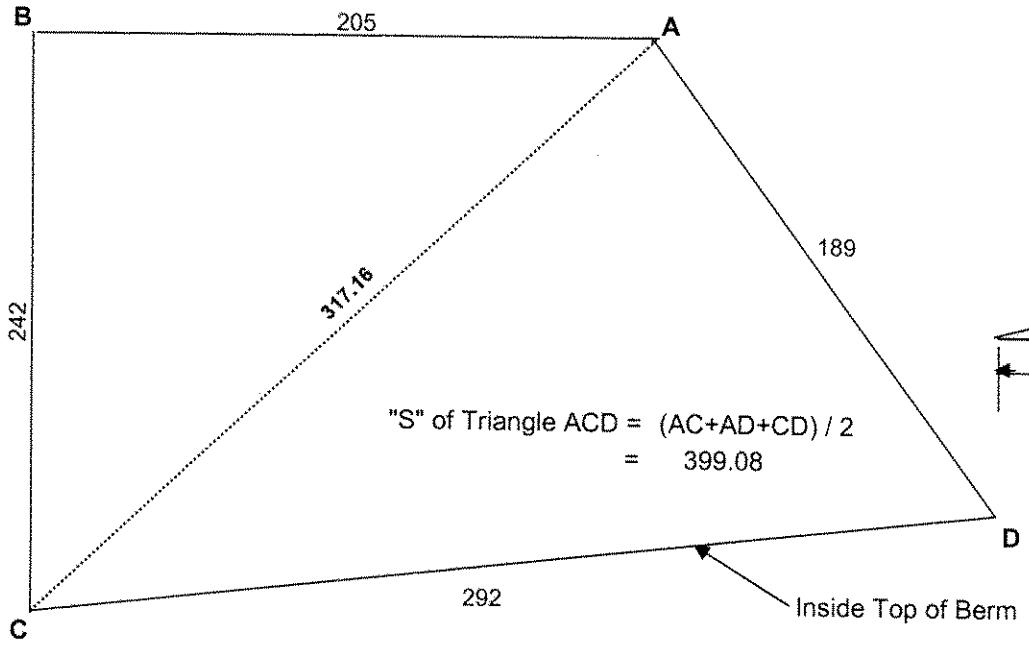
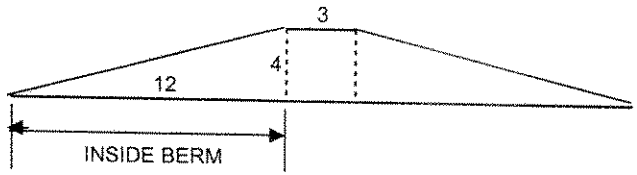
BURNSIDE

Appendix F
Detailed Design Calculations of the Sewage Lagoon

DETAILED DESIGN CALCULATIONS OF NEW SEWAGE LAGOON



AB = 205.00 m
BC = 242.00 m
AD = 189.00 m
CD = 292.00 m
AC = 317.16 m



P = perimeter of berm : 928 m

A1 = Triangle ABC = 24,805 m^2

A2 = Triangle ACD = Sq. Root of (S(S-AC)(S-AD)(S-CD))
27,119 m^2

A_t = Total Area = 51,924 m^2

V_t = total inside volume - inside berm volume
V_t = total volume = $((A_t)\, d - (24P))$
= 185,423 m^3

V_u = usable volume = $V_t - ((A_t)1 - (0.5x1x3)P)$
= **134,891** m^3 ← *OK*

Minimum V_u Required = 133, 600 m^3

BURNSIDE

Appendix G
Wetland Treatment Predictive Model

Wetland Treatment Predictive Model

In preparation of the design of the Kugluktuk Sewage Treatment Facility, Nuna Burnside reviewed a number of alternatives as described in the Schematic Design Report.

Based on the study of the existing system and the impacts the system was having on the environment, as well as, the systems in other communities in Nunavut, the concept of a two part treatment system was selected, consisting of a facultative storage lagoon for primary effluent treatment, and a Wetland Treatment Area for secondary treatment.

