Species at Risk Act* (*SARA*), by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and under the Alberta *Wildlife Act* (Government of Canada, 2018; COSEWIC, 2018; AEP, 2014). The Project will parallel existing linear features for 100% of its length in the WSAR caribou range (Table 3-1). Of the 12.6 km within caribou range, most of the southern-most 5.4 km (KP 65.9 to KP 71.3) of the Project is within 100 m of all-weather roads, or within or adjacent to the boundary of the MacKay Terminal in 34-89-14 W4M (Figure 1-1). The remaining 7.2 km of the Project in the WSAR range (KP 58.7 to KP 65.9) is more than 100 m from all-weather roads. The entire length of the Project within caribou range is located within the PetroChina Canada (formerly Brion Energy Corp.) lease area. Details related to the Project within caribou range are provided in Table 3-1.

Table 3-1: Caribou Range Interaction with the Project

Caribou Range	Alberta Provincial and Federal Status Designation	Current Population Trend	Project Linear Disturbance in Caribou Range (km)		
			Total Length	Parallels Linear Disturbance	Does Not Parallel Linear Disturbance
WSAR	Threatened[1,2,3]	Declining[4]	12.6 km	12.6 km (100%)	0 km (0%)

Notes:
1. Alberta provincial status designation under the *Wildlife Act* (AEP, 2014).
2. Status designation under Schedule 1 of the *SARA* (Government of Canada, 2018).
3. Status designation by COSEWIC (2018).
4. Population trend reported by Environment Canada (2012) and Environment and Climate Change Canada (2017).

3.2 QUANTIFICATION OF HABITAT DISTURBANCE

The Project has been designed to overlap and parallel existing disturbance features to the extent feasible, which reduces new habitat disturbance and fragmentation. Existing disturbances that overlap the Project include ATCO Electric Ltd. powerline easements, Grand Rapids Pipelines GP Ltd. pipeline ROW, road and terminal site,

other TransCanada and NOVA Gas Transmission Ltd. (NGTL) pipeline ROWs, and the PetroChina Canada Ltd. MacKay East Pipeline (MEP) ROW.

Within the WSAR Caribou Range, the Project footprint overlaps existing disturbances for approximately 10.44 ha, which includes 4.02 ha in third-party dispositions, 2.25 ha in existing TransCanada dispositions, and 4.17 ha without any active disposition (Table 3-2). Forest clearing (that is, "new cut") of 29.71 ha will be required for construction of the Project in the WSAR caribou range, 28.31 ha of which is outside of existing active dispositions.

Table 3-2: Habitat Disturbance Areas within the Project Footprint in WSAR Caribou Range

Project Footprint		Area (ha)[1]
Total footprint		38.75
Overlap of footprint with existing disturbance	Third-party disposition	4.02
	TransCanada disposition[2]	2.25
	No active disposition	4.17
	Total overlap with existing disturbance	***10.44***
New cut[3]	New cut overlapping an active disposition	1.40
	New cut with no active disposition	28.31
	Total new cut	***29.71***

Notes:
1. Areas are based on Project data provided by Precision Geomatics (2018).
2. Includes TransCanada and subsidiaries such as NGTL and Grand Rapids Pipelines GP. Ltd.
3. The area of new cut is calculated as all treed areas in the Project footprint (including the ROW and temporary workspace) that will be cleared for Project construction.

3.3 QUANTIFICATION OF HABITAT RESTORATION

Condition 6 of AER Decision 2018 ABAER 001 requires TransCanada to restore caribou habitat in the WSAR Caribou Range equivalent to 2.0 times the new cut area disturbed by the Project. As shown above in Table 3-2, the area of new cut will be approximately 29.71 ha, and the target area of habitat restoration will be 59.42 ha (2 x 29.71 ha = 59.42 ha).

TransCanada will restore the areas of the Project footprint that are outside existing third-party dispositions, and outside the area of operational access. Operational access is the area where TransCanada will periodically manage vegetation within the ROW during operations. The operational access extends 5 to 10 m from the centreline of the operational pipeline, in accordance with TransCanada operational procedures for integrity monitoring under Canadian Standards Association (CSA) Z662-15 (CSA, 2015). This area will regenerate naturally, but will be periodically mowed or

brushed. Over the long term, the vegetation community composition and structure is expected to mature to a seral stage that will provide functional caribou habitat and restore pre-disturbance predator–prey dynamics. However, operational access is not included in the area of habitat restored to achieve the target restoration area.

Table 3-3 provides provisional values for the restored Project footprint, accounting for exclusion of operational access extending 5 m both sides of the centreline (10 m width in total). The planned off-site restoration area is also estimated in Table 3-3. TransCanada expects these values will be refined following construction, based on the final construction footprint and the implementation of habitat restoration measures best suited to site-specific conditions, both within and outside of the Project footprint.

Table 3-3: Planned Habitat Restoration Area in the Project Footprint

Restoration Area	Area (ha)
Target Restoration Area (2 x area of new cut)	59.42
Area Restored in Project Footprint [1]	23.81
Area to be Restored in Offset Locations (minimum)	35.61

Note:
1. The area restored in the Project footprint excludes areas of overlap with existing third-party dispositions and the area of operational access.

3.4 HABITAT RESTORATION MEASURES

Candidate site-specific restoration measures within the Project footprint have been selected under the guidance of Habitat Restoration Decision Frameworks (see Figures 3-1 and 3-2 in Section 3.5). The measures include site preparation, tree planting, access management and natural regeneration, and are described in Sections 3.4.1 to 3.4.4. TransCanada will refine the site-specific restoration measures prior to implementing restoration, based on information collected onsite, including specific site conditions and availability of appropriate materials. Section 3.4.5 summarizes the list of potential restoration measures and discussion of their applicability, effectiveness and limitations for the Project.

For construction schematics (that is, typical drawings) for commonly used restoration measures, see Appendix C. For photographs of examples of restoration measures, see Appendix D.

3.4.1 Natural Regeneration

Prior to restoration, where applicable and site-specific conditions allow, natural regeneration methods are employed. Minimal surface disturbance techniques are employed during pipeline construction as general mitigation to promote rapid natural revegetation and provide the benefit of reducing lag in the establishment of vegetation consistent with the local ecotype. The technique relies on mowing/mulching and

freezing in the ROW to avoid disturbance of surface soils, except where grading is necessary.

Since minimal surface disturbance techniques and measures are implemented during construction, it is not included as a restoration measure in the decision frameworks for caribou habitat restoration. However, minimal surface disturbance techniques lay the foundation for natural regeneration and rapid re-establishment of vegetation on pipeline ROWs and will continue to be an important part of the caribou restoration program within the Project footprint.

3.4.2 Habitat Restoration/Tree Planting

Established reclamation and forestry reforestation practices will be applied to promote revegetation. Restoration measures that create more favorable microsite conditions (for example, mounding) and planting trees/shrubs, will be considered where site conditions allow. Rollback, if available, may be used to enhance site restoration by providing shade and microsites for planted seedlings. Tree species comparable to the surrounding landscape will be planted to mimic natural variation and complexity by optimizing density and spacing at the feature level.

3.4.3 Access Management

Access management for the Project and its offset areas in caribou habitat have been planned to:

- Manage access along the pipeline ROW in a manner that discourages all forms of access
- Maintain managed access necessary for safe pipeline operations compliant with applicable regulations and guidelines
- Maintain existing access at identified locations (for example, third-party industry access, traditional access identified by Aboriginal communities through engagement activities)

Access management measures are most effective when implemented on non-contiguous segments of the ROW and at intersections of the pipeline with existing perpendicular linear features relative to contiguous segments. Because the Project parallels existing linear disturbance for 100% of its length within the WSAR caribou range, suitable locations for effective access control are limited to, and would only be effective at, locations where access management measures have been placed on the existing adjacent MEP ROW (that is, at KP 58.1 and KP 66.1). Typically, access management measures are sited on active intersections with other linear features such as roads, utility corridors, seismic lines or watercourses. Potential access management measures include:

- Extended trenchless crossings

- Vegetation screens
- Rollback
- Fencing and signs
- Vegetation planting
- Mounding

3.4.4 Line-of-Sight Blocking

Line-of-sight blocking will be attained as a secondary effect of other restoration measures. This secondary benefit of other measures is further detailed in Table 3-4. Line-of-sight blocking can be effective when implemented on non-contiguous segments of the pipeline ROW. Where TransCanada parallels developments that do not implement line-of-sight measures, TransCanada's measures are rendered ineffective. As discussed above, the Project is contiguous with other developments in caribou habitat for 100% of the length of the pipeline. Purposely installed line-of-sight measures (such as fabricated screens) will not be effective on the contiguous segments of the Project and will not be used for restoration of the Project footprint unless adjacent disposition holders are directed to implement them by provincial regulators.

3.4.5 Effectiveness and Applicability of Restoration Measures

The applicability for the Project, effectiveness and limitations of the habitat restoration measures described above are summarized in Table 3-4. The candidate restoration locations and measures in the Project Footprint are listed in Section 3.6 and shown on the maps in Appendix A.

Table 3-4: Habitat Restoration Measures

Restoration Measure	Purpose(s)	Considerations	Limitations
Minimal surface disturbance construction	Primary: • Facilitate Natural Regeneration Secondary: • Reduce line-of-sight	• Application limited to construction during winter conditions. • Reduces the need for soil salvage and grading. • Width of grubbing is limited to the trench area and where grading is required. • Reduced disturbance to vegetation and root systems by cutting, mowing or walking down; mulching shrubs and small diameter trees at ground level and freezing in the ROW (mulch depths no more than 3 to 5 cm). • Intact root systems and seed bed facilitates rapid regeneration of vegetation. • Snow padding or matting preserves shrubs and small trees. • Minimum disturbance construction is constrained by existing ground topography and to ungraded areas. • Extending the length of existing bores under roads can reduce the need for additional vegetation clearing at ROW access points. • Rapid regeneration of vegetation contributes to line-of-sight blocks on ROW. **Minimal surface disturbance construction methods reduce impacts to soil structure and leads to the rapid regeneration of native vegetation. This method aids in achieving the goals of habitat restoration and access management, along with providing a visual barrier along the ROW.**	Minimal surface disturbance construction will be used for the Project and will be implemented where scheduling, soil conditions (for example, frozen), and topography allow. The extent of minimal disturbance construction is limited by scheduling to avoid or limit the duration of construction during the restricted activity period for caribou (February 15 to July 15). Minimal surface disturbance and natural regeneration are not applicable for restoration of caribou habitat outside the Project Footprint (that is, off-ROW offset locations).
Conifer seedling planting	Primary: • Habitat restoration Secondary: • Access management • Reduce line-of-sight	• Conifer seedling planting is considered a long-term habitat restoration measure, effective access management and a line-of-sight measure (effectiveness is expected to take longer than 10 years). • Species selection (that is, black spruce, white spruce or pine) is determined based on the biophysical characteristics of the site, adjacent forest stand composition, and restoration objectives. **Based on published information and Alberta ecosystems, the following conifer planting densities have been formulated:** • Minimum live seedling density of 1,600-2,000 stems/ha on upland sites • Minimum live seedling density of 1,200-2,000 stems/ha on lowland sites	Conifer seedling planting is a suitable habitat restoration measure and will be the main planting measure used for the Project Footprint and off-ROW offset locations.
Snow ramping	Primary: • Access management Secondary: • Reduce line-of-sight • Habitat restoration	• Deciduous shrubs are walked down using construction equipment and piled with layers of snow to create a ramp for vehicle traffic, if there is enough snow cover during winter construction. • Small coniferous trees can also be walked down but only during years where there is a higher than normal snow fall. • When the snow melts in the spring following construction, the trees and shrubs recover their original shape and create line-of-sight blocks, access management and provide habitat.	Snow ramping is a suitable habitat restoration measure for this Project if there is adequate snowfall during winter construction and where the correct species are present (that is, deciduous shrubs or small conifer trees. Snow ramping is not applicable for restoration of caribou habitat outside the Project Footprint (that is, off-ROW offset locations).
Woody debris rollback	Primary: • Access management • Habitat restoration	• Rollback can be effective immediately following implementation, provided adequate material is available and properly applied (Vinge and Pyper, 2012; CRRP, 2007a). Long rollback segments are more effective at managing access because ATV riders will be less inclined to try to ride through the debris or traverse around it in adjacent forest stands. • TransCanada has found on previous caribou habitat restoration projects that material availability often limits the segment length that can be achieved to 50 m to 100 m (75 m on average). • Coverage ranging from 200–300 m3/ha can deter access while allowing sufficient spaces between the debris to allow seedling planting. • Placement of woody debris rollback can conserve soil moisture, moderate soil temperatures and provide nutrients as debris decomposes, prevent soil erosion, provide microsites for seed germination and protection for planted tree seedlings (Pyper and Vinge, 2012; Vinge and Pyper, 2012). • Fire risk can be minimized through proper storage and placement of materials (Pyper and Vinge, 2012). A 25 m rollback-free fuel break placed at 250 m intervals along rollback segments is recommended by the Integrated Standards and Guidelines for the Enhanced Approval Process (AER, 2013). **Previous TransCanada construction experience indicates that material availability limits the segment length that can be achieved to 50 to 100 m (75 m on average).**	Woody debris rollback is a suitable habitat restoration measure to augment habitat restoration through the creation of microsites. The Project is contiguous with other developments in caribou habitat for approximately 99% of its length, so opportunities to use woody debris rollback for access management may be limited. Woody debris material availability limits the segment lengths that can be achieved. Fire risk is a consideration when using or storing woody debris. It is impractical to haul woody material over long distances for habitat restoration outside the Project Footprint. Therefore, woody debris likely will not be a suitable option for restoration of caribou habitat outside the Project Footprint (that is., off-ROW offset locations). TransCanada will investigate the feasibility of this measure for offset locations once site-specific locations have been finalized.

Restoration Measure	Purpose(s)	Considerations	Limitations
Shrub staking	Primary: • Habitat restoration Secondary: • Access management • Reduce line-of-sight	• Shrub staking in combination with stabilization measures (for example, soil wraps) is used at watercourses crossed with an open cut method. The installation of live shrub cuttings is primarily used to stabilize and revegetate slopes and banks. • Secondary benefit of shrub staking is rapid establishment of line-of-sight blocks at these locations.	Shrub staking is a suitable habitat restoration measure where site conditions allow. It requires the correct vegetation to be present in adjacent areas and moist soils. Many shrub species can attract prey species such as moose and deer, which can attract wolves. Its application will be limited to riparian areas for bank and slope stabilization as these species can have a negative effect on caribou.
Mounding	Primary: • Access management • Habitat restoration (create microsites)	• Mounding is used as an access management measure on pipelines, old roads and seismic lines to discourage off-road vehicle activity and can be effective immediately following implementation. • For access management purposes, mounds should be created using an excavator to approximately 0.75 m deep, and excavated material is placed right beside the hole (STDS-03-ML-05-314). • For the purposes of enhancing microsites for planted seedlings, mounding can be used in wet, low-lying areas to create better-drained microsites to enhance seedling survival. • For previous TransCanada caribou habitat restoration projects on pipeline ROWs, the achievable range in mound density was approximately 700 to 1,400 mounds/ha. Mound density is dependent on soil characteristics, amount of frost and type of equipment used (STDS-03-ML-05-314). • Mounding is often a suitable habitat restoration measure that is used in conjunction with conifer seedling planting, using 2 to 3 seedlings per mound, depending on the form and orientation of the mound. **For previous TransCanada caribou habitat restoration projects on pipeline ROWs, the achievable range in mound density was a minimum of 700 mounds/ha and 2 to 3 seedlings per mound.**	Mounding is a suitable habitat restoration measure that may be used in conjunction with conifer seedling planting where ground conditions allow. The limitations include scheduling mounding for restoration during final cleanup on the Project Footprint, which typically requires freezing-in of soils, availability of specialized equipment and spatial separation of 5 m between the holes and the centreline of the operating pipeline. Similar limitations apply to off-ROW offset locations, although freezing in of soils may not be necessary, depending on the equipment used for mounding.

3.5 DECISION FRAMEWORKS FOR HABITAT RESTORATION

The caribou Habitat Restoration Decision Frameworks (Figures 3-1 and 3-2) are principle-based logic models that inform restoration decisions to achieve the objective and goals of the CHRP. They will be applied iteratively to provide guidance on restoration measure selection based on site-specific characteristics. They have been used to select candidate restoration measures and locations (see Section 3.6), and will be used during construction to refine the site-specific restoration measures on the Project footprint, as well as prior to implementation of restoration at offset locations.

The decision frameworks are based on TransCanada's pipeline construction experience, information obtained from literature reviews, industry best management practices, industry consultation and consultation with regulators. The decision frameworks are continually revisited and updated based on recent findings from restoration monitoring reporting results.

Figures 3-1 and 3-2 are presented in chronological order of implementation on the Project footprint: access management is installed first, and habitat restoration is typically implemented after final cleanup. This order of implementation may not be applicable for restoration at offset locations outside the Project footprint. The decision frameworks provide the logic process for selection of restoration measures or tools. However, only tools applicable to the Project and suitable as restoration measures will be implemented.

