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18.0 ASSESSMENT OF POTENTIAL EFFECTS TO FEDERAL LANDS

The following sections assess the potential effects of the Project during flood and post-flood operations on federal lands. The federal lands included within the assessment, due to their proximity to the Project site, are the Tsuut'ina Nation Reserve 145 and the Stoney Nakoda Nations Reserves 142, 143 and 144. Figures 18-1 and 18-2 in Volume 3A, illustrates the assessment areas in relation to the Tsuut'ina Nation Reserve 145 and the Stoney Nakoda Nations Reserves 142, 143 and 144. The assessment draws upon the conclusions of the detailed assessments for each of the fifteen valued components in Volume 3B. The assessment areas used for the flood and post-flood assessment are the same as those used for the construction and dry operations phase. Issues and concerns raised during the Indigenous Engagement and public consultation programs relating to federal lands can be found in Volume 1, Sections 6 and 7.

18.1 AIR QUALITY AND CLIMATE

Effects on air quality and climate during flood and post-flood operations of the Project were evaluated at the same LAA/RAA as used for the air quality assessment for construction and dry operations. The following effects were assessed in the EIS for air quality and climate:

- change in ambient air quality due to fugitive dust emissions from the surface of the post-flood sediment deposited in the off-stream reservoir
- change in odours
- change in carbon sequestration capacity

Mitigation measures for air quality and climate are provided in Volume 3B, Section 3; no additional mitigation measures beyond those identified are required specifically for federal lands.

The flood operation phase will be limited to reservoir filling and reservoir draining activities. Because the reservoir will contain water, no fugitive dust emissions are expected during flood operations. Therefore, adverse residual effects during flood operations are not anticipated.

The post-flood phase of the Project could result in fugitive dust emissions from wind erosion of the surface of the deposited sediment during high wind speed conditions. The hydrological modelling of sediment deposition (Section 6.4.3 and Volume 4 Appendix J, Hydrology TDR Section 3) predicts that two flood scenarios, the 1:100 year flood and the design flood (i.e. 1: 200 year flood), could result in measurable sediment deposition. The air quality assessment indicates that there is a potential for short-term TSP concentrations to be greater than the regulatory

criteria for the 1:100 flood and the design flood along and near the eastern boundary of the PDA. However, TSP concentrations are predicted to be less than the ambient objectives in the Tsuut'ina Nation Reserve. Given the low recurrence of the flood events that could result in sediment deposition (i.e. 100 years and 200 years) and the proposed mitigation measures, effects on the Tsuut'ina Nation Reserve resulting from windblown emissions are predicted to be not significant.

Odours are not expected during flood because there would be no sewage washed into the off-stream reservoir and the short duration that vegetation would be submerged is not considered sufficient to allow decay and appreciable decomposition to occur. Therefore, effects on Tsuut'ina Reserve resulting from change in odour occurrences will be negligible and are not significant.

During the flood and post-flood period, vegetation would be submerged in the reservoir. This would potentially decrease the natural carbon uptake during the period prior to reestablishing a new vegetation cover. Given the short duration of a flood, the low recurrence of flood events and the sufficient time between floods for revegetation to occur, effects on the Tsuut'ina Nation Reserve resulting from a change in carbon sequestration capacity will be negligible and are not significant.

Follow-up and monitoring for air quality and climate are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.2 ACOUSTIC ENVIRONMENT

Noise caused by project activities during flood and post-flood operations are assessed at the LAA scale. All receptors (both Tsuut'ina receptors and non-Indigenous) are expected to be below the MNL threshold of 57 dBA Ldn, given the lower quantity and intensity of activities expected during post-flood events. Overall, the noise at all receptors during the flood and post-flood operations will meet the Health Canada noise thresholds, including those receptors in the Tsuut'ina Nation Reserve.

Mitigation measures for acoustic environment are provided in Volume 3B, Section 4. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for the acoustic environment are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.3 HYDROGEOLOGY

Changes in groundwater quantity during flood and post-flood operations of the Project are evaluated in the context of the hydrogeological framework of the RAA and in consideration of Project infrastructure and activities occurring during these phases. The areas over which changes in potentiometric head are observed are areas near the diversion channel, off-stream reservoir, and dam, or smaller in the case of the 1:10 year flood. Some effects are noted just outside of the PDA in areas near the off-stream reservoir. However, in all cases, effects on groundwater levels are well within the LAA, and changes are only observed north of the Elbow River, and not within the Tsuut'ina Nation Reserve.

Changes in groundwater quality during flood and post-flood operations of the Project are related to potential infiltration of flood affected surface water into the subsurface groundwater system. Due to the very low hydraulic conductivities of the upper sediments in the reservoir area, which are dominated by clayey and silty lithologies, the groundwater flow velocities are very low. Particle tracking indicates that advective flow outward from the reservoir area is limited to within the LAA within the timeframe of a flood.