The "Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement", dated March 2000, prepared by Alberta Environment, provided the best available document for evaluating the use of wetlands for the treatment of sewage lagoon effluent.

The document is divided into four main tasks:

- Task 1 Questionnaire to Determine Feasibility
- Task 2 Preliminary Feasibility
- Task 3 Evaluation of the Proposed Site
- Task 4 Design Guidance of the Site.

The content of the Feasibility Questionnaire was reviewed and an evaluation of feasibility conducted (see summary sheet and check sheets attached). Site specific conditions including climate were considered.

The use of the natural wetlands for polishing of the secondary effluent discharged from the lagoon was selected as the most favourable option. It was also noted that, some engineering assistance such as the use of an exfiltration berm to spread the discharge, would improve the process. Sub-surface flow would also provide some treatment in the seasonally thawed active zone. For the purposes of this evaluation, sub-surface flow is not included. Also for the purposes of this evaluation, "anticipated NWB guidelines" are used, which are more stringent then current NWB guidelines.

The Wetland Treatment Predictive Model used herein is modified from the Alberta Environment Model (2000) and based on the assumptions described below.

Assumptions

- Total year 20 discharge (including sewage (126,113 m^3) and precipitation (2,526 m^3/year) falling into the lagoon) – 128,639 m^3

- Expected sewage lagoon effluent quality prior to wetland treatment in year 2026, assuming 25 percent carbon removal efficiency:

BOD	222 mg/l
TSS	237 mg/l
T-PO_4	11 mg/l

TKN	59 mg/l
Fecal Coliforms	4.7×10^7 CFU/100ml

- Nunavut guideline requirements for final effluent quality at discharge from the sewage Treatment Facility:

	Current Guidelines	Anticipated Guidelines
BOD mg/l	120	45
TSS mg/l	180	45
T-PO_4 mg/l	-	1
TKN	-	10
Fecal Coliforms CFU/100 ml	1,000,000	2,000

- Based on Kugluktuk climate data the average temperature of the period mid-June through mid-October is approximately 6.5°C. For conservative calculations purposes 5°C will be used in the predictive model

- Average daily discharge to the wetland during the 120 day biologically active period (mid-June through mid-October) would be approximately 1,072 m^3/day

- Discharge will occur annually based on the climatic conditions each year

- The Alberta Environment model was designed for 20°C. To account for an average temperature of 5°C the Area Rate Constant has been modified as follows:

Parameter Area Rate Constant

	@ 20°C	@ 10°C	@ 5°C
BOD	1,000	500	250
TSS	34	17	8.5
T-PO_4	12	6	3
TKN	22	11	5.5
Fecal Coliforms	77	38.5	19.25

TABLE 5.1
SUMMARY SHEET FOR EVALUATION OF ECOLOGICAL FUNCTIONS OF A CANDIDATE SITE (CHECK APPROPRIATE BOXES AFTER COMPLETING EVALUATION)

Habitat Functions	Desktop Evaluation Significant Features Noted		Field Assessment Significant Features Noted		Negative Impacts Likely?		Mitigation Likely to be Successful?		Basis for Denial Noted	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
5.1: Flood storage capability		✓								
5.2: Water quality improvement		✓	✓			✓	✓			
5.3: Habitat for rare plants or plant communities		✓		✓		✓				
5.4: Significant habitat for breeding waterfowl		✓		✓		✓				
5.5: Significant habitat for migrating waterfowl or shorebirds		✓		✓		✓				
5.6: Habitat for breeding area- and disturbance-sensitive fauna		✓		✓		✓				
5.7: Corridor for floral or faunal distribution		✓		✓		✓				
5.8: Fisheries habitat		✓		✓		✓				
5.9: Habitat for significant animal species		✓		✓		✓				
5.10: Social or economic benefit		✓		✓		✓				

Alberta Environment Treatment Wetland Evaluation

5.1: Function: Flood Storage Capability

Rationale: Wetlands function in flood and erosion control, water storage, and protection of groundwater recharge and discharge.

