

**SPRINGBANK OFF-STREAM RESERVOIR PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT
VOLUME 3B: EFFECTS ASSESSMENT (FLOOD AND POST-FLOOD OPERATIONS)**

Assessment of Potential Effects on Land Use and Management
March 2018

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Abbreviations

AEP	Alberta Environment and Parks
CEA Agency	Canadian Environment Assessment Agency
LAA	local assessment area
PDA	project development area
VC	valued component

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12.0 ASSESSMENT OF POTENTIAL EFFECTS ON LAND USE AND MANAGEMENT

The scope of the assessment for land use and management and existing conditions for the construction and dry operations phases of the Project are presented in Volume 3A, Sections 12.1 and 12.2. The temporal boundary for the flood and post-flood operations is indefinite, since the Project is a permanent installation. Baseline conditions for the flood and post-flood operations phases of the Project is defined as the dry operations phase with major components of the Project in place and vegetation reclaimed after construction.

Section 12 of this volume assesses the effects of the Project on land use and management during flood and post-flood operations. Effects of the Project on land use and management during flood operations are assessed for three floods:

- 1:10 year flood
- 1:100 year flood
- design flood (2013 flood)

Post-flood operations begin with the initial release of retained water back into Elbow River; activities include cleanup and repair of project infrastructure.

As noted in Volume 3A, Section 12.4, there are pathways related to potential effects on special features or unique sites. Refer to the following assessments for further information on potential effects on valued components (VCs) during flood and post-flood operations:

- terrain and soils for potential effects on the topography, elevation and drainage patterns in the assessment areas (Volume 3B, Section 9).
- wildlife and biodiversity for potential effects on wildlife ranges and Key Wildlife Biodiversity Zones in the assessment areas (Volume 3B, Section 11).
- historical resources for potential effects on archaeological and palaeontological sites in the assessment areas (Volume 3B, Section 13).
- traditional land and resource use for potential effects on culturally significant sites in the assessment areas (Volume 3B, Section 14).

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12.1 PROJECT INTERACTIONS WITH LAND USE AND MANAGEMENT

Table 12-1 identifies the interactions of the Project with land use and management. These interactions are discussed in detail in Section 12.2 in the context of effects pathways, standard and project-specific mitigation and residual effects. A justification for no interaction is provided following the table.

Table 12-1 Project Interactions with Land Use and Management

Project Components and Physical Activities	Environmental Effects	
	Change in Land Use	Change in Parks and Protected Areas and Special Sites or Unique Features
Flood and Post-flood Operations		
Reservoir filling	✓	✓
Reservoir draining	✓	✓
Reservoir sediment partial cleanup	✓	-
Channel maintenance	-	-
Road and bridge maintenance	✓	✓
NOTES: ✓ = Potential interaction - = No interaction		

Our Lady of Peace Roman Catholic Mission cairn and monument plaque does not overlap with the Project development area (PDA). Therefore, there is no temporary or permanent direct removal of this unique site. Reservoir sediment partial cleanup and channel maintenance are not anticipated to affect access to this unique site because these activities would be restricted to the PDA and would not affect existing roads near the Project.

Similarly, channel maintenance is not anticipated to affect change in land use because this activity would be restricted to Area D of the PDA, which would be managed by AEP and designated for dam and water intake components with restricted access under management of the PDA.

Because utilities including pipelines and transmission towers would be retrofitted and/or realigned during construction, temporary or permanent change to industrial land uses in the local assessment area (LAA) are not anticipated.

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12.2 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON LAND USE AND MANAGEMENT

12.2.1 Analytical Assessment Techniques

Potential environmental effects on land use and management are qualitatively assessed by comparing baseline land uses and management frameworks to flood and post-flood operations.

12.2.2 Change in Land Use

12.2.2.1 Project Pathways

Once construction is completed, lands in the PDA would be managed by Alberta Environment and Parks (AEP) for the life of the Project (i.e., indefinitely) and there would be no change to land designation in the PDA. However, land uses in each area of the PDA may be affected during flood and post-flood operations.

Area D is primarily used for dam and water intake components; this land use and restricted public access to Area D would remain in effect during each of the floods.

Area B is primarily used for the reservoir with a secondary use is for research on flood reclamation, mitigation, and environmental effects. During the three floods, the primary and secondary uses for Area B would remain in effect.

The area that would be flooded by a 1:10 year flood would be 60 ha and would only affect a portion of Area B.

The area that would be flooded by a 1:100 year flood is 500 ha, and would cover all of Area B and 62.2 ha of Area C.