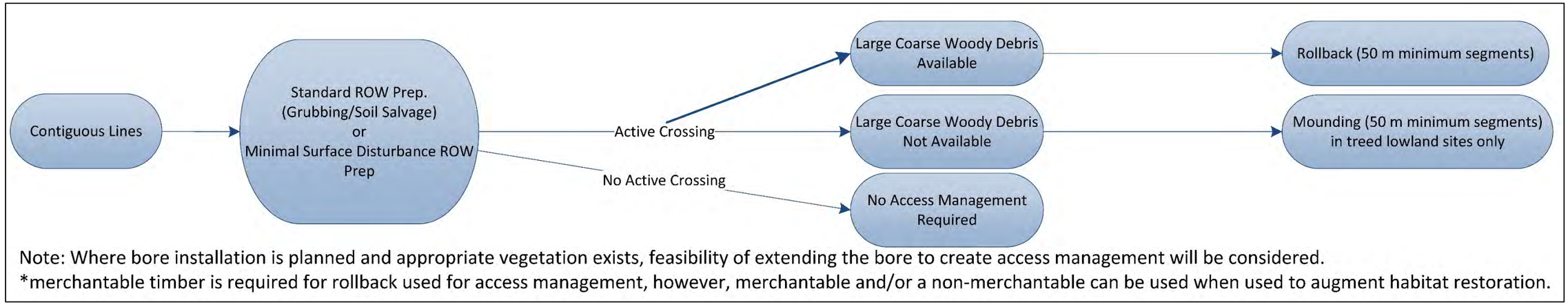


Figure 3-1: Access Management Decision Framework

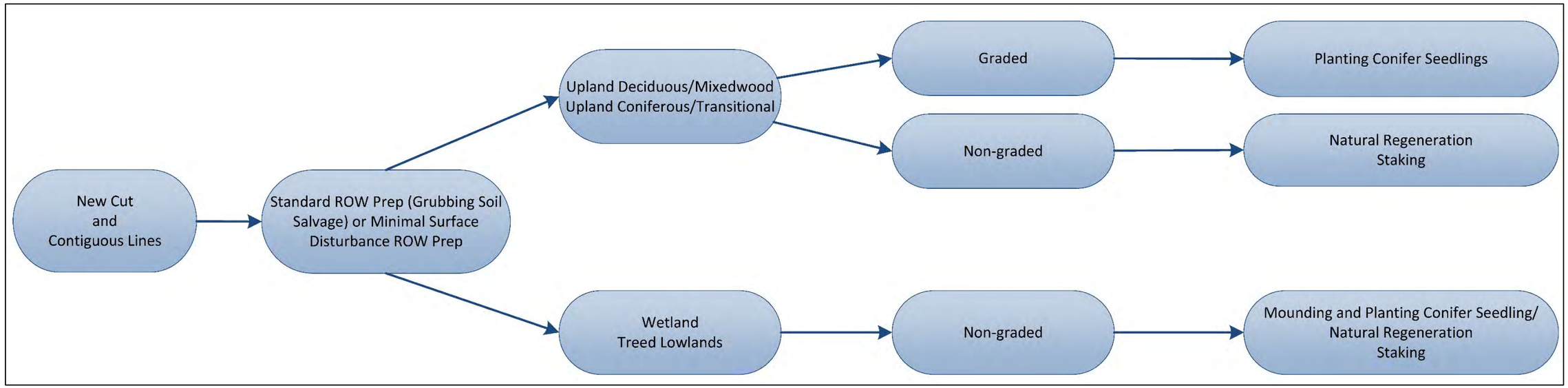


Figure 3-2: Habitat Restoration Decision Framework

3.6 HABITAT RESTORATION LOCATIONS AND MEASURES

The Decision Frameworks in Section 3.5, habitat conditions and planned Project construction information have been used to identify candidate habitat restoration measures within the Project footprint. As noted previously, TransCanada will refine the restoration measures and locations with site-specific information, such as aspect, land use, soil conditions (for example, depth of peat, drainage, nutrient regime), areas of grading, availability of materials (for example, woody debris), depth of mulch and surrounding vegetation species.

Table 3-5 lists the candidate locations, areas, habitat description and site-specific restoration measures to be implemented on the Project footprint. The list in Table 3-5 is supplemented by identification of locations for site-specific restoration measures in Appendix A.

Table 3-5: Candidate Habitat Restoration Areas and Measures on the Project Footprint

Restoration Unit Description			Area (ha)
Habitat	**Restoration Measure**	**Location[1]**	
Upland	Conifer seedling planting	Project footprint	5.66
	Access Control (Mounding and conifer seedling planting)	Project footprint	0.19
	Access Control (Woody debris rollback and planting vegetation screen)		
Lowland (treed fen)	Conifer seedling planting	Project footprint	3.94
	Conifer seedling planting *or* Natural regeneration	Project footprint	2.95
	Natural regeneration	Project footprint	6.65
Shrub/graminoid lowland or riparian	Natural regeneration	Project footprint	4.04
	Natural regeneration/ Snow ramp	Project footprint	0.39
All habitats	Natural regeneration	Operational access	12.53
Total Restoration Area[3]			**23.82**

Notes:

1. Refer to Appendix A for specific restoration locations within the Project footprint.
2. Locations comprised of a matrix of lowland habitats with varying soil moisture conditions will be restored using a combination of conifer seedling planting (in areas with sufficient drainage) and natural regeneration (in areas of poor drainage that will not support seedling growth).
3. Total Restoration Area excludes areas of natural regeneration along the Operational Access corridor, and areas that overlap existing operating facilities or roads (these areas will be returned to pre-construction conditions).

4.0 OFFSET SELECTION AND IMPLEMENTATION PLAN

The offset plan follows a like-for-like habitat restoration framework where offsets are directed to physical habitat restoration measures rather than indirect measures such as contributions to research programs or other financial mechanisms. Indirect offset measures were not contemplated for this offset plan. Rather, TransCanada will implement direct measures that are considered highest priority in the federal *Recovery Strategy for Woodland Caribou* (Environment Canada 2012b).

Offsets will be implemented as habitat restoration measures located outside of the Project footprint, as shown in Appendix B. Offsets are guided by the Decision Framework in Figure 4-1. The strategy for section of offset locations and measures is further described in Section 4.1. The offset measures that will be implemented for the Project align with the habitat restoration measures presented in Section 3. Certain measures that are suitable for habitat restoration on the Project footprint (for example, natural regeneration) require specific construction measures and, therefore, are not considered as suitable options for offset locations.

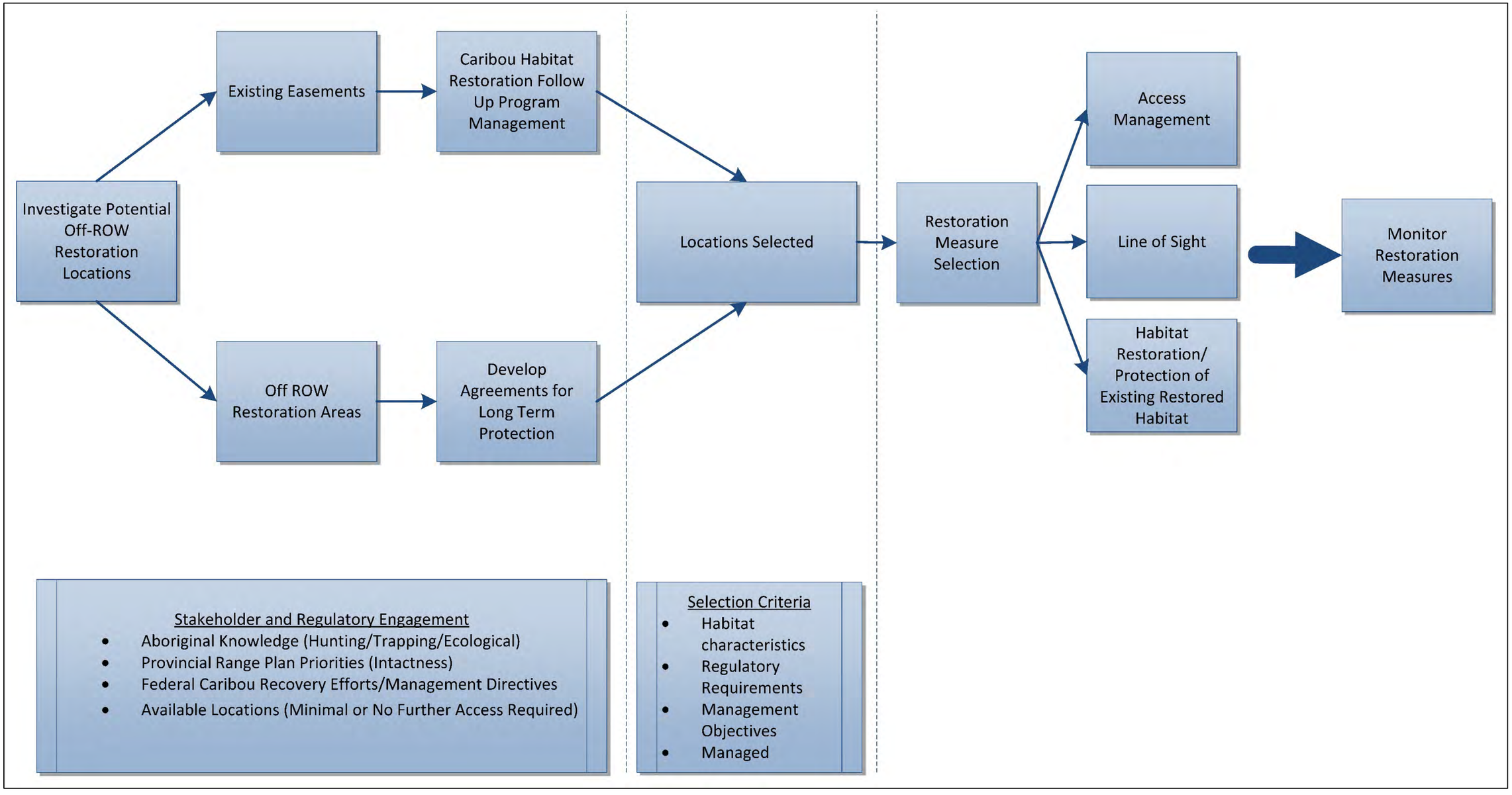


Figure 4-1: Offset Measures Decision Framework

4.1 OFFSET SELECTION CRITERIA

The offset selection strategy was developed by NGTL (a subsidiary of TransCanada), following a strategy consistent with conservation offset development, focusing on the specific conservation needs of boreal caribou, and supported by a literature review.

For past NGTL projects in caribou ranges, NGTL has located its offsets in parks to ensure longevity. Discussions with both AEP and ECCC indicated that both regulators would be amenable to on-ROW offsets, provided the Company could provide a reasonable assurance of permanence. See Section 8 for details of consultation with AEP and ECCC to date. As a result of ongoing consultation with AEP and ECCC, TransCanada evaluated options to locate offsets for the Project on existing TransCanada ROWs (or those of its subsidiaries) within the WSAR Caribou Range.

TransCanada followed the selection criteria outlined in Business and Biodiversity Offsets Programme (2012a), where the preferred approach to implementing offsets considers the regulatory policies and frameworks under which offsets might be structured. The following challenges to using this approach were identified for this Project:

- Absence of an established offset policy or other regulatory mechanism for developing offsets for caribou and caribou habitat
- Absence of provincial direction on priorities for restoration within the WSAR caribou range, which the Draft Provincial Woodland Caribou Range Plan proposes will be completed by a Caribou Habitat Restoration Committee that has not yet been formed
- Limited availability of suitable offset locations within caribou range that offer long-term protection
- Conflicting requirements of offset permanence and effectiveness, with requirements to have mechanisms in place to maintain vegetation for ongoing operations (i.e., integrity monitoring) and maintenance (i.e., access), if offsets are located within operating ROWs

Considering these challenges, TransCanada took guidance from the *Recovery Strategy for Woodland Caribou* (Environment Canada 2012b), which identified range intactness, reducing total disturbance and improving habitat condition as priorities. The proposed restoration strategies in the *Draft Provincial Woodland Caribou Range Plan* (Government of Alberta 2017) align with the federal Recovery Strategy priorities. Although a final Provincial Caribou Range Plan for Alberta is pending, TransCanada considered the principles and approaches outlined in the *Draft*

Provincial Woodland Caribou Range Plan, which adopts an Integrated Land Management approach to address cumulative loss of effective habitat for caribou. The *Draft Provincial Woodland Caribou Range Plan* proposes habitat restoration strategies, including identifying priority restoration locations that will provide the most value for improving caribou habitat. Although the Draft Provincial Woodland Caribou Range Plan released in December 2017 does not identify priority areas for habitat restoration, TransCanada will continue to work collaboratively with AEP to ensure offset planning aligns with future updates specific to the WSAR caribou range.

The offset locations listed in Section 4.2 and shown in Appendix B considered two scales: (i) landscape (or regional) scale, and (ii) site-specific scale. Considerations for selection of offset locations at the landscape scale include risks associated with offset permanence, caribou conservation benefits and spatial context.

Locating offsets where there are regulatory mechanisms for protection of an area provides a higher degree of certainty in the permanence of the offsets. This offset location strategy was limited by the regulatory preference to locate offsets on existing TransCanada ROWs. However, the following measures will be implemented to reduce the risks associated with offset permanence and spatial context, to maximize caribou conservation benefits:

- Selecting offset locations that provide incremental conservation benefits, (adding to existing programs, land-use plans or funding)
- Selecting locations in the same woodland caribou range to provide ecological benefit to the affected herd
- Selecting locations where TransCanada has operational control of the full ROW or corridor so the Company can ensure protection of the offsets

At the site-specific scale, permanence considerations relate to operational access requirements and minimal active use, including recreational, industrial and traditional access needs. Locating offsets in areas where re-disturbance is less likely improves success rates for offset measures. Appropriate locations will also ensure traditional access is not impeded by restoration measures. Lease holder or disposition agreements that permit application of offset measures and restrict further access are also site-specific considerations that might affect the permanence of offsets. The logic process shown in Figure 4-1 illustrates these considerations for the selection of offset locations.

Selection criteria considered the availability of ROWs owned by TransCanada or its subsidiaries where restoration could be implemented, the degree and location of existing third-party disturbances, the level of existing revegetation, evidence of human access, opportunities for collaborative partnerships and ease of access.

4.2 OFFSET LOCATIONS AND MEASURES

In order to identify candidate offset locations, TransCanada first identified all active, decommissioned and abandoned ROW owned by TransCanada or its subsidiaries, that are located within the WSAR caribou range. A total of approximately 495 km of ROW in the WSAR caribou range were identified for further review in the field. Field assessment of the candidate offset locations was conducted by helicopter on October 3 and 4, 2018. The following considerations were documented during the field assessment:

- Existing vegetation cover and type (such as, grass or woody vegetation) on the ROW
- Ecosystem conditions that affect suitability for tree planting, in particular soil substrate (such as, organic or mineral) and drainage
- Adjacent third party disturbance and degree of surrounding disturbance
- Evidence of motorized access along the ROW
- Potentially suitable locations for access management, such as intersection with other disturbance features

The decision frameworks (Figures 3-1, 3-2, and 4-1), information collected during the field assessment, available information on future operational needs, and information gathered through consultation and engagement have been used to identify candidate offset locations and measures. Of the ROW segments assessed in the field, TCPL identified approximately 41 km that are potentially suitable for offset restoration measures.

Table 4-1 lists the candidate offset locations, site description, restoration measures, and areas that will be restored. The list in Table 4-1 is supplemented by identification of offset restoration locations in Appendix B. As noted previously, TransCanada will refine the restoration measures and locations with additional information collected through engagement with FMFN and regulatory agencies, as well as site-specific information.

Due to the existing vegetation regenerating or low-lying, wet conditions that inhibit tree establishment, survival and growth on segments of the ROWs reviewed for offset potential, the planned restoration measures will focus primarily on functional restoration. Access management is the primary functional restoration method used in boreal caribou ranges. As a functional restoration method, the objective is to reduce human and predator access, thereby reducing caribou mortality risk and supporting conditions for vegetation growth. Access management measures will include primarily rollback and mounding (Table 3-5). Other options such as tree felling will be considered on a site-specific basis. In addition, approximately 20 ha of candidate offset locations were considered potentially suitable for tree planting (Table 4-1).

Table 4-1: Candidate Offset Areas and Measures

Candidate Offset Location		Restoration Unit Description		Area (ha)[2]
Legal Location	**Mapsheet[1]**	**Description**	**Potential Restoration Measures**	
5-31-93-20 W4M to 2-22-93-20 W4M	1, 2	• Abandoned TCPL ROW • Overgrown, not suitable for planting	Access Management Protection of disposition from future disturbance	12.1
11-21-89-20 W4M to 12-19-89-20 W4M	3, 4	• Active TCPL ROW • Overgrown and poor drainage, not suitable for planting	Access Management	11.6
13-16-89-21 W4M to 2-5-89-21 W4M	5, 6	• Active TCPL ROW • Overgrown and poor drainage, not suitable for planting	Access Management	8.8
15-32-88-21 W4M to 7-20-88-21 W4M	6, 7	• Active TCPL ROW • Overgrown and poor drainage, not suitable for planting	Access Management	7.4
10-17-88-21 W4M to 15-6-88-21 W4M	7, 8	• Active TCPL ROW • Poor drainage, not suitable for planting	Access Management	5.7
15-6-88-21 W4M to 4-31-87-21 W4M	8	• Active TCPL ROW • Poor drainage, not suitable for planting	Access Management	2.8
1-1-88-22 W4M to 11-23-87-22 W4M	8, 9	• Active TCPL ROW • Overgrown and poor drainage, not suitable for planting	Access Management	8.7
11-23-87-22 W4M to 10-8-87-22 W4M	9, 10	• Active TCPL ROW • Grass cover • Suitable for planting	Access Management, Tree Planting	10.5
2-4-83-17 W4M to 8-4-83-17 W4M	11	• Active TCPL ROW • Poor drainage, 90% not suitable for planting • 10% plantable	Access Management, Tree Planting	1.5
5-3-87-17 W4M to 11-3-87-17 W4M	11	• Active TCPL ROW • Poor drainage, not suitable for planting	Access Management	1.0
1-11-83-17 W4M	11	• Active TCPL ROW • Poor drainage, 50% not suitable for planting • 50% plantable	Access Management, Tree Planting	0.3
4-11-83-17 W4M to 16-11-83-17-W4M	11, 12	• Active TCPL ROW • Grass cover • Poor drainage, 20% not suitable for planting • 80% plantable	Tree Planting	3.6

Candidate Offset Location		Restoration Unit Description		Area (ha)[2]
Legal Location	**Mapsheet[1]**	**Description**	**Potential Restoration Measures**	
13-12-83-17 W4M	12	• Active TCPL ROW • Grass cover • 80% plantable	Tree Planting	0.7
4-13-83-17 W4M to 8-18-83-17 W4M	12	• Active TCPL ROW • Grass cover • Poor drainage, 20% not suitable for planting • 80% plantable	Access Management, Tree Planting	3.4
Total Area of Candidate Offset Restoration Sites				**78.2**
Total Area of Candidate Offset Sites for Supplemental Planting				**20.3**

Notes:
1. Refer to Appendix B for candidate offset restoration locations.
2. Areas are approximate.