For both changes in groundwater quantity and quality—due to the limited interaction of the Project with groundwater resources and limited areas over which this infiltration could occur and the short time period and eventual flow paths for this flood affected water—the residual effects on groundwater quantity and quality within the Tsuut'ina Nation Reserve would be not significant.

Mitigation measures for hydrogeology are provided in Volume 3B, Section 5. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for hydrogeology are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.4 HYDROLOGY

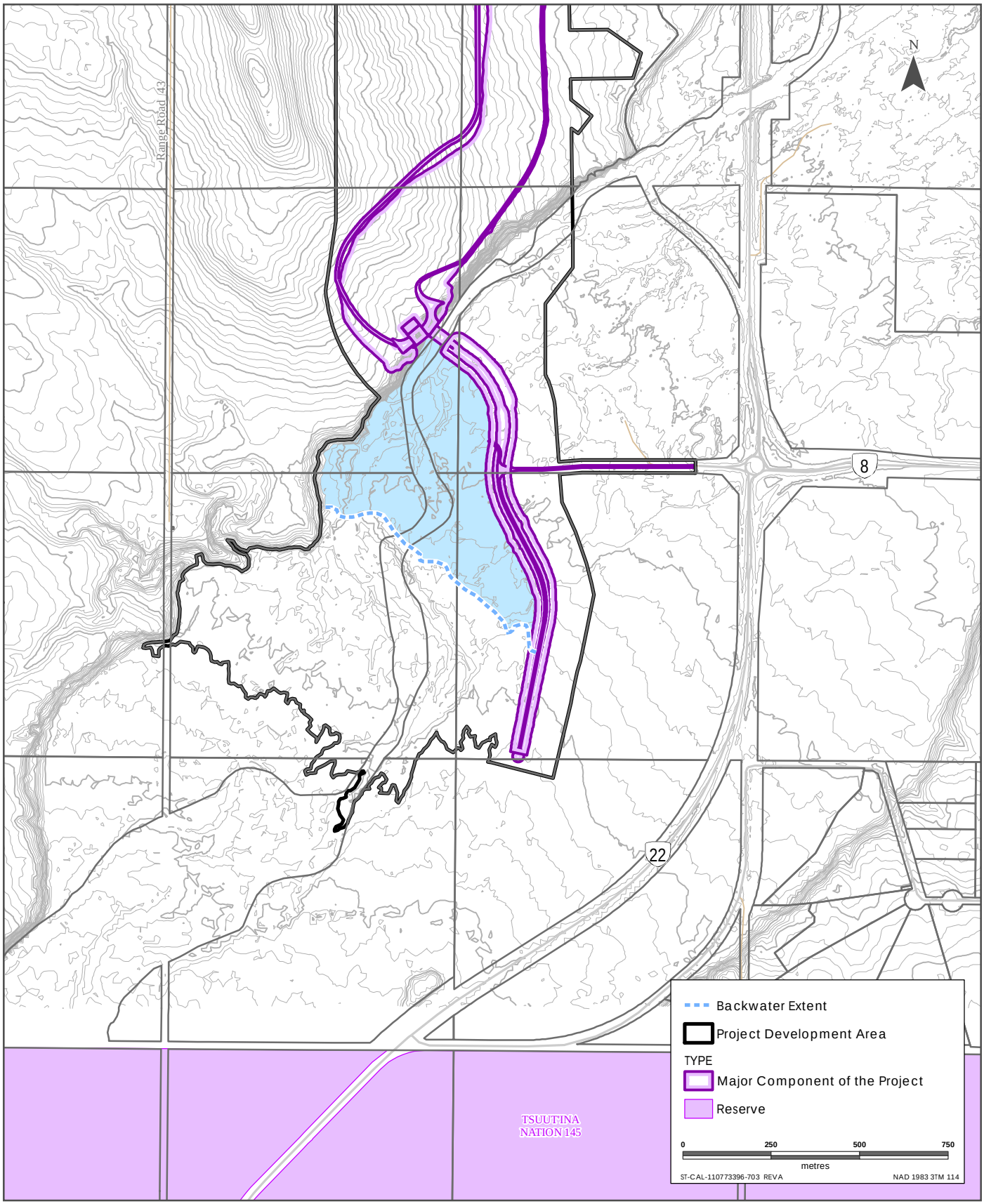
For the effects of the Project on hydrology during flood and post-flood operations, the determination of significance is not relevant for changes in hydrology because the purpose of the Project is to actively modify the hydrology of the Elbow River. However, as the hydrology is being intentionally modified and this modification would also change sediment transport, the significance of any resulting changes is assessed by other valued components.