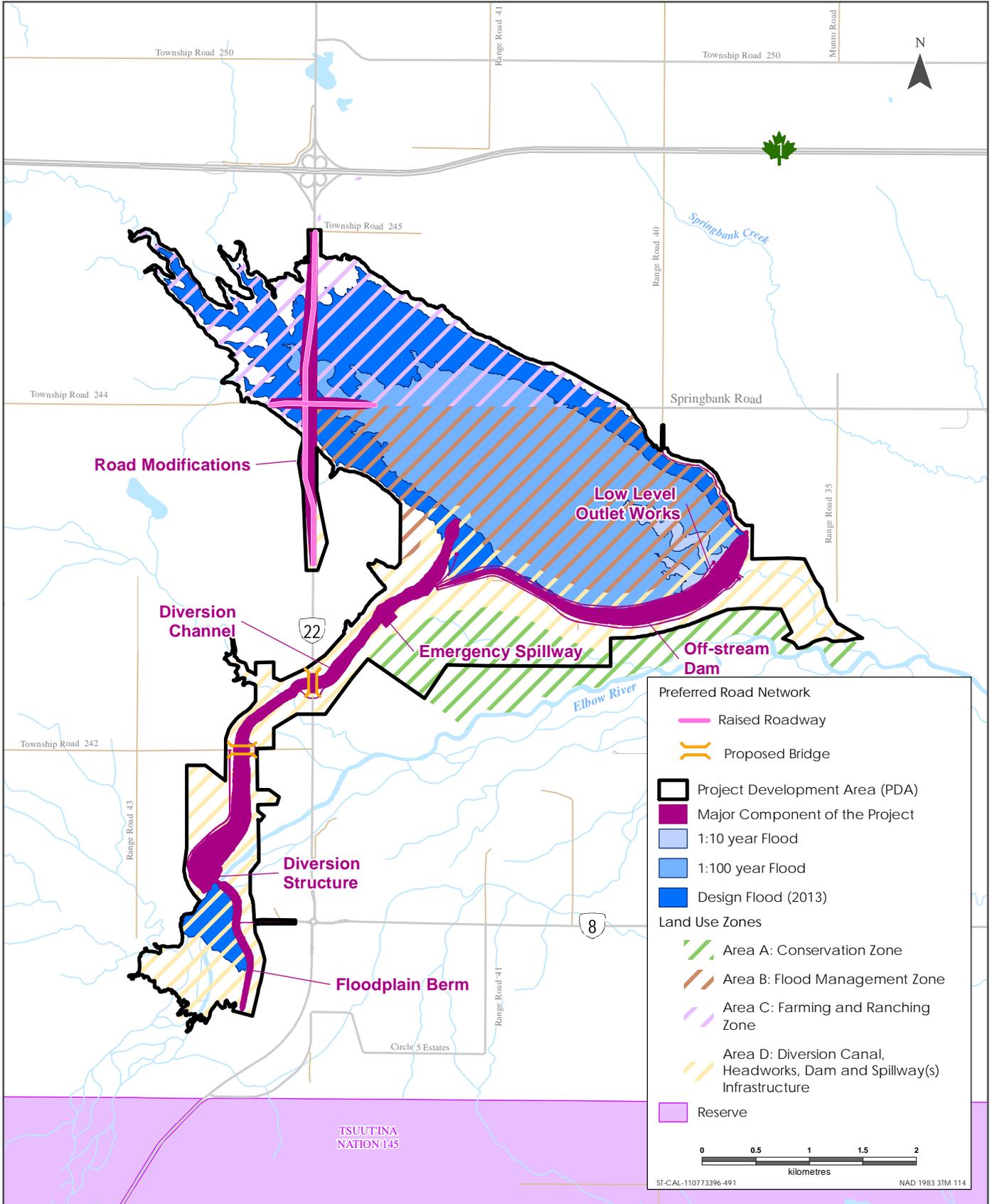
The area that would be flooded by the design flood is 730 ha, and would cover all of Area B and 256.7 ha of Area C (Figure 12-1). During the 1:100 year and design floods, grazing that may be permitted in Area C would be suspended (Table 12-2).