5.0 SCHEDULE FOR IMPLEMENTATION

Reclamation and habitat restoration activities on the Project footprint will be completed in phases as construction progresses. Scheduling and logistical coordination of restoration implementation will consider seasonal access constraints, sensitive timing periods for caribou and other valued components, production of nursery seedlings and appropriate timing for restoration efforts (for example, season of planting).

Table 5-1 outlines the anticipated Project schedule. Habitat restoration measures that will be implemented during construction include MSD construction and vegetation retention (snow ramps and trenchless crossings). During final cleanup following construction, mounding will be completed to prepare sites for planting or deter access, bioengineering will be completed at watercourse crossings (where needed), and rollback will be installed to deter access. Natural regeneration of the Project footprint begins during the growing season following construction. Tree planting will be implemented during the growing season (late July/August) following final clean-up after Project construction.

Pending confirmation of the offset locations for restoration outside of the Project footprint, restoration measures will be implemented with site preparation occurring in the winter prior to the February 15 to July 15 timing restriction for caribou, and seedling plantings occurring during the following growing season.

As-built construction information will be compiled to document spatial data of areas where restoration measures will be implemented. This information will be used to calculate the total area restored to demonstrate that the restoration area meets the CHRP target restoration area (minimum of 2.0 times the area of new cut resulting from the Project).

Table 5-1: Proposed Schedule for Project Construction and Habitat Restoration

Project Milestones	Proposed Timeline[1,2]
Construction	
Clearing	March and November to December 2018
Pipeline (mainline) construction	December 2018 to March 2019
Machine cleanup/validation testing/tie-ins	February 2019 to April 2019
Final cleanup	January to March 2020
Caribou Habitat Restoration On-ROW (Project Footprint)	
Site preparation (mounding), rollback, bioengineering	January to February 2020
Tree seedling planting	July to August 2020

Project Milestones	Proposed Timeline[1,2]
Caribou Habitat Restoration Off-ROW (Offset Locations)	
Access control (mounding, rollback, tree felling, tree seedling planting)	Pending confirmation of offset location (early winter to avoid the sensitive timing window)
Tree seedling planting	Pending confirmation of offset location (growing season, outside the sensitive timing window)

Note:

1. Dates are tentative and subject to change.
2. TransCanada has considered the seasonal sensitivity of caribou and has developed the habitat restoration schedule for the Project with this timing in mind. Final cleanup, site preparation and habitat restoration within caribou range are scheduled to occur outside the February 15 to July 15 timing restriction.

6.0 MONITORING AND ADAPTIVE MANAGEMENT

Monitoring and adaptive management are important elements to inform whether restoration investments are contributing meaningfully to the strategic outcome of conservation and recovery of woodland caribou. Adaptive management is the systematic process of monitoring and assessing outcomes and modifying habitat restoration measures, if necessary

The principles of adaptive management will be applied to ensure the restoration measures implemented by the Project are effective and achieve the objectives of the CHRP. As part of the Project's post construction reclamation monitoring (PCM) program, periodic inspection and implementation of adaptive measures will ensure restoration measures are functioning as designed.

The effectiveness and value of restoration will be assessed through confirmation of the successful implementation of restoration and offset measures implemented through TransCanada's PCM program. Reclamation success will be determined by comparing the conditions observed on the construction ROW against a representative area adjacent to and off the construction ROW (that is, the reference location). Monitoring observations assess whether equivalent land capability has established on the construction ROW. Where environmental issues are observed, remedial measures will be planned and implemented in a timely manner, then monitored until the issue is resolved.

The goal for similarity between pre- and post-construction conditions is considered achieved when forested communities in the reclaimed Project footprint demonstrate healthy, ecologically appropriate plant communities and function. That is, as a result of planting, early seral forested communities present during PCM are not expected to reflect the mature communities of adjacent undisturbed forested areas, but are appropriate for the area based on qualified professional judgment. Additionally, the vegetation assessment will take into account that the current land use of the Project footprint is a pipeline ROW; therefore, it is subject to vegetation control and brushing for safety and operational purposes.

TransCanada's goal is to minimize residual effects of the Project on wildlife habitat; residual effects include those that could ultimately prevent habitat recovery. Vegetation establishment is a key component of wildlife habitat restoration and will be used as a proxy for habitat development. Generally, if plant growth is progressing on a positive trajectory, then wildlife habitat development and restoration is also progressing. TransCanada will use established evaluation criteria to monitor habitat restoration through native revegetation and effective access control.

Results of PCM activities following the completion of final cleanup and subsequent field assessment(s) will be prepared and presented to the AER on or before December 31, within 2 years of PCM activities being initiated, as per the schedule presented on Figure 6-1.

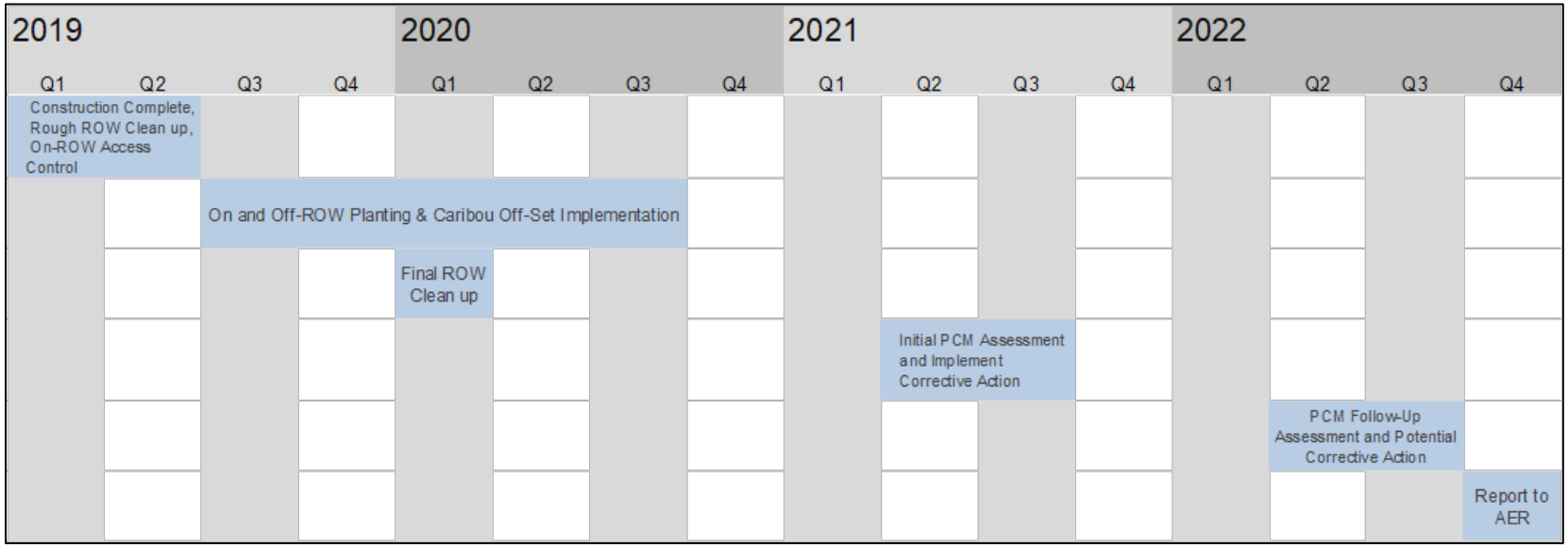


Figure 6-1: Post-construction Monitoring and Adaptive Management Schedule

7.0 CONSULTATION

7.1 ABORIGINAL ENGAGEMENT

Engagement with FMFN on caribou-related issues have taken place in a consistent manner throughout the duration of all Project phases. FMFN has participated in various caribou management reviews through funded technical reviews; map reviews; flyover reconnaissance; meetings; and written submissions including a Statement of Concern (SOC). TransCanada has ensured that questions or requests for information regarding caribou management have been addressed with FMFN in a timely manner.

On June 15, 2018, the draft CHRP was shared with FMFN for review and comment. FMFN provided its feedback to the CHRP in the form of a letter of recommendations titled "Fort McKay Review _White Spruce Pipeline Caribou Habitat Restoration Plan", on July 25, 2018. Table E-1 in Appendix E summarizes FMFN's recommendations and TransCanada's responses on the draft CHRP. TransCanada also had a follow-up meeting to discuss and review TransCanada's responses. Table E-2 in Appendix E outlines how the recommendations provided were considered and why, or why not, they were addressed by TransCanada.

TransCanada will continue to engage with FMFN on the proposed offset locations and measures, and will fully consider any feedback provided.

7.2 REGULATORY CONSULTATION

TransCanada has had ongoing consultation with provincial and federal regulators to align the caribou habitat restoration measures with provincial and federal policies. Consultation with ECCC and AEP has led to recent changes in TransCanada's approach to offset plans, resulting in a decision to identify offset opportunities on active TransCanada ROWs within the caribou range affected by a project. This is a significant change from previous offset plans, which focused on implementing offsets off-ROW. TransCanada has met with AEP personnel to discuss implementing this methodology for the Project. TransCanada will continue to work with provincial and federal regulators to align the caribou habitat restoration measures with provincial and federal policies.

TransCanada continues to build upon its history of consultation with federal and provincial agencies from project to project. TransCanada is committed to continuing consultation specific to this CHRP through the Project's planning and implementation stages.

As described above, TransCanada has met with AEP and ECCC several times on other projects to discuss offset options for implementation. Outcomes from these

discussions have been applied to this plan. TransCanada has begun consulting with AEP to discuss the Project specifically (see Appendix C for details) and intends to continue to meet with regulators to further discuss the Project.

Over time, consultation with regulators has resulted in the following outcomes:

- AEP and ECCC agreed with TransCanada that access control will generally be ineffective on the parallel portions of the ROW, however access control will be implemented at nonparallel intersecting disturbances.
- AEP and ECCC encouraged restoration of existing pipeline disturbances as offsets. TransCanada is currently investigating offsets on existing TransCanada ROWs through planting and natural regeneration, and access management.
- ECCC encouraged the implementation of offsets within existing caribou ranges. AEP encouraged prioritizing offsets with emerging provincial restoration plans. TransCanada will implement offsets within the WSAR Caribou Range.
- TransCanada is committed to ongoing consultation on opportunities for restoration within the area of the ROW where vegetation is managed.
- TransCanada is committed to ongoing consultation with AEP and ECCC on the implementation of the CHRP.

8.0 REFERENCES

Alberta Energy Regulator. 2013. Integrated Standards and Guidelines. Enhanced Approval Process (EAP). Effective: December 1, 2013. Edmonton, AB. 94 pp.

Alberta Environment and Parks 2016. Key Wildlife and Biodiversity Zone (digital file). Edmonton, AB. Available: http://esrd.alberta.ca/forms-maps-services/maps/wildlife-sensitivity-maps/default.aspx. Acquired: December 2016. Last Update Check: January 15, 2018.

Alberta Environment and Parks. 2014. Species Assessed by Alberta's Endangered Species Conservation Committee. Updated July 4, 2014. Fish and Wildlife Policy Branch. Edmonton, AB. 2 pp.

Alberta Environment and Parks. 2016. Caribou Range (digital file). Edmonton, AB. Available: http://esrd.alberta.ca/forms-maps-services/maps/wildlife-sensitivity-maps/default.aspx. Acquired: December 2016. Last Update Check: January 15, 2018.

Alberta Tourism, Parks and Recreation (ATPR). 2012. Protected Areas (pashape_ocsites_10tm) (digital file). Edmonton, AB. Available: http://albertaparks.ca/albertaparksca/library/downloadable-data-sets.aspx. Acquired: May 2017. Last Update Check: August 31, 2017.

AltaLIS. 2009. Alberta Township System version 4.1 (digital file). Calgary, AB. Available: http://www.altalis.com. Acquired: October 2009. Last Update Check: December 15, 2015.

AltaLIS. 2014. Hydrography Polygons (digital file). Calgary, AB. Available: http://www.altalis.com/products/base/20k_base_features.html. Acquired: November 2014. Last Update Check: June 5, 2017.

AltaLIS. 2017. Alberta Municipal Boundaries (digital file). Calgary, AB. Available: http://www.altalis.com. Acquired: January 2018. Last Update Check: January 15, 2018.

BlackBridge Geomatics. 2016. SPOT6 1.5m Colour Satellite Imagery (digital file). Lethbridge, AB. Available: www.blackbridge.com. Acquired: December 2014.

Canada's Oil Sands Innovation Alliance. 2015. COSIA: Canada's Oil Sands Innovation Alliance. Website: https://www.cosia.ca/. Accessed: September 2015.

Canadian Standards Association. 2015. CSA Z662-15: Oil and Gas Pipeline Systems. Toronto, ON. 865 pp.

Caribou Range Restoration Project. 2007a. Caribou Range Restoration Project: Guidelines for Planning and Implementation.

Caribou Range Restoration Project. 2007b. Little Smoky Caribou Habitat Restoration Pilot Project Summary. Prepared for Suncor Energy, ConocoPhillips Canada, Canadian Forest Products and Alberta Newsprint Co. Unpublished Document.

CH2M HILL Energy Canada Ltd. 2017. All-Weather Roads (digital file). Calgary, AB. Extracted/ Digitized (from Access Plan Map - P16-005867, Nov 25, 2016 provided by TCPL and Alberta Digital Integrated Dispositions 2016). Last Update Check: February 03, 2017.

CH2M HILL Energy Canada Ltd. 2018. Habitat Restoration Methods (digital file). Calgary, AB. Acquired: May 2018. Last Update Check: April 11, 2018.

Committee on the Status of Endangered Wildlife in Canada. 2018. Canadian Species at Risk. Website: http://www.cosewic.gc.ca/. Accessed: May 2018.

Enbridge Pipelines (Athabasca) Inc. 2010. Waupisoo Pipeline Project: 2010 Green Area Post-Construction Reclamation Assessment. Submitted to Alberta Sustainable Resource Development. Calgary, AB.

Environment and Climate Change Canada. 2017. Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou (Rangifer tarandus caribou), Boreal population in Canada for the Period 2012-2017. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 94 pp.

Environment Canada. 2012. Recovery Strategy for the Woodland Caribou, (Rangifer tarandus caribou), Boreal Population in Canada. Species at Risk Act Recovery Strategy Series. Ottawa, ON. xi + 138 pp.

Golder Associates Ltd. 2010. Canadian Natural Resources Limited: Primrose and Wolf Lake: Wildlife Habitat Enhancement Program Development and Implementation. Prepared for Canadian Natural Resources Ltd. Calgary, AB.

Golder Associates Ltd. 2011. Waupisoo Pipeline 2011 Seedling Monitoring Plot Summary. Prepared for Enbridge Pipelines (Athabasca) Inc. Calgary, AB.

Government of Alberta. 2017. Draft Provincial Woodland Caribou Range Plan. December 2017. 75 pp. + appendices.

Government of Canada. 2018. Aboriginal Lands, Canada (digital file). Edmonton, AB. Available: http://open.canada.ca/data/en/dataset/522b07b9-78e2-4819-b736-ad9208eb1067. Acquired: January 2018. Last Update Check: January 17, 2018.

Government of Canada. 2018. Species at Risk Public Registry. Website: http://www.sararegistry.gc.ca. Accessed: May 2018.

Imagery. ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Retrieved on: April 11, 2018.

Natural Resources Canada (NRCan) 2007-2011. National Hydro Network (digital files). Sherbrooke, QC. Available: http://www.geobase.ca/geobase/en/data/nhn/index.html. Acquired: April 2012. Last Update Check: May 2012.

Natural Resources Canada (NRCan) 2015. National Road Network – Alberta (digital file). Sherbrooke, QC. Available: http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/geobase_nrn_rrn. Acquired: June 2017. Last Update Check: September 25, 2017.

Osko, T. and M. Glasgow. 2010. Removing the Wellsite Footprint: Recommended Practices for Construction and Reclamation of Wellsites on Upland Forests in Boreal Alberta. University of Alberta, Department of Biological Sciences. Edmonton, AB. 61 pp.