However, most of the changes to the Elbow River due to the Project will occur outside the Tsuut'ina Nation Reserve because the diversion structure is located within a part of the Elbow River which is outside the Tsuut'ina Nation Reserve. During engagement, the Tsuut'ina Nation raised concerns that the diversion structure would result in backup on the Elbow River and thus flooding of reserve lands. No back up of water onto Tsuut'ina Reserve is predicted. The Project will provide flood protection for communities and lands downstream of the diversion structure, including the northeastern part of the Tsuut'ina Reserve that is located downstream of the diversion structure. During a flood, it is expected that some water will back-up upstream of the diversion structure. However, modeling studies have shown that the back-up of water would not reach the Tsuut'ina Reserve upstream even in a design flood. At its closest point, the back-up water would be approximately 1,100 m from the Reserve (see Figure 18-1).

In the event the diversion structure does not operate properly, and water continually backs up behind the structure, the auxiliary spillway and floodplain berm have been designed with a low point that will allow flood water to pass over the berm and continue downstream, thereby preventing back up flooding.

No mitigation measures for changes to hydrology during flood and post-flood are proposed because the purpose of the Project is to actively modify hydrology.

Follow-up and monitoring for hydrology are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.



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

Distance Between Backwater Extent and Tsuu T'ina Nation Boundary

Stantec

18.5 SURFACE WATER QUALITY

The effect of the Project on water quality is not significant because the change in water quality is not anticipated to cause acute or chronic toxicity or change the trophic status of the Elbow River or Glenmore Reservoir, including where the Elbow River runs through the Tsuut'ina Nation Reserve. Even though the total load of sediment in the Elbow River is reduced by the Project, flood operations is not predicted to substantially affect the Elbow River suspended sediment concentrations during diversion. The Project does increase suspended sediment concentrations for a short duration (days) at the end of release of water back into Elbow River.

Mitigation measures for surface water quality are provided in Volume 3B, Section 7. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for surface water quality are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.6 AQUATIC ECOLOGY

The Project would result in direct and indirect alteration of fish habitat during flood and post-flood operations; however, fish habitat alteration downstream of the low-level outlet, in the Elbow River (including within the northeastern part of the Tsuut'ina Nation Reserve) would be small. The diversion structure and reservoir are planned and designed as mitigation measures to limit the effects of floods in the Elbow River.

Fish often move into sheltered habitats which experience reduced flows during floods, potentially including the reservoir. The low frequency of floods, design of diversion structure, depth of water held in the reservoir, grading of the reservoir, rate of downdraw in the reservoir, and monitoring and contingency plans for stranded fish would be used to avoid and limit fish mortality. This would include fish using habitat within the Elbow River where it runs through the Tsuut'ina Nation Reserve.

Overall, the Project would not result in the death of fish that would threaten the long-term persistence or viability of aquatic species of management concern in the RAA. As a result, effects on aquatic resources on the Tsuut'ina Nation Reserve are negligible and not significant.

Mitigation measures for fish and fish habitat are provided in Volume 3B, Section 8. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for aquatic ecology are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.7 TERRAIN AND SOILS

Effects to terrain stability and to soil quality and quantity within the reservoir will be confined to the PDA. As a result, effects on terrain and soils on the Tsuut'ina Nation Reserve during the flood and post-flood operations are not predicted because the PDA is outside the Reserve. There may be some changes to terrain stability for the low-level outflow channel; however, those changes should be mostly restricted to the PDA (i.e., outside the Tsuut'ina Nation Reserve).

Mitigation measures for terrain and soils are provided in Volume 3B, Section 9. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for terrain and soils are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.8 VEGETATION AND WETLANDS

Direct effects on vegetation and wetlands resulting from a flood would be restricted to the PDA. Flood and post-flood operations of the Project would not result in the loss of native vegetation communities or wetland functions, or known occurrences of species of management concern or traditional use plants from the portion of the LAA that overlaps a small part of the northwest edge of the Tsuut'ina Nation Reserve. As a result, effects on vegetation and wetlands on the Tsuut'ina Nation Reserve are not predicted.

Mitigation measures for vegetation and wetlands are provided in Volume 3B, Section 10. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for vegetation and wetlands are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.9 WILDLIFE AND BIODIVERSITY

Direct effects on wildlife and biodiversity during flood and post-flood operations will be restricted to the PDA. As a result, the Project will not result in an increased wildlife mortality risk or alteration of movement on the Tsuut'ina Nation Reserve or the Stoney Nakoda Nations Reserves. There will be no direct effect to wildlife habitat on the Tsuut'ina Nation Reserve or the Stoney Nakoda Nations Reserves as a result of the Project. This effect is expected to be low magnitude and not significant. The Project is not expected to affect biodiversity on the Tsuut'ina Nation Reserve or the Stoney Nakoda Nations Reserves.