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Table 12-2 Agriculture in the PDA during 100-year and Design Floods

Agricultural Land Use Class	Management Area	Existing Area (ha)	Baseline Area (ha)	1: 100 Year Flood (ha)	Design Flood (ha)
Annual cropping	A	0.02	0.02	0.0	0.0
	B	8.1	0.0	8.1	8.1
	C	1.9	0.0	0.0	0.0
	D	128.5	10.5	18.0	28.0
	Total	138.5	10.5	26.1	36.1
Hayland	A	8.9	2.3	0.0	0.0
	B	4.3	0.0	4.3	4.3
	C	4.2	0.0	0.0	2.2
	D	65.4	0.7	4.7	10.8
	Total	82.8	3.0	9.0	17.3
Tame pasture	A	2.7	10.4	0.0	0.0
	B	270.1	302.1	214.0	255.9
	C	59.7	62.3	19.9	50.0
	D	79.0	185.6	9.6	25.9
	Total	411.5	560.4	243.5	331.8
Total		632.8	573.9	278.6	385.2



Sources: Base Data - Government of Alberta, Government of Canada, Thematic Data - Stantec Ltd.

Land Use Zones and Areas Covered by the Flood Scenarios

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For each of the floods, the minimum amount of time that diverted water would remain in the reservoir is 43 days. Draw down time would depend on various factors including flow rate in the Elbow River.

The distribution of vegetation communities in the PDA would be affected because of flooding and sedimentation. (Sedimentation and its effects on land use was raised as a concern during public consultation.)

During post-flood operations, deposits such as gravel and debris would be cleaned up. The settling of silt over the floodplain would not be appreciable (Volume 3B, Section 6). Affected areas would be left to revegetate naturally and monitored. For the distribution of vegetation communities compared to baseline conditions, refer to the vegetation and wetlands assessment (Volume 3B, Section 10). For further information on cleanup during post-flood operations, see the Conservation and Reclamation Plan (Volume 4, Appendix D).

Area A is primarily used as a conservation area with low impact recreation. Access to Area A would not be restricted and consumptive recreation and livelihood and non-consumptive recreation has the potential to occur in the area, although a management plan for this area has yet to be developed. For each flood, primary use of Area A would not change.

It is assumed that there would be no users on the Elbow River during flood operations. During post-flood operations, users on the Elbow River downstream of the Project may experience increased volume and flow rate as waters are released from the reservoir. However, use of the river for sportfishing and recreational boating during post-flood operations would return to baseline conditions and would be facilitated by the permanent portage (refer to Volume 3A, Section 12.4.2).

In a letter to Canadian Environment Assessment Agency (CEA Agency) on May 30, 2016, members of the Tsuut'ina Nation 145 expressed concern that flood waters could back up as a result of the water intake components or spill over the floodplain berm and affect lands belonging to Tsuut'ina Nation 145, carrying contamination and debris. Flood and post-flood operations would not result in the direct loss of use of land in the Tsuut'ina Nation 145; land owned by residents, businesses, or recreation organizations in the LAA; or lands held under disposition in the LAA.

Members of the Tsuut'ina Nation 145 also expressed concern for businesses in the Townsite of Redwood Meadows, including the Redwood Meadows Golf and Country Club, and potential financial consequences to the community because of flood events (Tsuut'ina Nation 2016). The Townsite of Redwood Meadows is outside the LAA; therefore, it would not be directly affected by the Project during flood and post-flood operations.

During a 1:10 year flood, floodwaters would not affect Springbank Road and other access roads in the PDA and LAA.

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During 1:100 and design floods, Springbank Road and other access roads would be flooded. As part of Project construction, Highway 22 would be raised, Range Road 40 and Township Road 242 would be upgraded, and bridges would be installed over the diversion channel along Highway 22 and Township Road 242. These roads could be used as alternate routes (see Volume 1, Section 3.2.7) to Springbank Road. Access restrictions because of flooding events would last until flood waters are released from the off-stream reservoir. Once diverted waters are released, damage to roadways in the project area would be assessed and repaired.

Rocky View County expressed concern that the Project would result in the loss of Springbank Road as a regional transportation link and it would not be able to be developed as a future major network road (Rocky View County 2016). Consultation also indicated that the public believe Springbank Road should only be closed during flooding events. Given the availability of alternate routes during flooding events, Springbank Road's role as a major network road for Rocky View County would not be compromised.

Access roads to the Project and in the PDA, including emergency access roads, would remain in place during flood and post-flood operations to allow for repair and access by emergency vehicles. Access roads may require repair during post-flood operations.

12.2.2.2 Mitigation

Mitigation for effects on change in land use during flood and post-flood events include the following:

- Integrated landscape management policies will be implemented in the project footprint, which would allow for management of flood waters in the off-stream reservoir during floods. A management plan for the PDA will be developed by AEP in consultation with land users and the public.
- Project design includes armouring of the floodplain berm along the north side and armouring the river bank along parts of the south side, including at the water intake components to prevent flooding outside of the PDA.
- The following signs will be installed:
 - Areas B, C, and D will be restricted to public access using wildlife-friendly fencing, gates, and signs indicating "Danger" and "No Trespassing".
 - Multiple signs will be placed upstream and downstream of the water intake components on both banks of the Elbow River. These signs will warn users on the Elbow River that they are approaching the diversion structure with associated dangers and direct them to a portage location.