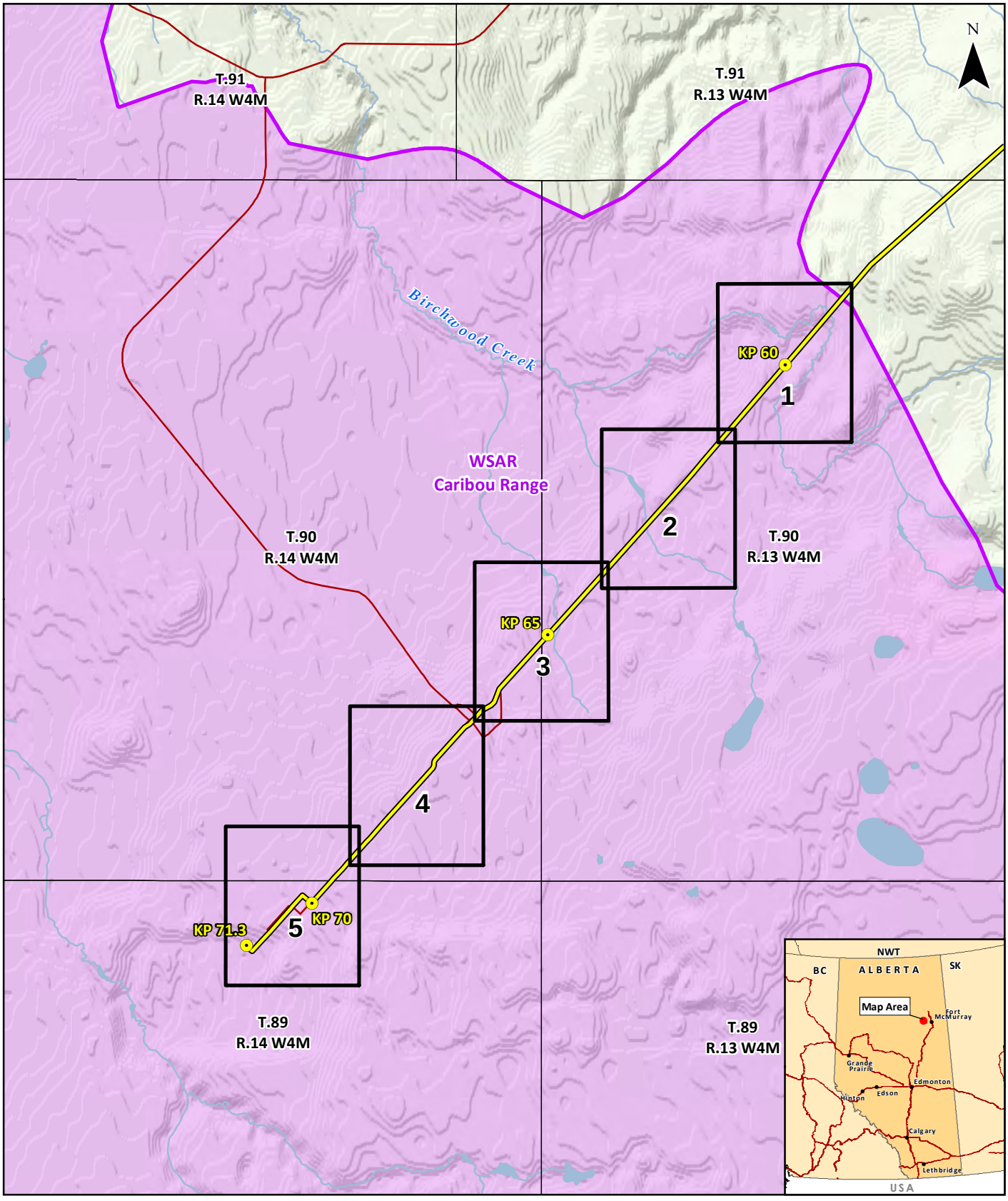
Pyper, M. and T. Vinge. 2012. A Visual Guide to Handling Woody Materials for Forested Land Reclamation. Report No. TR-31. Oil Sands Research and Information Network, University of Alberta, School of Energy and the Environment, Edmonton, AB. 10 pp.

TERA Environmental Consultants. 2008. Hillshade. Derived from Natural Resources Canada, Earth Sciences Sector, Centre for Topographic Information. 2000-2008. Canadian Digital Elevation Data 250k (digital files). Sherbrooke, QC. Available: http://www.geobase.ca/geobase/en/data/cded/index.html. Acquired: 2008. Last Update Check: December 2010.

TransCanada Pipelines Limited (TCPL.) 2016. Kilometre Post (KP) / Pipeline Route / Footprint (digital files). Calgary, AB. Acquired: August 2016. Last Update Check: February 02, 2017.

Vinge, T. and M. Pyper. 2012. Managing Woody Materials on Industrial Sites: Meeting Economic, Ecological and Forest Health Goals through a Collaborative Approach. University of Alberta, Department of Renewable Resources, Edmonton, AB. 32 pp.

Appendix A: Candidate Habitat Restoration Locations on the White Spruce Pipeline Footprint



Kilometre Post (KP)
Pipeline Route
Road
Hydrology
Waterbody
Caribou Range
Sheetframe Extent

APPENDIX A
CANDIDATE HABITAT RESTORATION LOCATIONS
WHITE SPRUCE PIPELINE FOOTPRINT

INDEX MAP

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m

UTM Zone 12N
KP, Pipeline: TCPL 2016; Road: CH2M 2017 (Extracted/Digitized from Access Plan Map - P16-005867, Nov 25, 2016 provided by TCPL and Alberta Digital Integrated Dispositions 2016); Hydrology, Waterbody: NRCan 2007-2011; Caribou Range: AEP, GOA 2016; Alberta Township System: AltaLIS 2009; Hillshade: TERA Environmental Consultants 2008.

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June 2018	672406
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Watercourse Crossing

Kilometre Post (KP)

Footprint

Operational Access

Habitat Restoration

Conifer Seedling Planting

Conifer Seedling Planting or MSD - Natural Regeneration

MSD - Natural Regeneration

Mounding and Conifer Seedling Planting

Snow Ramp – Natural Regeneration

APPENDIX A:
CANDIDATE HABITAT RESTORATION LOCATIONS
WHITE SPRUCE PIPELINE FOOTPRINT

SHEET 1 OF 5

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m

UTM Zone 12N
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; Watercourse Crossing: CH2M 2016; KP, Footprint: TCPL 2016;
Operational Access/Habitat Restoration Method: CH2M 2018;
Alberta Township System: AltaLIS 2009.

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(All Locations Approximate)

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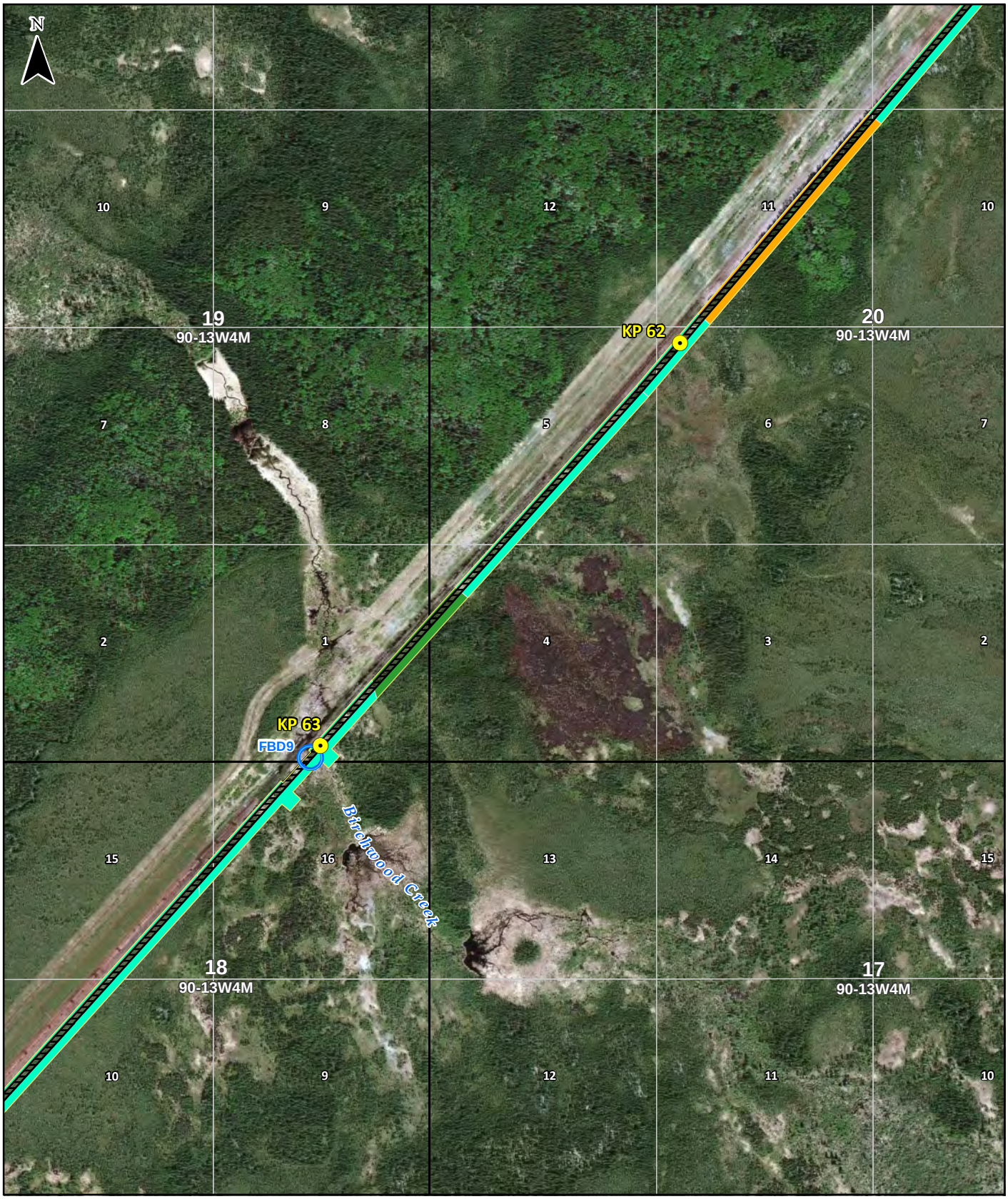

Watercourse Crossing

Kilometre Post (KP)

Footprint

Operational Access

Habitat Restoration

Conifer Seedling Planting

Conifer Seedling Planting or MSD - Natural Regeneration

MSD - Natural Regeneration

Mounding and Conifer Seedling Planting

Snow Ramp – Natural Regeneration

APPENDIX A:
CANDIDATE HABITAT RESTORATION LOCATIONS
WHITE SPRUCE PIPELINE FOOTPRINT

SHEET 2 OF 5

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m

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Operational Access/Habitat Restoration Method: CH2M 2018;
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(All Locations Approximate)

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Watercourse Crossing
Kilometre Post (KP)
Footprint
Operational Access

Habitat Restoration

Conifer Seedling Planting
Conifer Seedling Planting or MSD - Natural Regeneration
MSD - Natural Regeneration
Mounding and Conifer Seedling Planting
Snow Ramp – Natural Regeneration

APPENDIX A:
CANDIDATE HABITAT RESTORATION LOCATIONS
WHITE SPRUCE PIPELINE FOOTPRINT

SHEET 3 OF 5

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m

UTM Zone 12N
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; Watercourse Crossing: CH2M 2016; KP, Footprint: TCPL 2016;
Operational Access/Habitat Restoration Method: CH2M 2018;
Alberta Township System: AltaLIS 2009.

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TransCanada
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(All Locations Approximate)

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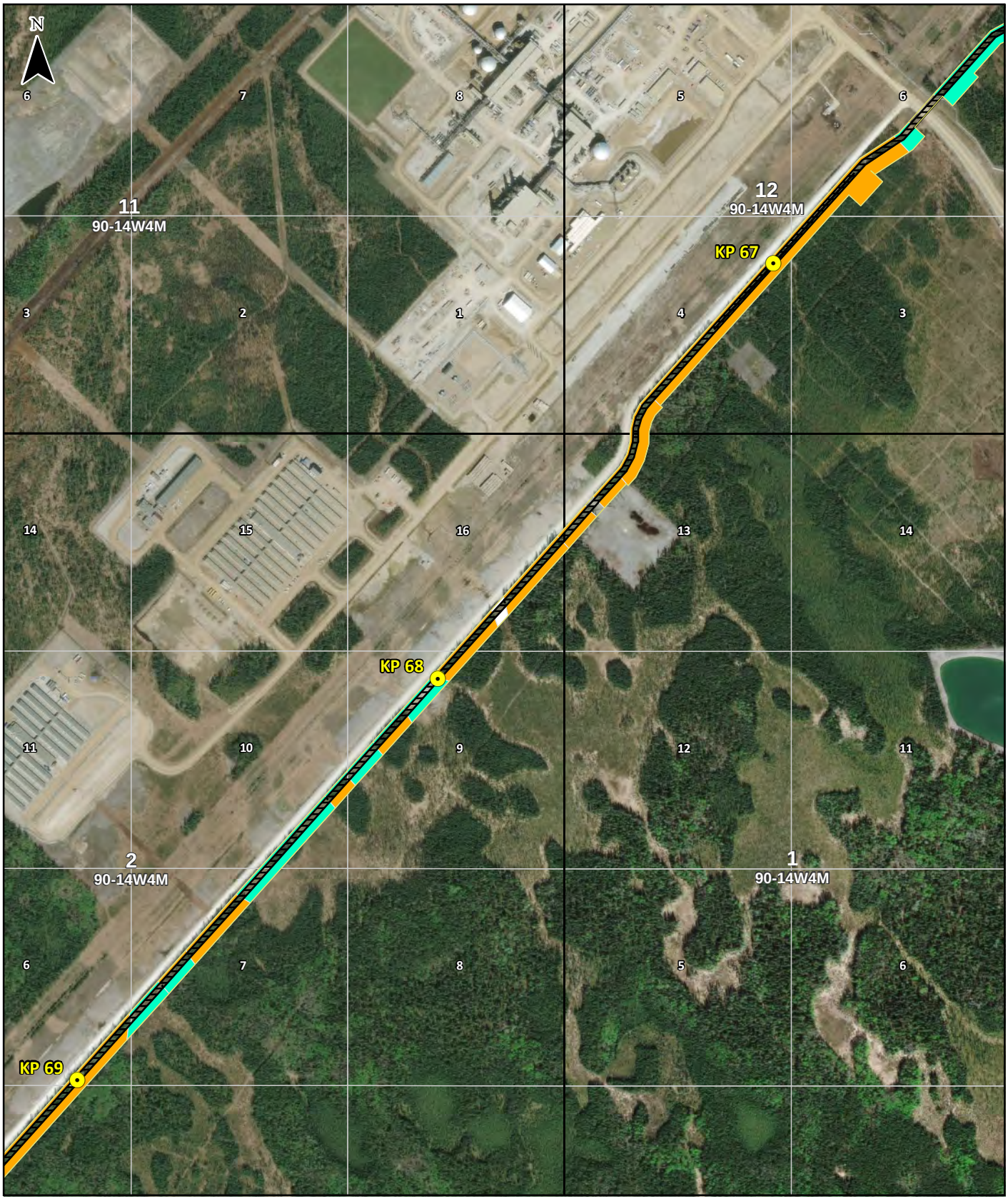

Watercourse Crossing

Kilometre Post (KP)

Footprint

Operational Access

Habitat Restoration

Conifer Seedling Planting

Conifer Seedling Planting or MSD - Natural Regeneration

MSD - Natural Regeneration

Mounding and Conifer Seedling Planting

Snow Ramp – Natural Regeneration

APPENDIX A:
CANDIDATE HABITAT RESTORATION LOCATIONS
WHITE SPRUCE PIPELINE FOOTPRINT

SHEET 4 OF 5

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m

UTM Zone 12N
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; Watercourse Crossing: CH2M 2016; KP, Footprint: TCPL 2016; Operational Access/Habitat Restoration Method: CH2M 2018; Alberta Township System: AltaLIS 2009.

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(All Locations Approximate)

June 2018	672406
Mapped By: DR	Checked By: JB

672406_Wildlife_CHRP_AppendixA_Rev3.mxd

Watercourse Crossing
Kilometre Post (KP)
Footprint
Operational Access

Habitat Restoration

Conifer Seedling Planting
Conifer Seedling Planting or MSD - Natural Regeneration
MSD - Natural Regeneration
Mounding and Conifer Seedling Planting
Snow Ramp – Natural Regeneration

APPENDIX A:
CANDIDATE HABITAT RESTORATION LOCATIONS
WHITE SPRUCE PIPELINE FOOTPRINT

SHEET 5 OF 5

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m

UTM Zone 12N
Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; Watercourse Crossing: CH2M 2016; KP, Footprint: TCPL 2016;
Operational Access/Habitat Restoration Method: CH2M 2018;
Alberta Township System: AltaLIS 2009.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