Methods for Evaluation

Office evaluation-document the following

Conduct preliminary calculation to determine the area of the watershed draining into the wetland.

Calculate wetland area (if wetland mapping is digitized, this may be done with the same software; otherwise a polar planimeter may be used).

Calculate catchment area.

Calculate average monthly rainfall (Reference Environment Canada 1982 (Appendix D).

Multiply average monthly rainfall by catchment area (minus the area of the wetland).

Multiply by an appropriate runoff coefficient.

Add this figure to figure for effluent volume: assume the wetland is an average of 1m deep.

Is this wetland large enough to hold both natural and effluent inputs?
If wastewater inputs total 10% or more of natural inputs, conduct modelling studies to determine flooding probabilities more accurately. Note ratio of wastewater to natural inputs, and recommend further studies if needed.

Wastewater would contribute less than 10 percent of total annual natural inputs.

Flooding is not a concern, as area is not sensitive to flooding.

Determine the effects that additional wastewater inflows are predicted to have on flood-related impacts associated with a 1:50 rainfall event.

(mitigation may be required if probability is high)

Compare flooding with and without effluent:
The area is not flood sensitive and effluent discharge is controlable, so it can be stopped during high flow events. This is part of the D&O Plan.

☒ Wastewater will not increase magnitude or frequency of flooding. Impact on flood control function is not a basis for denial of treatment wetland.

☐ Wastewater will increase magnitude or frequency of flooding. Proceed to evaluation of mitigation.

If Impacts Predicted, Examine Potential for Mitigation

Can a control structure be erected? Yes ☐ No ☐
Describe:

The lagoon discharge can be controlled to avoid discharge during storm events.

Can storage capacity for water be increased (i.e. by underground or above ground storage structures)?
Note: reconsider possibilities of impacts on other wetland functions as a result of increasing storage.
Describe:

Final Analysis: Predicted Net Impacts and Action

Mitigation Potential:

Lagoon discharge is controllable from value. D&O Plan includes protocols for halting discharge during significant storm events. The area is not sensitive to flooding. There is nothing a flood could damage downgradient of the lagoon.

Conclusions:

No significant concerns. Area suitable for use.

☒ No negative impact likely. Impact on flood control is not a basis for denial of treatment wetland.

☐ Negative impact likely. Impact on flood control is a basis for denial of treatment wetland.

Alberta Environment Treatment Wetland Evaluation

5.2: Function: Water Quality Improvement

Rationale: Wetlands function to store and transform certain chemical elements, which could otherwise affect downstream surface or groundwater quality. Additional inputs from effluent may result in unacceptable water quality downstream.
Increases in water flow can affect this function by reducing the hydraulic retention time in the wetland, (thereby reducing treatment time), and by keeping sediment suspended or resuspending settled material.
Groundwater can become contaminated by recharge from contaminated surficial water table.

Methods for Evaluation (note water quality measurements are part of the initial assessment).

Measure water quality entering and leaving wetland (as reported in preliminary assessment of wetland, Table 1 Section 1). Note where measurements taken (map if necessary).

*Note: in wetlands where inflow or outflow is dispersed, measurements should be taken at several points.
List the following water quality parameters :

Phosphorus:	Inflow_____	Outflow_____	**See historic sampling results.**
Nitrogen:	Inflow_____	Outflow_____	
Suspended solids:	Inflow_____	Outflow_____	

List other potential contaminating inputs (i.e. feedlot operations, storm water runoff, industries; note both point and non-point sources of contamination).

No other contaminant inputs exist. Landfill inputs not expected.

Recommend other water quality parameters, which should be measured, based on potential for contamination from surrounding area.

A complete suite including metals and general chemistry (with Nitrite, Nitrate, TKN, Total Phosphorous, Ammonia-N, BOD, Fecal Coliforms) in order to monitor a broad spectrum of water quality.

1. Assess whether this wetland already plays a significant role in improving surface water quality from surrounding inputs.

Explain:

Existing raw sewage discharge.