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- Multiple warning signs and alarms to draw attention will be placed along the diversion channel at road crossings and at walking trails; at the emergency spillway; and at the tributary low-level outlet works, along trails leading to the tributary, and at the confluence of the tributary and Elbow River. When alarms are sounding during flood events, including the release of water from the off-stream reservoir, evacuation of areas around these infrastructure components will be implemented.
- Multiple signs will be placed along Highway 22 to the north and south sides of the PDA. These signs would advise the public against swimming or using watercraft on the water when it is present in the diversion channel or off-stream reservoir.
- Gates and signs will be placed along Springbank Road to the north, west and east of the PDA. Gates would be closed during all floods. Signs would advise vehicles that the roads are closed and to use an alternate route.
- Flood damage to Springbank Road will be repaired, as necessary.
- Gated approaches into the project footprint will be constructed to restrict public access.
- Access roads into the PDA, including emergency access roads, will remain in place for the life of the Project for repair activities during post-flood operations and for access to the PDA for emergency vehicles during flood and post-flood operations.
- Inspection and maintenance of all infrastructure will occur regularly during post-flood operation. Post-flood cleanup will include removal of debris and other material that may interfere with the flow of the tributary. Further mitigation measures such as re-seeding areas that have been inundated and repairing areas where soil has eroded may be implemented depending on the results of inspection after flooding events.

12.2.2.3 Project Residual Effects

With the implementation of mitigation measures, Project residual effects on change in land use during flood and post-flood operations are the following:

- Direction—residual effects are predicted be adverse during flood operations because they are detrimental to land users relative to baseline conditions. Residual effects are predicted to be neutral during post-flood operations; land use would be returned to baseline conditions after post-flood cleanup is complete
- Magnitude—residual effects are predicted to be moderate during flood operations because they are outside normal variability for the region in terms of recreational land use and land access. However, these activities are anticipated to continue elsewhere in the LAA.
- Geographic extent—residual effects are expected to be restricted to the LAA

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- Frequency—residual effects are predicted to be multiple and irregular
- Duration—residual effects are predicted to be medium-term because they are expected to extend beyond the minimum retention period for floodwaters after the design flood (43 days), but not beyond complete release of water from the off-stream reservoir.
- Reversibility—residual effects are predicted to be reversible
- Ecological and socioeconomic context—residual effects occur in an area that has been disturbed by human development
- Timing - not applicable because effects from Project activities would be similar regardless of season or other timing characteristics.

12.2.3 Change in Parks and Protected Areas and Unique Sites and Special Features

12.2.3.1 Project Pathways

Change in Access

Land users in the LAA, including those who access the Our Lady of Peace cairn and monument plaque, would experience change in access during 1:100 year and design floods (Springbank Road and other access roads would be flooded). Access restrictions are anticipated to last until flood waters are released from the off-stream reservoir. After diverted waters are released, flood damage to Springbank Road, and other access roads, would be repaired, as necessary. However, Range Road 40 and Township Road 242 could be used as detours when Springbank Road is flooded (see Volume 1, Section 3.2.7).

12.2.3.2 Mitigation

Mitigation for effects on change in parks and protected areas and unique sites and special features during flood and post-flood events include the following:

- Project design includes armouring of the floodplain berm along the north side and armouring the river bank along parts of the south side, including at the water intake components to prevent flooding outside of the project footprint.
- The following signs will be installed:
 - Multiple warning signs and alarms to draw attention to the signs will be placed along the diversion channel at road crossings and at walking trails; at the emergency spillway; and at the tributary low-level outlet works, along trails leading to the tributary, and at the confluence of the tributary and Elbow River. When alarms are sounding during flood events, including draw down, evacuation of areas around these infrastructure installation is required.

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- Multiple signs will be placed along Highway 22 to the north and south sides of the project footprint. These signs would advise the public against swimming or using watercraft on the water when present.
 - Gates and signs will be placed along Springbank road to the west and east of the project footprint and along private residential access roads in Area C. Gates would be closed during all floods. Signs would advise vehicles that the roads are closed and to use an alternate route.
- Flood damage to Springbank Road will be repaired, as necessary.