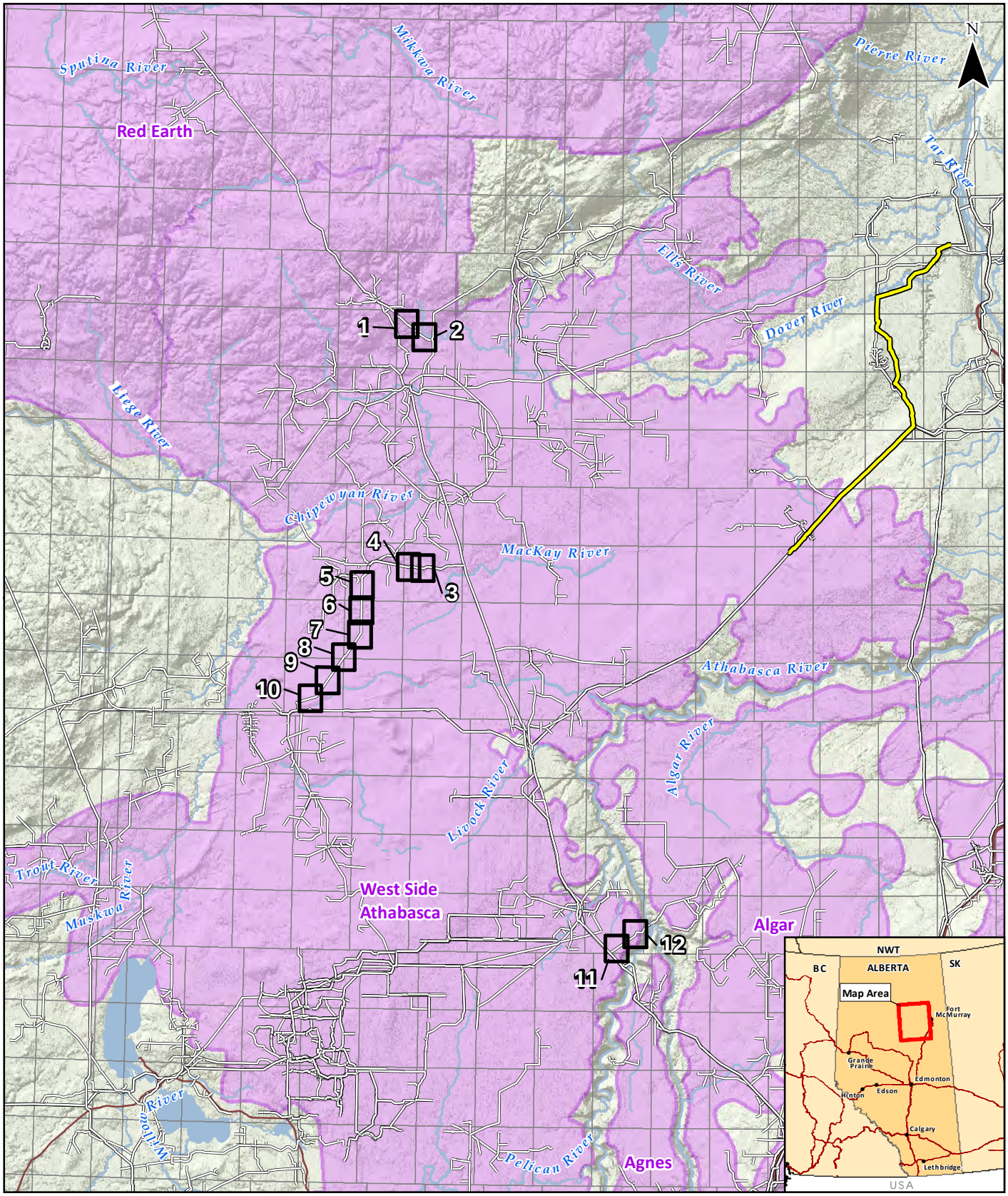
TransCanada
In business to deliver

SCALE: 1:10,000
0 100 200 300 m
(All Locations Approximate)

June 2018	672406
Mapped By: DR	Checked By: JB

672406_Wildlife_CHRP_AppendixA_Rev3.mxd

Appendix B: Candidate Habitat Restoration Offset Locations in the WSAR Caribou Range



White Spruce Pipeline
Existing Pipeline
Road
Highway
Hydrology
Waterbody
Caribou Range
Sheetframe Extent

APPENDIX B
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

INDEX MAP

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m CCI

UTM Zone 12N
Pipeline: TCPL 2016; Highway, Road: NRCan 2015;
Hydrology, Waterbody: NRCan 2007-2011; Caribou Range: AEP, GOA 2016; Offset Assessed Pipeline: CCI 2018;
Alberta Township System: AltaLIS 2009; Hillshade: TERA Environmental Consultants 2008.

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SCALE: 1:900,000
0 5 10 15 20 25 km
(All Locations Approximate)

October 2018 | 672406
Mapped By: AJ | Checked By: JB

672406_Wildlife_CHRP_AppendixB_Index_Rev0.mxd

Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 1 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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UTM Zone 12N
2014 SPOT6 ©2016 CNES, Licensed by Blackbridge Geomatics Corp, www.blackbridge.com;
Existing Pipeline: IHS Inc. 2018;Road: NRCan 2015;Potential Restoration Measure: CCI 2018; Caribou Range: AEP, GOA 2016;
Alberta Township System: AltaLIS 2009.

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SCALE: 1:20,000
0 100 200 300 400 500 m
(All Locations Approximate)

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Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 2 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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Alberta Township System: AltaLIS 2009.

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(All Locations Approximate)

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672406_Wildlife_CHRP_AppendixB_Rev0.mxd

Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 3 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m CCI

UTM Zone 12N
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Existing Pipeline: IHS Inc. 2018;Road: NRCan 2015;Potential Restoration Measure: CCI 2018; Caribou Range: AEP, GOA 2016;
Alberta Township System: AltaLIS 2009.

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SCALE: 1:20,000
0 100 200 300 400 500 m
(All Locations Approximate)

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Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 4 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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Existing Pipeline: IHS Inc. 2018;Road: NRCan 2015;Potential Restoration Measure: CCI 2018; Caribou Range: AEP, GOA 2016;
Alberta Township System: AltaLIS 2009.

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SCALE: 1:20,000
0 100 200 300 400 500 m
(All Locations Approximate)

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Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 5 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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Alberta Township System: AltaLIS 2009.

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In business to deliver

SCALE: 1:20,000
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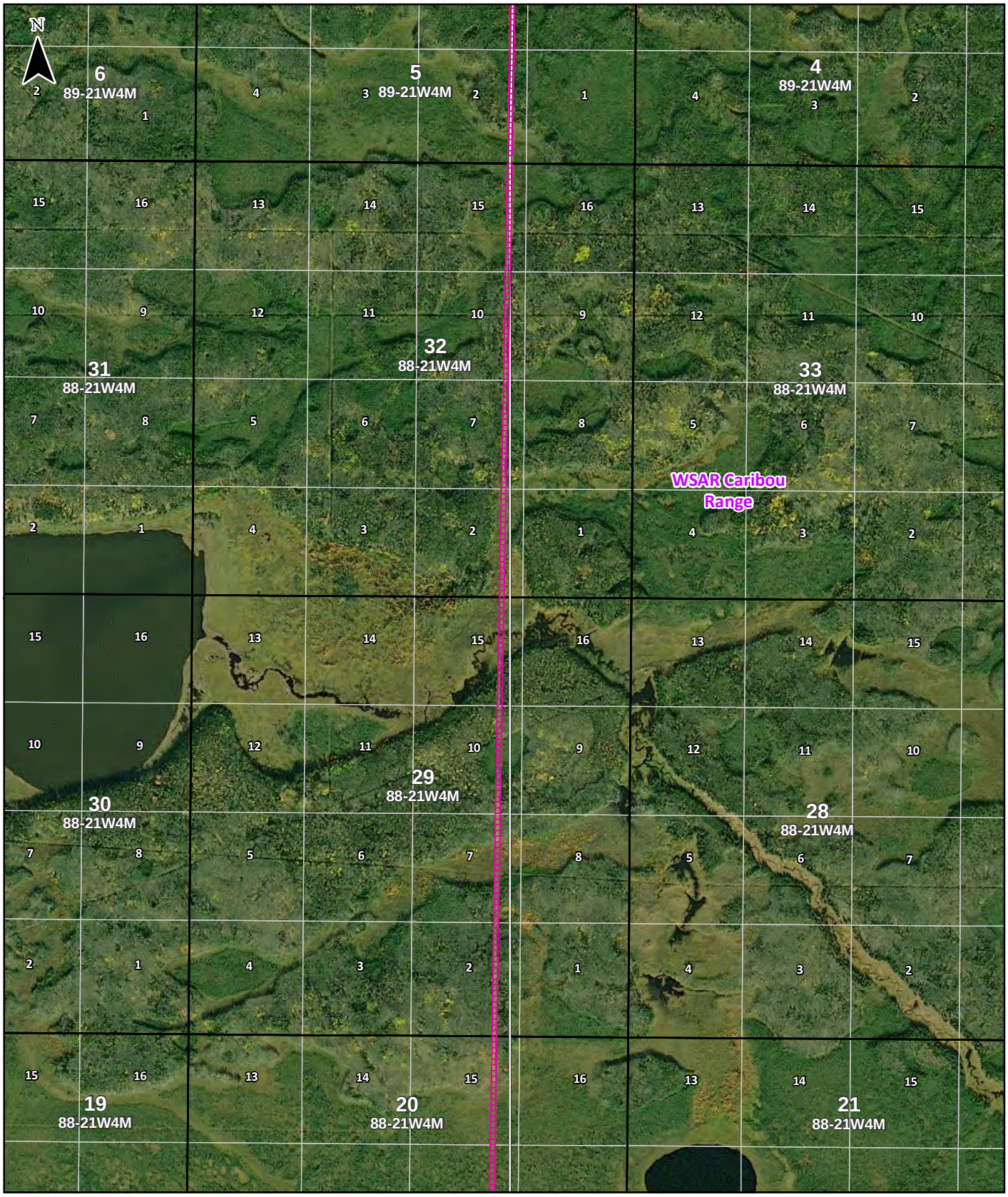
(All Locations Approximate)

October 2018	672406
Mapped By: AJ	Checked By: JB

672406_WildlfeCHRP_AppendixB_Rev0.mxd



Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 6 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m CCI

UTM Zone 12N
2014 SPOT6 ©2016 CNES, Licensed by Blackbridge Geomatics Corp, www.blackbridge.com;
Existing Pipeline: IHS Inc. 2018;Road: NRCan 2015;Potential Restoration Measure: CCI 2018; Caribou Range: AEP, GOA 2016;
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SCALE: 1:20,000
0 100 200 300 400 500 m
(All Locations Approximate)

October 2018	672406
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Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 7 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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2014 SPOT6 ©2016 CNES, Licensed by Blackbridge Geomatics Corp, www.blackbridge.com;
Existing Pipeline: IHS Inc. 2018;Road: NRCan 2015;Potential Restoration Measure: CCI 2018; Caribou Range: AEP, GOA 2016;
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SCALE: 1:20,000
0 100 200 300 400 500 m
(All Locations Approximate)

October 2018	672406
Mapped By: AJ	Checked By: JB

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Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 8 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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Existing Pipeline: IHS Inc. 2018;Road: NRCan 2015;Potential Restoration Measure: CCI 2018; Caribou Range: AEP, GOA 2016;
Alberta Township System: AltaLIS 2009.

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(All Locations Approximate)

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Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 9 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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SCALE: 1:20,000
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(All Locations Approximate)

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Mapped By: AJ	Checked By: JB

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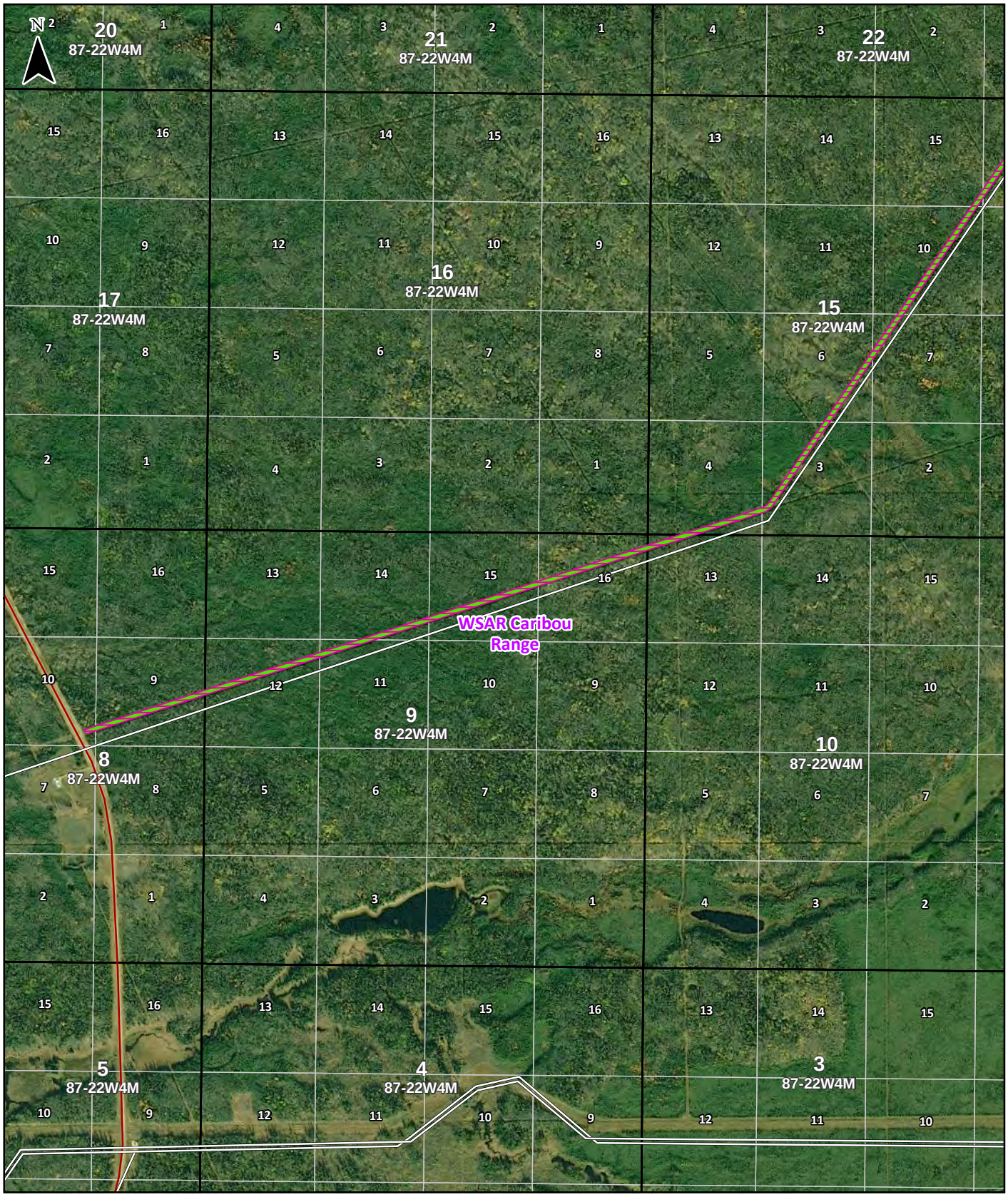

Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 10 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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SCALE: 1:20,000
0 100 200 300 400 500 m
(All Locations Approximate)

October 2018	672406
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672406_WildlfeCHRP_AppendixB_Rev0.mxd

Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 11 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

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SCALE: 1:20,000
0 100 200 300 400 500 m
(All Locations Approximate)

October 2018	672406
Mapped By: AJ	Checked By: JB

672406_Wildlife_CHRP_AppendixB_Rev0.mxd

Existing Pipeline
Road
Caribou Range

Candidate Offset Restoration Measure

Mounding + Natural Revegetation
Mounding + Planting
Rollback + Natural Revegetation
Rollback + Planting
Tree Planting

APPENDIX B:
CANDIDATE HABITAT RESTORATION OFFSET LOCATIONS

SHEET 12 OF 12

CARIBOU HABITAT RESTORATION PLAN
FOR THE TRANSCANADA PIPELINES LIMITED
WHITE SPRUCE PIPELINE PROJECT

ch2m CCI

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In business to deliver

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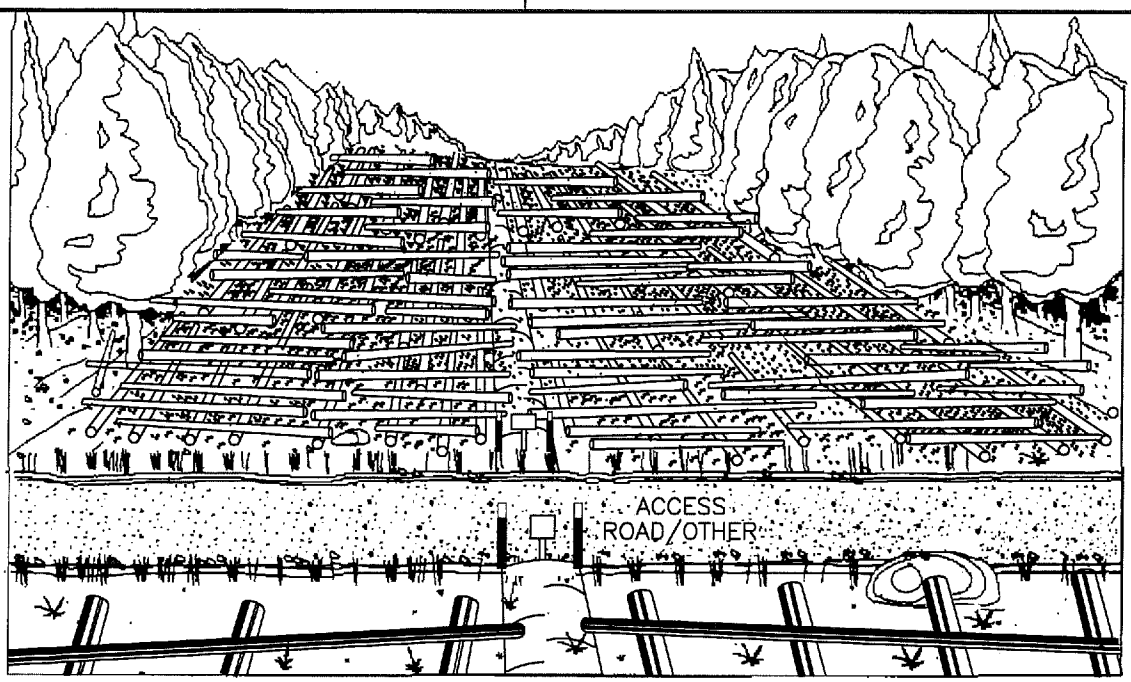
0 100 200 300 400 500 m
(All Locations Approximate)