Mitigation measures for wildlife and biodiversity are provided in Volume 3B, Section 11. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for wildlife and biodiversity are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.10 LAND USE AND MANAGEMENT

Direct effects on land use and management during flood and post-flood operations will be restricted to the PDA, as well as portions of the LAA north of the Elbow River (e.g., along Springbank Road). There will be no direct effect to land use on the Tsuut'ina Nation Reserve Our Lady of Peace cairn and monument plaque (the only designated historic site in the LAA) does not reside in the Tsuut'ina Nation Reserve. In the assessment of change in parks and protected areas and unique sites or special features, none were identified in the Tsuut'ina Nation Reserve.

Mitigation measures for land use and management are provided in Volume 3B, Section 12. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for land use and management are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.11 HISTORICAL RESOURCES

Effects to historical resources will be restricted to the PDA. As a result, there will be no effects to historical resources on the Tsuut'ina Nation Reserve.

Mitigation measures for historical resources are provided in Volume 3B, Section 13. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for historical resources are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.12 TRADITIONAL LAND AND RESOURCE USE

There will be no direct effects to TLRU on the Tsuut'ina Nation Reserve or Stoney Nakoda Nations Reserves; however, flood and post-flood operations has the potential to affect the abundance and distribution of wildlife in the LAA. This effect is expected to be low to moderate magnitude and not significant. The Project is not expected to directly affect TLRU on the Tsuut'ina Nation Reserve or the Stoney Nakoda Nations Reserves.

Mitigation measures for TLRU are provided in Volume 3B, Section 14. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for TLRU are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.13 PUBLIC HEATH

The assessment of public health shows that the effects from air quality, water quality and country foods are not significant for the flood and post-flood operations; this also includes receptors on the Tsuut'ina Nation Reserve.

For drinking water quality, the Project would reduce the TSS entering the Glenmore Water Treatment Plant during a flood and improve the water quality with respect to TSS.

Methylmercury that is formed in the reservoir and released back into the Elbow River (including where it runs through the northeastern corner of the Tsuut'ina Nation Reserve) would be at concentrations that are below the Canadian drinking water quality guidelines. There would be no unacceptable risk to human health for people drinking municipal water.

In consideration that there have been no fish consumption advisories for methylmercury in the Elbow River recently, there is a low probability that a single water release from the off-stream reservoir after a flood could substantially change the viability of fish. Therefore, the overall health

risk to people who harvest and consume fish from the Elbow River would remain the same as the current conditions; this includes the segment of the Elbow River downstream of the reservoir that runs through the northeastern corner of the Tsuut'ina Nation Reserve.

For exposure to $PM_{2.5}$ during post-flood operations (caused by wind-blown dust), mitigation measures such as natural revegetation of the reservoir and the application of tackifiers can manage dust concentrations during high wind periods. There would be no unacceptable risk to human health from exposure to $PM_{2.5}$ during this period in any location, including the Tsuut'ina Nation Reserve.

Mitigation measures for public health are provided in Volume 3B, Section 15. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for public health are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.14 INFRASTRUCTURE AND SERVICES

Project activities will not interact directly with any infrastructure and services located on the Tsuut'ina Nation Reserve or the Stoney Nakoda Nations Reserves. If population-related demands were expected, they would likely occur in the larger service areas within the LAA/RAA because since it is unlikely that Project workers would relocate to smaller communities. However, as described above, since workers will likely live within commuting distance of the Project, no additional population-based demands are expected to be placed on any communities within the LAA/RAA, including the Tsuut'ina Nation Reserve or the Stoney Nakoda Nations Reserves.

Flood and post-flood operations during a 1:100 year and design floods would affect existing roadways, but residual adverse effects on transportation infrastructure and services are predicted to be not significant.

Mitigation measures for infrastructure and services are provided in Volume 3B, Section 16. No additional mitigation measures beyond those identified are required specifically for federal lands.

Follow-up and monitoring for infrastructure and services are provided in Volume 3C, Section 2. No additional follow-up and monitoring programs beyond those identified are required specifically for federal lands.

18.15 EMPLOYMENT AND ECONOMY

The Project is predicted to have a net economic benefit due to flood damage avoidance. This would include lands downstream of the reservoir, including the northeast portion of the Tsuut'ina Nation Reserve.

Mitigation measures for employment and economy are provided in Volume 3B, Section 17. No additional mitigation measures beyond those identified are required specifically for federal lands.

No follow-up or monitoring is proposed for employment and economy.