12.2.3.3 Project Residual Effects

With the implementation of mitigation measures, Project residual effects on change in parks and protected areas and unique sites and special features during flood and post-flood operations are predicted to be:

- Direction—residual effects are predicted to be adverse because they are detrimental to land users relative to baseline conditions.
- Magnitude—residual effects are predicted to be moderate because they are outside of normal variability for the region, but these activities are anticipated to continue elsewhere in the LAA.
- Geographic extent—residual effects are restricted to the LAA
- Frequency—residual effects are predicted to be multiple irregular
- Duration—residual effects are predicted to be short-term during a 1:10 year flood because access roads, including Springbank Road, are not anticipated to be flooded. Residual effects during 1:100 year and design floods are predicted to be medium-term because residual effects are expected to exceed the minimum draw-down period for floodwaters after a design flood but can be reversed (e.g., repair of Springbank Road) during the life of the Project.
- Reversibility—residual effects are predicted to be reversible
- Ecological and socioeconomic context—residual effects occur in an area that have been disturbed by human development
- Timing - not applicable because effects from Project activities would be similar regardless of season or other timing characteristics.

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12.2.4 Summary of Project Residual Effects

Table 12-3 summarizes the residual environmental effects on land use and management during flood and post-flood operations.

Table 12-3 Project Residual Effects on Land Use and Management

Residual Effect	Residual Effects Characterization								
	Project Phase	Timing	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Change in Land Use	F/PF	N/A	A	M	LAA	MT	IR	R	D
Change in Parks and Protected Areas and Unique Sites or Special Features	F/PF	N/A	A	M	LAA	MT	IR	R	D
<p>KEY</p> <p>See Table 12-2 in Volume 3A for detailed definitions</p> <p>Project Phase F: Flood PF: Post-Flood</p> <p>Timing Consideration S: Seasonality T: Time of day R: Regulatory</p> <p>Direction: P: Positive A: Adverse N: Neutral</p> <p>Magnitude: N: Negligible L: Low M: Moderate H: High</p> <p>Geographic Extent: PDA: Project Development Area LAA: Local Assessment Area RAA: Regional Assessment Area</p> <p>Duration: ST: Short-term; MT: Medium-term LT: Long-term</p> <p>Frequency: S: Single event IR: Irregular event R: Regular event C: Continuous</p> <p>Reversibility: R: Reversible I: Irreversible</p> <p>Ecological/Socio-Economic Context: D: Disturbed U: Undisturbed</p> <p>N/A: Not applicable</p>									

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12.3 DETERMINATION OF SIGNIFICANCE

The Project complies with outcomes and strategic directions outlined in the SSRP, which provides the land use framework for lands in the PDA. Current land uses such as consumptive recreation and livelihood and non-consumptive recreation and access to the LAA would be disrupted by flood events, but these land uses would be able to continue at or near current levels once post-flood operations are complete.

Unique sites or special features near the Project would not be substantially or irreversibly compromised because of reduced access or reduced quality of the sites. Therefore, residual effects on land use and management during flood and post-flood operations are predicted to be not significant.

12.4 PREDICTION CONFIDENCE

Prediction confidence is high based on the level of data available and on the implementation of the mitigation measures outlined above.

12.5 CONCLUSIONS

12.5.1 Change in Land Use

Land ownership in the PDA would not change in the event of a flood; however, recreation in Area A and research in Area B would be suspended. Additionally, grazing in Area C would be suspended during 1:100 year and design floods.

Access to areas in the PDA and to the LAA would be affected by 1:100 year and design floods because Springbank Road is anticipated to be flooded by these events. Post-flood operation includes repair of Springbank road and cleanup and repair, as necessary, in the PDA.

The Project would comply with the SSRP and implement integrated landscape management policies. Residual effects on change in land use during flood and post-flood operations are predicted to be not significant.

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12.5.2 Change in Parks and Protected Areas and Unique Sites or Special Features

Unique sites or special features near the Project would not be substantially or irreversibly compromised because of flooding events or during post-flood operations. Access to these unique sites or special features in the LAA would be affected by 1:100 year and design floods because Springbank Road would be flooded by these events and visitors to the Our Lady of Peace cairn and monument would need to use detours to access this unique site. Post-flood operation includes repair of Springbank Road and cleanup and repair of the PDA. Residual effects on parks and protected areas and unique sites or special features during flood and post-flood operations are predicted to be not significant.

12.6 REFERENCES

Rocky View County. 2016. Springbank Off-Stream Reservoir Project. Letter to Canadian Environmental Assessment Agency.

Tsuut'ina Nation. 2016. Springbank Off-Stream Reservoir Project. Letter to Canadian Environmental Assessment Agency.