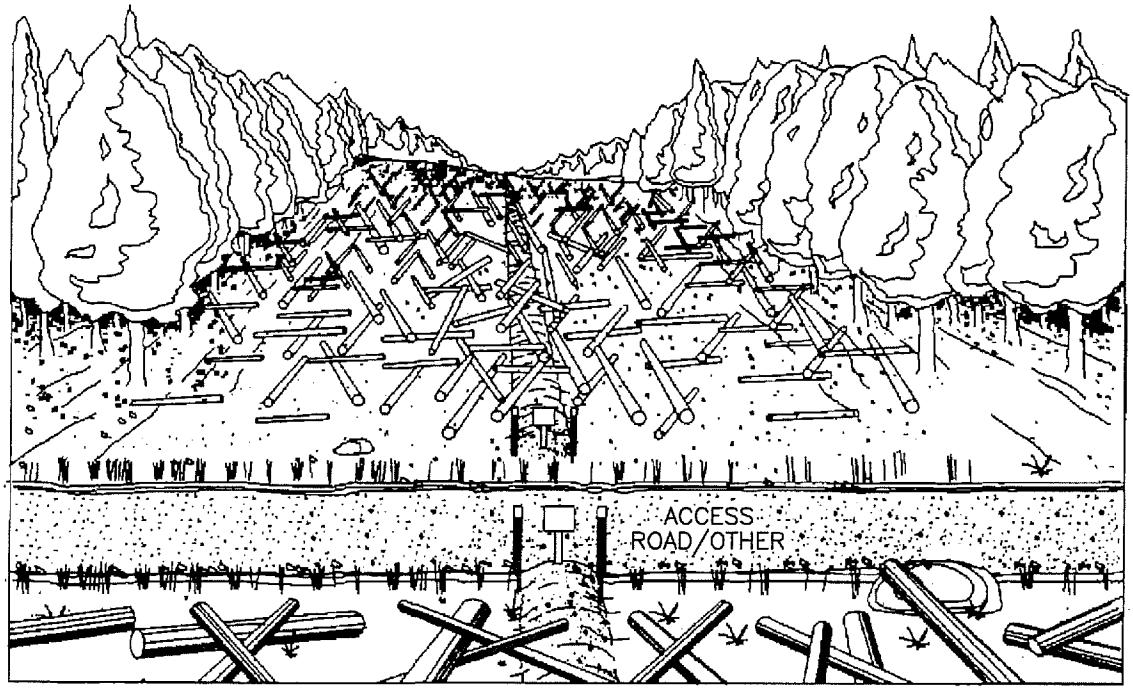
October 2018	672406
Mapped By: AJ	Checked By: JB

672406_Wildlife_CHRP_AppendixB_Rev0.mxd

Appendix C: Typical Drawings



OPTION A



OPTION B

1. PLACE ROLLBACK AS INDICATED ON THE DRAWING (OPTION A OR B). REFER TO THE EPP FOR SITE SPECIFIC DETAILS. THE COMPANIES AUTHORIZED REPRESENTATIVE WILL DETERMINE THE OPTION AND LOCATION OF ROLLBACK TO FIT WITHIN THE RIGHT-OF-WAY.
2. ENSURE ROLLBACK IS EXTENDED TO THE TRENCH ROACH AND TO THE EDGE OF THE CONSTRUCTION FOOTPRINT (STANDING TIMBER WHERE APPLICABLE). TO ENSURE EFFECTIVENESS, TYPICAL LENGTH AND DENSITY OF ROLLBACK IS APPROXIMATELY 500 M3/HA.
3. IF SITE CONDITIONS WARRANT MODIFICATIONS TO THE PROCEDURE, THE COMPANY'S AUTHORIZED REPRESENTATIVE SHALL ENSURE THE MODIFICATIONS MEET THE INTENT OF THE MITIGATION MEASURE.

REVISIONS | ID | DRAWING SUPERSEDES SK-1543 | 00 | GENERAL ISSUE – REVIEWED FOR 2015 SPEC | 01 | GENERAL ISSUE | 02

TIME | DESIGNFILE

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DESIGNER: NAME Oct 31/17 DATE

CHECKED BY: KR DESIGN CHECKER: JH

DESIGN STANDARD

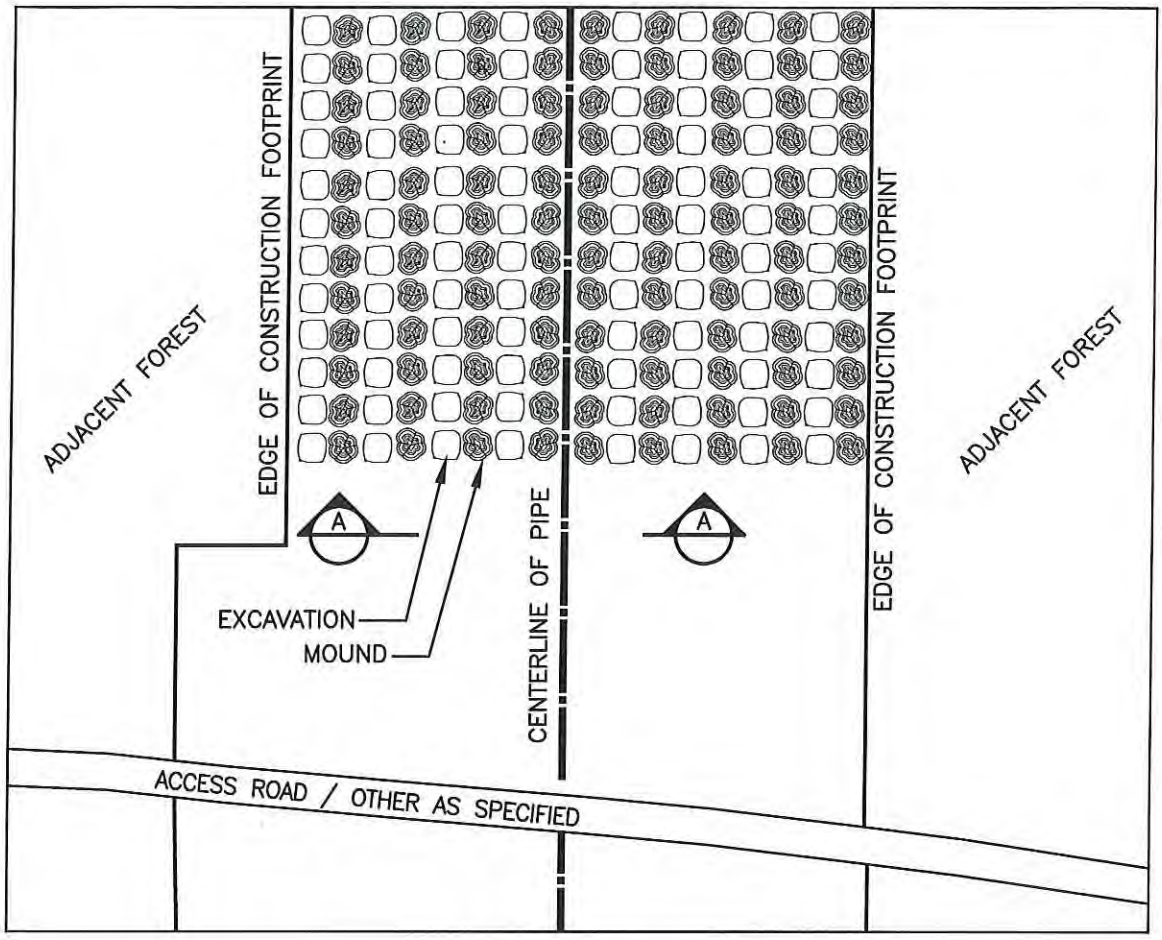
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TYPICAL ROLLBACK FOR ACCESS CONTROL

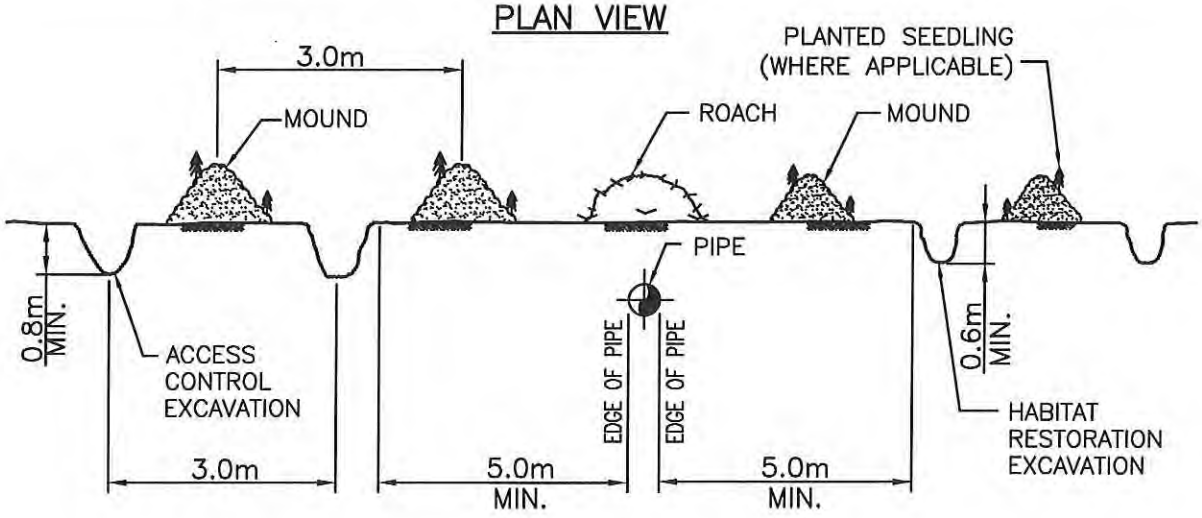
SCALE N.T.S.	DWG No STDS-03-ML-05-312	REV 02

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



PLAN VIEW



CROSS SECTION A–A

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DESIGNER: NAME DATE

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DESIGN STANDARD

FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: MOUNDING AND HABITAT RESTORATION (SHEET 1 OF 2)

SCALE N.T.S. | DWG No STDS-03-ML-05-314 | REV 00

TIME | DESIGNFILE

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

NOTES:

1. MOUNDING WILL BE USED PRIMARILY FOR ACCESS CONTROL IN AREAS SPECIFIED ON PROJECT PLANS, AND AS DIRECTED BY THE COMPANY. MOUNDING WILL BE COMBINED WITH HABITAT RESTORATION MEASURES WHERE INDICATED IN PROJECT PLANS, AND AS DIRECTED BY THE COMPANY.
2. EXCAVATIONS SHALL NOT BE CONDUCTED WITHIN 5m OF THE COMPANY'S PIPELINE. ENSURE APPLICABLE COMPANY AND THIRD PARTY PERMITS AND AGREEMENTS ARE IN PLACE AND ADHERED TO.
3. THE EDGE OF THE EXCAVATION SHALL BE JUST BEYOND THE 5m BUFFER LIMIT AND THE MOUND SHALL BE PLACED WITHIN THE 5m BUFFER LIMIT ADJACENT TO THE COMPANY'S PIPELINE.
4. FOR ACCESS CONTROL PURPOSES, THE EXCAVATED AREA SHALL BE MINIMUM 0.8m DEEP AND APPROXIMATELY 1m IN DIAMETER, WHERE SITE CONDITIONS ALLOW.
5. WHERE MOUNDING IS COMBINED WITH HABITAT RESTORATION MEASURES, THE EXCAVATED AREA SHALL BE APPROXIMATELY 0.6m DEEP AND APPROXIMATELY 1m IN DIAMETER, WHERE SITE CONDITIONS ALLOW.
6. THE EXCAVATED MATERIAL IS PLACED BESIDE THE HOLE TO CREATE THE MOUND.
7. MOUNDS SHALL BE SPACED APPROXIMATELY 3m APART, WITH FINAL SPACING IMPLEMENTED TO ENSURE ACCESS BY OFF-ROAD VEHICLES IS DETERRED.
8. DENSITY SHALL BE A MINIMUM OF 700 MOUNDS/HA. MOUND DENSITY IS DEPENDENT ON SOIL CHARACTERISTICS, AMOUNT OF FROST AND TYPE OF EQUIPMENT USED. TYPICAL LENGTH OF MOUNDING TO MEET THE MINIMUM DENSITY IS APPROXIMATELY 50m.
9. WHERE MOUNDING IS COMBINED WITH HABITAT RESTORATION MEASURES, LIVE SEEDLING PLANTING DENSITY SHALL BE A MINIMUM OF 2 SEEDLINGS PER MOUND, OR 1,400 TO 2,000 SEEDLINGS/HA.
10. IF SITE CONDITIONS WARRANT MODIFICATIONS TO THE PROCEDURE, THE COMPANY'S AUTHORIZED REPRESENTATIVE SHALL ENSURE THE MODIFICATIONS MEET THE INTENT OF THE MITIGATION MEASURE.

GENERAL:

- MOUNDING IS TYPICALLY CONDUCTED DURING FINAL CLEANUP AND NOT IN THE SAME SEASON AS CONSTRUCTION/ INTERIM CLEANUP.
- PRECAUTIONS SHALL BE TAKEN TO MINIMIZE FROST PENETRATION WHERE PRACTICAL IN AREAS WHERE MOUNDING IS SPECIFIED. DEEPER FROST PENETRATION CAN LIMIT THE ABILITY TO EXCAVATE HOLES AND SUBSEQUENT EFFECTIVENESS OF THE MITIGATION MEASURES.
- SITE SPECIFIC SOIL PROPERTIES (E.G. SUBSTRATE AND DRAINAGE) MAY AFFECT THE HOLE AND MOUND SIZE, STABILITY AND OVERALL STRUCTURE.
- MOUNDING MAY ALSO BE USED IN COMBINATION WITH HABITAT RESTORATION BY CREATING MICROSITES FOR PLANTED SEEDLINGS.

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FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: MOUNDING AND HABITAT RESTORATION (SHEET 2 OF 2)

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TIME | DESIGNFILE

TC_A4_EE.DWG 210X280

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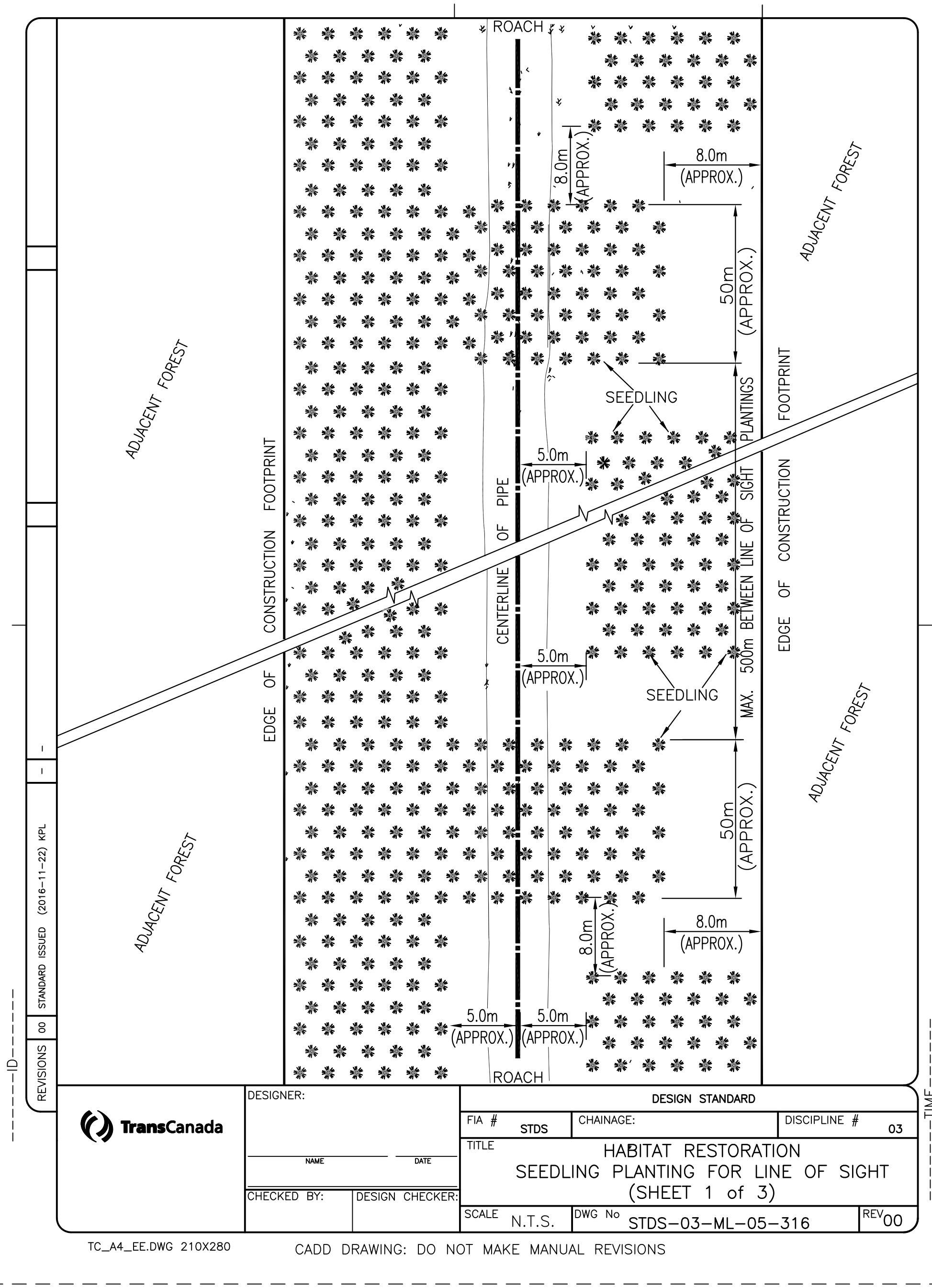
ROACH
8.0m (APPROX.)
8.0m (APPROX.)
ADJACENT FOREST
50m (APPROX.)
SEEDLING
5.0m (APPROX.)
EDGE OF CONSTRUCTION FOOTPRINT
CENTERLINE OF PIPE
MAX. 500m BETWEEN LINE OF SIGHT PLANTINGS
5.0m (APPROX.)
SEEDLING
50m (APPROX.)
8.0m (APPROX.)
8.0m (APPROX.)
5.0m (APPROX.)
5.0m (APPROX.)
ROACH
REVISIONS
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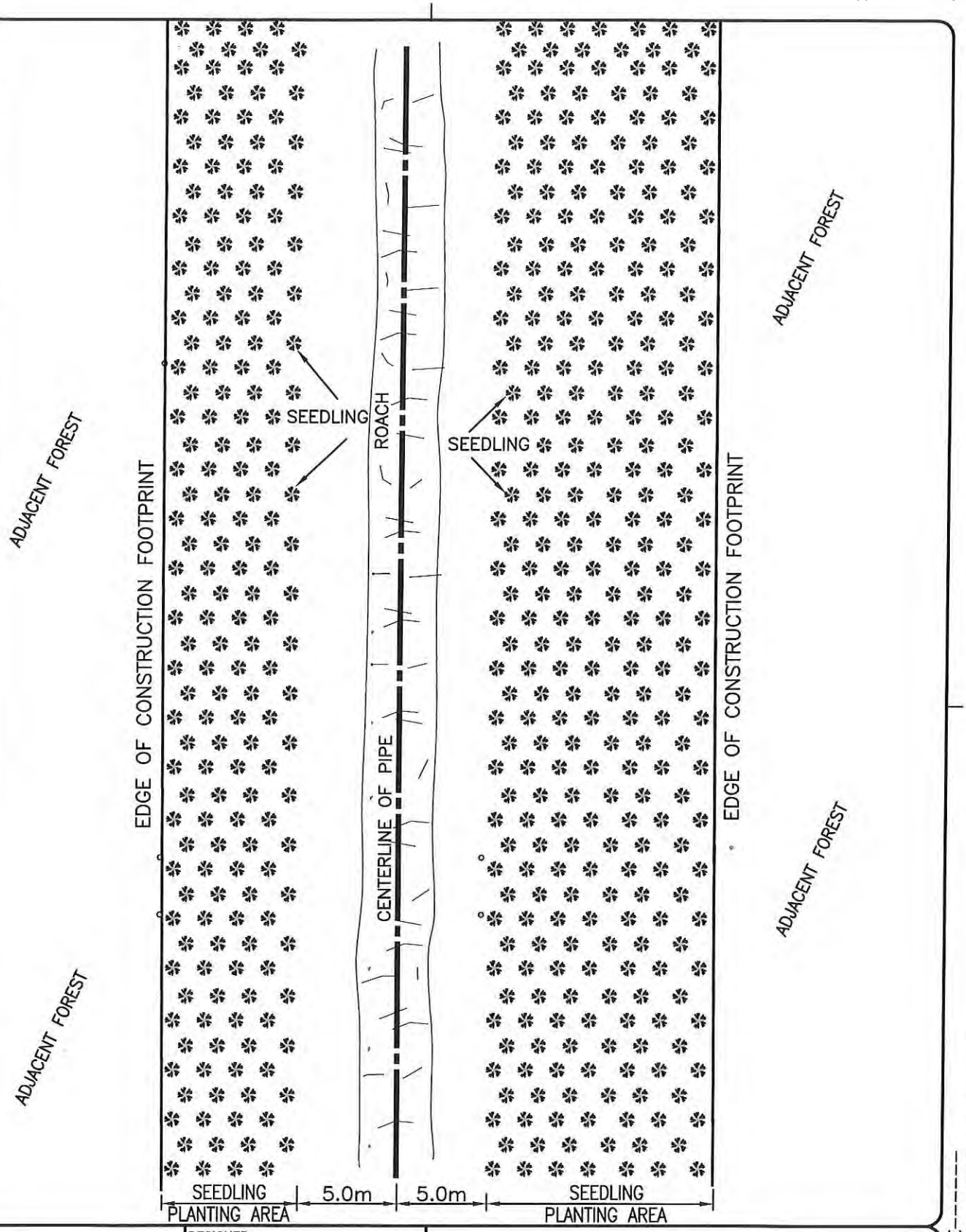
STANDARD ISSUED (2016-11-22) KPL
ID
TIME
DESIGNFILE
TransCanada
DESIGNER:
NAME
DATE
CHECKED BY:
DESIGN CHECKER:
DESIGN STANDARD
FIA # STDS
CHAINAGE:
DISCIPLINE # 03
TITLE
HABITAT RESTORATION
SEEDLING PLANTING FOR LINE OF SIGHT
(SHEET 1 of 3)
SCALE N.T.S.
DWG No STDS-03-ML-05-316
REV 00
TC_A4_EE.DWG 210X280
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