☒ Wetland does not receive significant inputs. Negative impacts on this function are not a basis for denial of treatment wetland.

☐ Wetland significantly treats water from incoming sources. Proceed to evaluation of impacts.

If wetland currently provides significant water quality improvement, determine potential for impact (based on Section 2 calculation).
Predict impacts from increase in hydroperiod:

Existing raw sewage discharge will be halted once the new lagoon is built.

Predict impacts from increased nutrient loading:

No increase - No impacts.

2. Assess potential for contamination of the groundwater table through recharge of surface water

Determine soil type from existing soils data or obtain soil core from the wetland:

Sandy soil.

Estimate:

Soil permeability **K = 0.036 cm/sec**

Water balance of wetland

Note whether contaminated water could reach the local aquifer through recharge:

Permafrost area. Only a 0.9 m active layer.

☒ No negative impact likely. Impact on water quality is not a basis for denial of treatment wetland.

☐ Negative impact likely. Proceed to evaluation of mitigation.

If potential impact is determined, examine potential for mitigation of impacts. Refer to table of Impacts and Mitigation (Appendix E).

Further pretreatment of incoming wastewater:

N/A

Pretreatment of wastewater from other sources, or source controls:

Increase the size of treatment wetland (note that potential for impacts to other habitat functions must be re-evaluated):

Final Analysis: Suggested Net Impacts and Action

No impact expected.

Conclusions:

Only active layer groundwater could be potentially impacted. No sensitive receptors. Active layer groundwater would provide attenuation.

☒ No negative impact likely. Impact on water quality is not a basis for denial of treatment wetland.

☐ Negative impact likely. Impact on water quality is a basis for denial of treatment wetland.

Alberta Environment Treatment Wetland Evaluation

5.3: Function: Provision of Habitat for Rare Plants or Plant Communities

Rationale: Some plant communities, for example, native prairie, have been almost eliminated by development for agriculture, etc. Rare plants and plant communities are often highly sensitive to changes in nutrient and moisture regimes.

*Note: In some areas where soil disturbance and a high proportion of "weeds" is the norm, predominantly native plant assemblages, even without rare plants, can be considered significant.

Methods for Evaluation

Office Evaluation

Contact and document correspondence with agencies re. rare species mapping for area (e.g. Alberta Environment, Natural Resources Service; University of Alberta; Alberta Museum of Natural History).

Airphoto and document review indicate no sensitive species at risk.

Contact and document correspondence with local sources (Naturalist Clubs, FAN, botany groups, and local landowners).

On site discussions with Hamlet staff. No issues of concern.

Refer to examples of significant landscape types and localities in Appendix G. Note whether site falls into categories listed as potentially significant.
Refer to Packer and Bradley (1984) (Appendix D) for comprehensive list of rare plants and dot maps of distribution.

☐ Sufficient survey data exist, i.e. botanical inventory of site. No significant plant species, community found (see Appendix F for rare plant species). Site is not in an area or landscape noted for potential significance (Appendix G). Presence of significant plant species is not a basis for denial of treatment wetland.

☒ Sufficient survey data do not exist. Proceed to preliminary field evaluation.

Preliminary field evaluation must be conducted if no inventory exists, or if the site falls into area or landscape categories noted for their potentially significant vegetation (see Appendix G).

Preliminary Field Evaluation (to be conducted by a qualified vegetation specialist)

Summarize from field notes habitat conditions at the site, which may indicate presence of significant plants or plant communities.

Discussion with local Inuit indicate no concerns with this wetland.

Summarize from field notes indicators of significant plants or plant communities at the site (e.g. certain plant species, soils or landform coupled with absence of disturbance by tilling or intensive grazing; history of fire) or presence of significant plant species in similar habitat nearby).

No conflicting land use.

If such indicators are found, particularly if the site is in an area or landscape type noted for potentially significant flora (Appendix G), conduct intensive field evaluation and give rationale for conducting full inventory.

N/A

Intensive Field Evaluation

Botanical Inventory (conducted on at least two visits: approximately coinciding with summer and fall. Woodlands should be additionally evaluated in spring).