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TIME

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FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE
HABITAT RESTORATION
SEEDLING PLANTING
(SHEET 2 OF 3)

SCALE N.T.S. | DWG No STDS-03-ML-05-317 | REV 00

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

NOTES:

1. CONDUCT SEEDLING PLANTING FOR HABITAT RESTORATION AND LINE OF SIGHT WHERE INDICATED IN PROJECT PLANS, AND AS DIRECTED BY THE COMPANY. FIELD SUPERVISION OF SEEDLING PLANTING MUST BE CONDUCTED BY A REGISTERED FOREST PRACTITIONER.

2. ENSURE APPLICABLE COMPANY AND THIRD PARTY AGREEMENTS ARE IN PLACE AND FOLLOWED.

3. SEEDLING PLANTING SHALL BE CONDUCTED IN NON–FROZEN GROUND CONDITIONS IN THE SEASON FOLLOWING WINTER FINAL CLEANUP, AND OUTSIDE OF APPLICABLE RESTRICTED ACTIVITY PERIODS WHERE WAIVERS ARE NOT OBTAINED.

4. DO NOT PLANT IN THE SEASON FOLLOWING CONSTRUCTION/ INTERIM CLEANUP UNLESS APPROVED IN PROJECT PLANS OR DIRECTED BY THE COMPANY.

5. SEEDLING PLANTING DENSITY SHALL BE (A) 1,600–2,000 STEMS PER HA IN UPLAND (CONIFER /DECIDUOUS); (B) 1,200–2,000 STEMS PER HA IN LOWLAND (CONIFER ONLY). PLANT IN A STRAIGHT LINE PARALLEL TO THE ROACH. OFF–SET THE ADJACENT PARALLEL LINE OF PLANTING TO AVOID A GRID PATTERN.

6. WHERE THE LINE OF SIGHT PROCEDURE IS REQUIRED, IT SHOULD BE IMPLEMENTED AT MAXIMUM 500m SPACING OR AS DIRECTED BY THE COMPANY. TO ADDRESS ACCESS REQUIREMENTS DURING PIPELINE OPERATIONS, THE LINE OF SIGHT PLANTING PATTERN SHALL ENSURE AN APPROXIMATE 8m WIDE GAP IS LEFT UNPLANTED ADJACENT TO THE EDGE OF THE CONSTRUCTION FOOTPRINT. WHERE ACCESS IS REQUIRED ADJACENT TO THE OPERATING PIPELINE, PLANTING SHALL NOT BE CONDUCTED WITHIN 5m OF THE PIPELINE.

7. SEE DRAWING STDS–03–ML–05–316 AND STDS–03–ML–05–317 FOR EXAMPLES OF THE ALTERNATING PLANTING PATTERN AND LAYOUT TO BE APPLIED FOR HABITAT RESTORATION AND LINE OF SIGHT LOCATIONS.

8. ALTERNATING PLANTING PATTERN SHALL BE APPROXIMATELY 50m IN LENGTH OR AS INDICATED BY THE COMPANY TO MEET THE INTENT OF THE LINE OF SIGHT REQUIREMENTS.

9. IF SITE CONDITIONS WARRANT MODIFICATIONS TO THE PROCEDURE, THE COMPANY'S AUTHORIZED REPRESENTATIVE SHALL ENSURE THE MODIFICATIONS MEET THE INTENT OF THE HABITAT RESTORATION MITIGATION MEASURES.

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ID

TIME

DESIGNFILE

TransCanada

DESIGNER:

NAME DATE

CHECKED BY: DESIGN CHECKER:

DESIGN STANDARD

FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE HABITAT RESTORATION AND LINE OF SIGHT SEEDLING PLANTING NOTES (SHEET 3 OF 3)

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CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

Appendix D: Photoplates

Plate 1: Example of the effectiveness of minimal disturbance construction in forested areas. Photo shows growth after one growing season. Photo source: TCPL.

Plate 2: Example of coarse woody debris rollback for access management on a non-parallel pipeline ROW. The debris also creates microsites to enhance vegetation establishment and growth. Photo source: TCPL.

Plate 3: Example of conifer seedling planting on a pipeline ROW. The upland area has sufficient drainage and suitable soils for seedling establishment and growth. Photo source: CH2M HILL.

Plate 4: Example of access management implemented on a ROW with parallel developments. Note the ATV tracks that divert around the woody debris rollback. Photo source: TCPL.

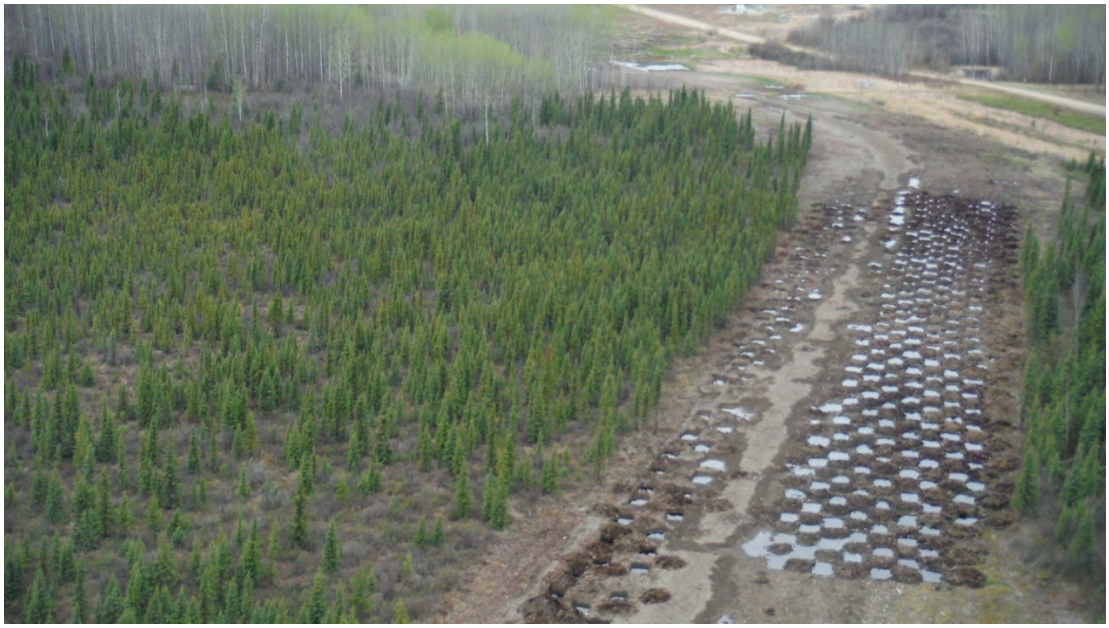

Plate 5: Aerial view of mounding in lowland on a non-parallel portion of the ROW. Photo source: TCPL.

Plate 6: Aerial view of combination rollback and mounding as access management on a non-parallel portion of the ROW. Photo source: TCPL.

Plate 7: Example of a wood berm designed to deter access and reduce line-of-sight. This measure is no longer used due to the risks associated with forest fires. Photo source: TCPL.

Plate 8: Example of a vegetation screen retained along edge of pipeline right-of-way at intersection with an existing linear disturbance. Vegetation screens block line-of-sight and can effectively manage access. Photo source: CH2M HILL.

Plate 9: Example of a ramp-over area where a snow ramp was packed over vegetation in a treed lowland. The resultant vegetation screen will also contribute to natural regeneration. This measure can only be used in seasons with high snowfall. Photo source: CH2M HILL.

Plate 10: Fabricated line-of sight on a ROW paralleled by another ROW and a power line. This measure is not fully effective due to the presence of adjacent developments where no line-of-sight measures are implemented. Photo source: TCPL.

Plate 11: Example of mounding combined with conifer seedling planting on a ROW. The combination of measures is intended to manage access, and facilitate revegetation of conifers. Photo source: TCPL.

Plate 12: Example of shrub staking in the riparian area at a watercourse crossing. Photo source: TCPL

Plate 13: Example of lattice placement of rollback. Photo source: TCPL

Appendix E: Consultation

Table E-1: Summary of Caribou Management Engagement with Fort McKay First Nation

Method and Date	Engagement Related to Caribou	Comments
Emails August 19, 2016 August 22, 2016	FMFN provided TransCanada with Technical Memos related to its review of the draft AER application on (i) Wildlife; (ii) Hydrology/Water Quality/Safety, and (iii) Traditional Land Use The Technical Memo on Terrestrial Resources and Reclamation was emailed to TransCanada on August 22, 2016. The Wildlife Technical Memo included the following FMFN's comments regarding caribou: • **Comment #1**: A Caribou Protection Plan (CPP) has not yet been completed by TransCanada • **Comment #2**: The Environmental Protection Plan (EPP) for the White Spruce Project includes mitigation and timing constraints within the WSAR caribou range. Mitigation should occur whenever caribou or /high quality habitat is present • **Comment #3**: It is possible that caribou are present outside the WSAR caribou range near the Project route. TransCanada should obtain caribou location data (GPS and radio-collar) from AEP and complete pre-construction surveys prior to construction in high quality caribou habitat. Construction should not occur within 1 km of observed caribou	Refer to the entry below in this table for September 9, 2016 email that includes TransCanada's responses to these comments
Meeting August 25, 2016 Conference Call August 26, 2016	TransCanada's subject matter experts met with FMFN, FMML#63, and their respective consultants to go through FMFN's and FMML#63's Technical Memos submitted as part of their review of TransCanada's draft AER application. The meeting was focused on understanding FMFN's and FMML#63's Technical Memos, discussing opportunities to incorporate some of the feedback from the memos into TransCanada's final AER application, and to discuss proposed mitigations. Topics discussed included: 1. Wildlife Technical Memo 2. Traditional Knowledge Memo 3. Terrestrial Resources and Reclamation Memo 4. Historical Resources Management Memo 5. Issue Scan Technical Memo Due to a time constraint, the discussion on the Issue Scan was completed on August 26, 2016 via a teleconference	On August 9, 2016, FMFN called TransCanada to inform that Fort MacKay Metis Local #63 will be participating in the meeting in addition to FMFN

Method and Date	Engagement Related to Caribou	Comments
Email September 09, 2016	TransCanada emailed FMFN TransCanada's response to the Technical Memos received as part of FMFN's Technical Review of TransCanada's draft AER Application and subsequent meetings held on August 25, 2016 and August 26, 2016. TransCanada attached a summary table containing TransCanada's responses. See below the responses regarding caribou: • **TransCanada's Response to Comment #1**: A CPP will be completed for the Project and can be provided to the community. • **TransCanada's Response to Comment #2:** • General mitigation measures designed to minimize impacts to all wildlife species, including caribou, for the entire project footprint will be implemented and can be found in the EPP. • **TransCanada's Response to Comment #3:** • TransCanada adheres to the federal boundaries of the designated caribou ranges. Although TransCanada recognizes that caribou may be found outside these ranges, the ranges were delineated as they represent areas the resource managers have found the highest congregation of caribou. Any caribou outside of the range would be identified using TransCanada's wildlife sighting cards and the Wildlife Species of Concern Discovery Plan would be applied. TransCanada also informed FMFN that TransCanada filed its final Project Application with the AER on September 7, 2016.	--
Email September 28, 2016	TransCanada emailed FMFN to inquire if FMFN has any questions about TransCanada's final Project Application provided on September 14, 2016. TransCanada attached the final EPP and Environmental Field Report that were filed with the appropriate regulatory bodies in conjunction with the Application. TransCanada also inquired if FMFN has any questions about TransCanada's responses provided to FMFN on September 9, 2016 with respect to the Technical Memos FMFN provided as part of FMFN's technical review of TransCanada's draft AER application and subsequent meetings held on August 25th and 26th, 2016? TransCanada advised it is available by telephone or in person if FMFN would like to discuss any of the above items.	--

Method and Date	Engagement Related to Caribou	Comments
Email October 13, 2016	FMFN submitted an SOC against the Project to TransCanada Below is a summary of FMFN's SOC regarding caribou: • **Concern #1**: Portions of the Project are located in the WSAR caribou range. Caribou are an important traditional use species and its habitat valuable for cultural purposes and for its support of caribou for harvesting • **Concern #2**: The Project will disturb and remove approximately 13.3 km of habitat in the WSAR caribou range • **Concern #3**: The Project will create a wide linear disturbance in caribou habitat that will result in increased wolf prey on caribou and increased hunting pressures • **Concern #4**: TransCanada has not proposed mitigation for caribou found outside of their range or has provided a completed CPP for review • **Concern #5**: TransCanada has not considered, assessed or proposed adequate mitigation to address impacts on traditional resources including caribou and other valued species • **Concern #6**: It is possible that caribou are present outside the WSAR caribou range near the pipeline route. TransCanada should obtain caribou location data (GPS and radio-collar) from AEP and complete pre-construction surveys prior to construction in high quality caribou habitat. Construction should not occur within 1 km of observed caribou • **Concern #7**: TransCanada should mitigate Project impacts in high quality caribou habitat, not just within designated caribou ranges	Refer to the entry below in this table for October 28, 2016 email that includes TransCanada's responses to these concerns
Email October 17, 2016	TransCanada emailed FMFN a copy of the Project Caribou Protection Plan (CPP) that was filed with the AER on October 13, 2016.	--
Emails October 17, 2016 October 21, 2016	TransCanada emailed FMFN to advise that TransCanada is in the process of reviewing FMFN's SOC and is aiming to provide a response by October 21, 2016. TransCanada exchanged emails with FMFN to advise TransCanada will provide the SOC response the week of October 24, 2016 and proposed a meeting the week of October 24, 2016 to discuss outstanding concerns. FMFN responded that it is unable to meet during that time and will provide available dates shortly	--

Method and Date	Engagement Related to Caribou	Comments
Email October 27, 2016	FMFN emailed TransCanada to ask the following questions regarding the CPP: • **Question #1:** Number of new and current projects that TransCanada has in similar protected areas (Caribou ranges) across Canada. FMFN would like to understand TransCanada level of knowledge and years accumulated from different projects and operation managing interaction with caribou ranges • **Question #2:** Plans to mitigate the interaction with wildlife in these areas during construction and operations • **Question #3**: If mineral lick is found on the ROW, will it be disturbed, or ROW will be moved? FMFN understands that there will be no disturbance, only extension of current ROW • **Question #4**: TransCanada should be more specific in indicating who to contact in case of a trapped wildlife in open trench during construction (Mitigation #28, page 3-4 of CPP) • **Question #5**: FMFN believes that TransCanada is only doing the minimum required by regulations. Has TransCanada considered supporting community initiatives for habitat preservation or caribou monitoring programs?	Refer to the entry below in this table for November 1 & 2, 2016 emails that include TransCanada's responses to these questions
Email October 28, 2016	TransCanada emailed FMFN TransCanada's SOC Response table that was filed by FMFN on October 14, 2016. TransCanada's responses regarding caribou were as follows: • **TransCanada's Response to Concerns #1, 2, 4, 6, 7**: General mitigation measures designed to minimize impacts to all wildlife species, including caribou, for the entire Project footprint will be implemented and can be found in the EPP. In addition, a CPP has been completed and was provided to FMFN on October 17, 2016. Upon review, it has been determined that the proposed pipeline will cross approximately 12.6 km of WSAR caribou range • **TransCanada's Response to Concerns #3:** • In accordance with direction provided by regulators, in order to minimize the number of new corridors created, the Project has been routed to parallel existing linear disturbance for 100% of its length • **TransCanada's Response to Concerns #5:** • General Mitigation measures designed to minimize impacts to all wildlife species, including caribou, for the entire footprint will be implemented and can be found in the EPP. In the event that site-specific delineation of resources identified in the Community Report is available and unique site-specific mitigation is required, this information can be incorporated into Table 1 of the EPP, to be finalized immediately prior to construction	--

Method and Date	Engagement Related to Caribou	Comments

Emails
November 1, 2016
November 2, 2016
	TransCanada emailed FMFN a response to the questions FMFN raised about TransCanada's CPP and asked for clarification on some of the questions. FMFN provided a clarification on the questions.
	Below are TransCanada's Responses after clarification:
	• **TransCanada's Response to Question #1:** TransCanada has hundreds of kilometers of operating and proposed pipeline in caribou range across Canada. As described in the previous response, the White Spruce Project will capitalize on TransCanada's long history of consultation and working collaboratively with provincial regulators, Aboriginal communities, stakeholders and industry partners for projects in caribou range and will continue to work with provincial and federal regulators to align protection and restoration measures with provincial and federal policies. TransCanada does and will continue to work with Provincial Regulators to align caribou protection as well as habitat restoration and monitoring programs with upcoming government led Range Plans and Action Plans. TransCanada considers the feedback from ongoing consultation for other projects. TransCanada and its subsidiaries will continue to work with regulators to identify and address caribou-related concerns, and will facilitate open communication for continuous improvement.
	• **TransCanada's Response to Question #2:** Specific sections of the EPP that covers interaction with wildlife during construction and operations were cited (e.g., Table 1 and Sections: 8.1, 8.5 and 8.6)
	• **TransCanada's Response to Question #3:** No mineral licks were identified during pre-construction survey completed for the Project. However, site specific mitigation with respect to discovery of a mineral lick was added to Table 1 of the EPP prior to September 7, 2016 submission. The following mitigation is now included:
	  • In the event that a mineral lick is discovered during clearing or construction activities and shifting/narrowing the construction right-of-way is not possible to maintain the recommended setback from the mineral lick, consult with the appropriate regulatory agency to discuss practical options and mitigation measures.
	  • In the event a mineral lick is discovered during clearing or construction activities, do not block well used game trails to/from a mineral lick. Ensure there is a gap in strung pipe within the area of the mineral lick to allow wildlife to access the mineral lick. The locations of the gaps should coincide with gaps in surface material, spoil, snow and rollback windrows and obvious wildlife trails, where practical.
	• **TransCanada Response to Question #4:** The Environmental Inspector (EI) is responsible for ensuring that the appropriate regulatory agency is contacted where required. For Projects that are regulated by the AER, the AER is typically the primary contact for caribou-related issues, however the EI would seek clarification on the appropriate contact as required.
		--

Method and Date	Engagement Related to Caribou	Comments
Emails November 1, 2016 November 2, 2016 (cont'd)	• **TransCanada's Response to Question #5:** The White Spruce Project will capitalize on TransCanada's long history of consultation and working collaboratively with provincial regulators, Aboriginal communities, stakeholders and industry partners for projects in caribou range and will continue to work with provincial and federal regulators to align restoration measures with provincial and federal policies. TransCanada does and will continue to work with Provincial Regulators to align caribou habitat restoration and monitoring programs with upcoming government led Range Plans and Action Plans. TransCanada considers the feedback from ongoing consultation for other projects. TransCanada and its subsidiaries will continue to work with regulators to identify and address caribou-related concerns, and will facilitate open communication for continuous improvement. As new information on effective habitat restoration becomes available, it will be incorporated in the planning and implementation process for all projects in caribou habitat**.**	See above
Email November 4, 2016	TransCanada emailed FMFN and confirmed TransCanada is available for a meeting on November 17, 2016 and clarified the primary intent of the meeting should be to attempt to address outstanding concerns FMFN has with respect to the Project and to discuss TransCanada's proposed mitigation. TransCanada inquired if FMFN would be able to provide a response to TransCanada's SOC response by November 10, 2016 in order to ensure the meeting is as productive as possible and so that TransCanada will be in a position to address FMFN's outstanding issues/concerns. The suggested meeting could not be arranged.	--
Conference Call April 27, 2018	TransCanada held a conference call with FMFN to follow up on the Action Plan for AER Decision 2018-001 (Action Plan. Regarding AER Condition # 6, TransCanada agreed to provide FMFN with a copy of TransCanada's draft Caribou Habitat Restoration Plan (CHRP) for feedback once it is prepared.	An Action Plan for the Project was developed by the AER to help monitor and ensure that the conditions imposed to the Project are met. It included completion time frames and a summary of the required evidence. Overall, no concerns were raised by FMFN during the April 27, 2018 conference call
Email and Letter June 15, 2018	TransCanada emailed FMFN in follow up to the April 27, 2018 conference call to discuss the Action Plan for the Project. TransCanada provided responses to FMFN's questions and requests. Addressing the intent of Condition # 6, TransCanada provided a draft of the project-specific CHRP to FMFN to provide an opportunity for feedback on the document.	--

Method and Date	Engagement Related to Caribou	Comments
Email June 18, 2018	TransCanada received an email from FMFN acknowledging receipt of TransCanada's June 15, 2018 email in follow up to the April 27, 2018 conference call. FMFN provided its budget to review the draft CHRP for the Project. FMFN noted that it will be in a position to meet with TransCanada by July 4, 2018.	--
Emails June 19, 2018 June 21, 2018	TransCanada emailed FMFN in follow up to FMFN's June 18, 2018 email to confirm that it will follow up internally to see who is available to meet on July 4, 2018; as the Project's Indigenous Relations representative will be on vacation during that time. On June 21, 2018, TransCanada emailed FMFN to inquire if FMFN would be willing to postpone the July 4, 2018 meeting to July 12 or 13, 2018. TransCanada also confirmed that it approves FMFN's budget to review the draft CHRP for the Project and requested an invoice once FMFN has incurred the expense. FMFN replied to state that it is not available to meet on July 12 or 13, 2018; however, FMFN is available to meet on July 16, 2018.	--
Emails June 22, 2018 July 10, 2018 July 25, 2018	TransCanada and FMFN exchanged emails to try to schedule a conference call to discuss the draft CHRP. Confirmations and cancellations of dates were exchanged due to summer vacations that impacted team members' availability	--
Email and Letter July 25, 2018	TransCanada received an email from FMFN providing FMFN's feedback regarding the draft CHRP for the Project. TransCanada replied to acknowledge receipt of FMFN's letter which provided feedback for the draft CHRP for the Project. TransCanada noted that upon its initial review of FMFN's letter, TransCanada requested to schedule a conference call to discuss the draft CHRP.	Feedback provided by FMFN included 11 recommendations (see Table E-2 below for further details). Refer to September 7, 2018 email that provides TransCanada's response to FMFN's recommendations.
Emails July 30, 2018 July 31, 2018 August 21, 2018 August 22, 2018 August 29, 2018	TransCanada and FMFN exchanged emails to schedule a conference call to discuss the draft CHRP.	--

Method and Date	Engagement Related to Caribou	Comments
Emails September 7, 2018 September 10, 2018	TransCanada emailed FMFN to provide TransCanada's response to FMFN's feedback on the Project's draft CHRP. TransCanada also provided a copy of the approved Grand Rapids Pipeline CHRP for FMFN's reference. TransCanada inquired about FMFN's availability to for a conference call on September 10, 17, or 20, 2018. FMFN replied to confirm its availability to for a conference call at 1:30 p.m. on September 20, 2018. FMFN requested TransCanada confirm if it can accommodate FMFN's preferred time. On September 1, 2018, TransCanada emailed FMFN an outlook calendar meeting invitation for 1:30 p.m. on September 20, 2018 to discuss the draft CHRP for the Project. TransCanada provided the conference call-in information.	See Table E-2 below for more details on TransCanada's response to FMFN's feedback on the draft CHRP.
Conference call September 20, 2018	TransCanada held a conference call with FMFN to discuss the FMFN's recommendations and TransCanada's responses to the draft CHRP document. At this time, the current draft CHRP document did not include offset locations, TransCanada committed to sending FMFN an updated copy of the CHRP (that includes the proposed offset locations) once the plan is formally submitted to the AER and prior to implementation. TransCanada has committed to reviewing any FMFN's comments on the plan.	TransCanada provided the opportunity to discuss all the recommendations and responses in the conference call. The conference call discussion largely focused on FMFN's Recommendations and TransCanada's Responses #: 1, 2, 3, 7, 8 (see Table E-2 for further details). The Grand Rapids Pipeline approved CHRP was not discussed. No specific issues or concerns were raised by FMFN regarding TransCanada's proposed AER CHRP submission plan.

Table E-2: Fort McKay First Nation's Recommendations and TransCanada's Responses on the Draft CHRP

Recommendation Number	FMFN Recommendation	TransCanada Response
1	The project area restoration plan will have a smaller impact on the establishment of effect caribou habitat because it is adjacent to corridors and industrial facilities (also see Figure 1). TransCanada to avoid restoration in areas where there are minimal benefits to caribou (e.g., adjacent to corridors and industrial areas). Caribou restoration should occur within FMFN's Traditional Territory.	TransCanada is committed to caribou habitat restoration. TransCanada committed during the AER hearing to undertake caribou habitat restoration on our White Spruce Pipeline project (Project) footprint. It is also TransCanada's preference, wherever possible, to undertake habitat offsets within the West Side Athabasca Range (WSAR) caribou range, which is consistent with guidance provided by Provincial resource managers, (Alberta Environment and Parks (AEP) and Environment and Climate Change Canada (ECCC) as part of TransCanada's broader consideration of Caribou Habitat Restoration activities.
2	FMFN to be included in future meetings between TransCanada and governments in relation to caribou.	The AER decision required TransCanada to provide a summary of discussions with FMFN regarding the restoration plan including any concerns raised by FMFN and how or if the concerns are addressed. TransCanada appreciates FMFN's involvement to date in the establishment of the caribou habitat restoration plan and will provide updates to FMFN on developments and progress of finalizing the CHRP. Broader policy discussions are beyond the scope of this Project.
3	TransCanada to develop a decision matrix to assist in the selection of restoration locations that considers benefits to caribou (e.g., avoid disturbance, improve connectivity, block predators), benefits to land users (e.g., access), and benefits to TransCanada (e.g., cost, reputation). All potential restoration locations (project and offset) should be discussed with FMFN.	As indicated in the CHRP, Figure 4-1 and section 4.1 "the offset selection strategy was developed by NGTL (a subsidiary of TransCanada), following a strategy consistent with conservation offset development, focusing on the specific conservation needs of boreal caribou, and supported by a literature review. For past NGTL projects in caribou ranges, NGTL has located its offsets in parks to ensure longevity. Discussions with both AEP and ECCC indicated that both regulators would be amenable to on-ROW offsets, provided the company could provide a reasonable assurance of permanence. As a result of ongoing consultation with AEP and ECCC, TransCanada evaluated options to locate offsets for the Project on existing TransCanada ROWs (or those of its subsidiaries) within the WSAR Caribou Range". Specific offset locations are selected based on site conditions and feasibility for implementation. All proposed restoration and offsets are mapped prior to implementation. TransCanada will share the planned Caribou habitat restoration and offset locations with Fort McKay for feedback prior to implementation

Recommendation Number	FMFN Recommendation	TransCanada Response
4	It is important that TransCanada ensures that restoration occurs in locations that maximizes the area and connectivity of caribou habitat and works with other operators that share ROWs to collaborate on methods to conserve caribou and reclaim habitat.	TransCanada believes that restoration and offsets should maximize benefit to caribou habitat. Accordingly, TransCanada continues to participate in range planning activities in association with the Province. Part of the restoration priorities identified in these activities targets Project footprint and existing ROWs to address existing footprint within caribou range. These efforts will complement larger restoration programs being established by AEP.
5	TransCanada should adopt recommendations included in the Draft Alberta Caribou Range Plan as best practice but also consider implementing this mitigation in non-caribou range areas.	As per section 3.3 of the CHRP, "TransCanada will restore the areas of the Project footprint that are outside existing third-party dispositions, and outside the area of operational access. Operational access is the area where TransCanada will periodically manage vegetation within the ROW during operations. The operational access extends 5 to 10 m from the centreline of the operational pipeline, in accordance with TransCanada operational procedures for integrity monitoring under Canadian Standards Association (CSA) Z662-15 (CSA, 2015)". TransCanada continues to consult with AEP on emerging caribou policies and will comply with the Alberta Caribou Range Plan when it is finalized. The Project Environmental Protection Plan (EPP) encompasses a series of construction mitigation measure that include industry best management practices, such as minimal disturbance and access management implemented in non-caribou range area.
6	FMFN requires specific details about the CHRP adaptive management plan and, specifically, types of action that will occur (e.g., vegetation monitoring, alternative planting strategies). Other examples that TransCanada could provide from other projects such as the Grand Rapids Pipeline Project where restoration was required (CHRP pdf page 4) would be appreciated.	The Project will ensure compliance with specific reclamation performance expectations and applicable regulatory requirements. Mitigation methods will be based on the principle that success of land reclamation is measured against adjacent representative site conditions, while taking into consideration the status of reclamation at the time of assessment. Preliminary assessments are conducted during the most appropriate time of the season, which depends on the various biophysical resources and their growth stage or life cycle. This is usually in the spring/summer, and involves identifying deficiencies and proposing recommendations for corrective actions. Please see attached GRP CHRP as filed and approved by the AER.
7	TransCanada to track costs (e.g. per hectare) of the CHRP implementation and share with AEP, ECCC and FMFN.	Costs associated with Habitat restoration is confidential and therefore will not be disclosed.

Recommendation Number	FMFN Recommendation	TransCanada Response
8	As it is a requirement of Condition 6 that FMFN's concerns are addressed. FMFN will require meetings with land users that are familiar with the pipeline route and potential offset areas in the caribou range and the Traditional Territory in order to ensure community land users benefit from the habitat restoration and are not negatively impacted.	The AER decision requires TransCanada to provide a summary of discussions with FMFN about the restoration plan including any concerns raised by FMFN and how or if the concerns are addressed. Accordingly, TransCanada is reaching out to FMFN to discuss the CHRP and answer any questions and understand any concerns that FMFN may have. TransCanada will endeavor to respond to questions and concerns.
9	TransCanada should identify and begin restoration in the offset areas as soon as possible.	Once the CHRP is approved by the AER, TransCanada will identify opportunities for timely implementation of offset measures.
10	TransCanada must ensure these requirements are included in the environmental protection plan, alignment sheet, and employee/contractor training.	As per the commitment made during the hearing the EPP has been updated to include mitigation for moose. As well, moose mitigation is included in the contractor orientation and training.
11	Caribou range restoration is the joint responsibility of all governments. A meeting to understand restoration priorities should be held between Alberta, Canada, and FMFN.	A meeting of this nature is outside of the scope of this CHRP.

Table E-3: Summary of Consultation with Federal and Provincial Agencies Related to Caribou

Name and Title	Date and Method	Consultation Related to Caribou	Section in Preliminary CHR&OMP
George Duffy, Caribou Range Planning Lead, AEP Dave Hervieux, Regional Resource Manager, AEP Robin Steenweg, Species at Risk Wildlife Biologist, AEP Monica Dahl, Planner, AEP Paul Gregoire, Wildlife Biologist, ECCC	June 30, 2017 Meeting	NGTL met with ECCC and members of AEP to discuss use of existing ROWs for offset measures. ECCC supported this approach and locating offsets within existing ranges.	Section 4
Monica Dahl, Planner	March 19, 2018 Email	NGTL provided information to AEP regarding Condition 6 of the AER decision, and approximate areas of caribou habitat restoration that will required, based on preliminary estimations of restoration within and outside the Project footprint.	
Monica Dahl, Planner	March 22, 2018 Conference Call	AEP provided an update regarding the status of range planning for the WSAR caribou range, and recommended TransCanada's offset location selection process prioritize habitat restoration on legacy disturbances, including existing TransCanada ROW, with preference given to ROW that are not looped (i.e., a single corridor).	
George Duffy, Caribou Range Planning Lead, AEP Chad Wilms, Manager - Caribou Range Planning, AEP	July 18, 2018 Meeting	General consultation on TransCanada caribou program, AEP caribou range planning priorities, and restoration objectives.	