From field notes, list significant species or plant communities found. Note ratio of native plant species to total species. Append plant community mapping, plant list.

N/A

If indicator detected, determine potential for impact: refer to table of impacts and mitigation found in Appendix E.

1 Summarize features, which likely contribute to the presence of significant species or communities.

N/A

2 Determine zone where impacts may be expected, and:

A. Assess expected impacts from increase in hydroperiod (e.g. potential replacement of extant plant communities by communities more tolerant of inundation).

N/A

B. Assess expected impacts from increased nutrient loading (e.g. potential invasion by fast-growing non-native species, change in vegetation, change in water quality, decrease in species diversity).

N/A

C. Assess expected impacts from earthworks, if proposed.

N/A

☒ No impact likely. Impact on significant plant species or communities is not a basis for denial of treatment wetland.

☐ Impact likely. Proceed to examination of mitigation.

If potential impact determined, examine the potential for mitigation afforded by the following techniques

Restoration of habitat (e.g. planting of native species, etc.):

N/A

Further treatment of wastewater:

N/A

Pretreatment of wastewater from other sources, or source controls:

N/A

Final Analysis: Suggested Net Impacts and Action

Mitigation Potential:

N/A

Summary of Projected Net Impacts After Mitigation. Qualify Projections.

N/A

Conclusions: are net impacts acceptable? Explain:

N/A

☒ No negative impact likely. Impact on significant plant species or communities is not a basis for denial of treatment wetland.

☐ Negative impact likely. Impact on significant plant species or communities is a basis for denial of treatment wetland.

Alberta Environment Treatment Wetland Evaluation

5.4: Function: Significant Habitat for Breeding Waterfowl

Rationale: Even small wetlands have been shown to be important in waterfowl production, particularly in prairie and parkland ecoregions. Initiatives like the North American Wetland Management Program (NAWMP) recommend protection of potholes.

Methods for Evaluation

Office Evaluation:

Contact Ducks Unlimited; Alberta Environment Natural Resource Service for pre-existing information re: breeding waterfowl. Note whether site is subject to NAWMP agreement.

Refer to the following references (Appendix D): Strong et al. (1993) for information on value of wetlands in the Settled Area to waterfowl, Nietfield et al. (1985) for list of priority duck production habitat in Alberta, and Refer to D.A. Westworth & Associates (1990) for significant breeding habitat in Boreal Forest region

Document known level of significance:

No documentation available.

Contact local sources (Naturalist clubs, FAN, Alberta Fish and Game Association). List or append sources including name, phone number of contact and significance of habitat.

Document level of significance from these sources:

No documentation available. Discussions with Hamlet staff indicates no concerns.

- ☒ Wetland is not considered significant and has been evaluated within past 5 years. Significant habitat for breeding waterfowl is not a basis for denial of treatment wetland. If information not available, conduct preliminary field visit.
- ☐ Wetland is considered significant. Proceed to evaluate potential for impact.

If information is not available, conduct preliminary field visit to determine potential significance.

Preliminary field visit:

Note following variables:

- ☒ 50m (diameter) or more standing water until late summer
- ☒ Concealing vegetation
- ☒ Discrete areas of short, grass-like plants
- ☒ Submerged or floating aquatic vegetation
- ☒ Shrubby areas
- ☒ Check if other wetlands with standing water (as above) are within 5 km; linked by natural habitat; linked by agricultural land, i.e. not separated by ecological barrier

If standing water plus three or more of these conditions apply, a field evaluation must be conducted: note whether field evaluation advised.

Yes ☐ No ☒

- ☒ Wetland is not considered significant, and preliminary field visit does not indicate potential significance. Habitat for breeding waterfowl is not a basis for denial of treatment wetland.
- ☐ Wetland is considered significant. Habitat for breeding waterfowl is a basis for denial of treatment wetland.

No Hamlet evaluation conducted. Site visit and discussions with Hamlet staff indicates the wetland is a small insignificant component of a huge similar bio-environment stretching for 1,000's of kilometers.

Intensive field evaluation (to be conducted by a qualified waterfowl biologist)

Conduct and provide record of one of the following waterfowl surveys:

Conduct observational and nest (dragging) surveys in late April to June.

Conduct surveys of downy young and post-breeding adults in May-July.

Estimate number and species of waterfowl pairs observed

Assess significance of habitat

As estimated from field surveys:_____

In consultation with agencies noted above :

☒ Wetland is not considered significant. Breeding habitat for waterfowl is not a basis for denial of treatment wetland.

☐ Wetland is considered significant. Determine and record the potential for impact.

Determination of Potential for Impact

1. **Assess factors contributing to significance of habitat based on:**
   - Factors noted above
   - High percentage of wetlands in the region
   - Large and undisturbed habitat tract
   - Other
2. **Determine zone where impacts may be expected, and**
   A Predict impacts from increase in hydroperiod (also note potential for positive impact from increase in permanence of water, area of wetland, etc.). Refer to table of impacts in Appendix E.

   No significant impacts.

   B Predict impacts from increased nutrient loading.

   No significant impacts.

   C Assess expected impacts from earthworks, if proposed:

   No significant impacts.

If potential negative impact expected, examine potential for mitigation:

Refer to table of impacts and mitigation techniques in Appendix E and habitat matrix (Appendix H) to aid in determining impacts due to vegetation shifts.
Potential for mitigation offered by creating habitat.

N/A

Potential for mitigation offered by further pretreatment of wastewater.

N/A

Assess potential for success of mitigation:

N/A

Summary of net impacts after mitigation:

N/A

Final Analysis: Suggested Net Impacts and Action

☒ No negative impact likely. Impact on waterfowl breeding habitat is not a basis for denial of treatment wetland.

☐ Negative impact likely. Impact on waterfowl breeding habitat is a basis for denial of treatment wetland.

Conclusions:

A small wetland area in a huge area of similar tundra. Hamlet staff and site observations indicate that, should the use of this wetland slightly impact waterfront, the impact will be insignificant.

Alberta Environment Treatment Wetland Evaluation

5.5: Function: Significant Habitat for Migrating Waterfowl or Shorebirds

Rationale: Migrating shorebird and waterfowl populations are vulnerable to human interference, since they concentrate in great numbers in only a few locations along migratory pathways (Dickson and Smith 1991).

Methods for Evaluation

*Note: Field evaluation of significance of habitat for migrating waterfowl and shorebirds is sufficiently complex to be beyond the scope of this evaluation. Evaluation of this criterion will be general and based on existing information only.

Office Evaluation:

Contact agencies re. Mapping of significant staging areas (e.g. Alberta Environment Natural Resources Service, Canadian Wildlife Service, and Ducks Unlimited). Tabulate below agency, contact person, phone number and date of call.

Note published reports listing significant staging areas (e.g. Dickson and Smith 1991, Nietfield et al. 1985, Poston *et al.* 1990; Appendix D).

* Dickson and Smith (1991) note that Regional Shorebird Staging Reserves are those, which have at least 20,000 using the site annually, or at least 5% of a species flyway population.

Site visit and discussions with Hamlet staff indicate no concern.

☒ No significant shorebird or waterfowl staging area noted. Presence of staging area is not a basis for denial of treatment wetland.

☐ Significant migratory staging area noted. Proceed to examination of impacts and mitigation.

If staging area noted, determine potential for impact:

Refer to table of impacts and mitigation techniques, Appendix E.

1. Summarize features which contribute to significance as a staging area:

   ☐ Extensive open water and concealing vegetation.
   Comments:_____

   ☐ Presence of large areas of mud flat or short grass-like vegetation.
   Comments:_____

   ☐ Other: N/A ;
   Comments:_____

2. Determine zone of influence where impacts can be expected, and:

   A. Predict impacts from increase in hydroperiod (e.g. particularly inundation of mud flats, or extension of inundation time with consequent failure of forage species to germinate and/or loss of invertebrates).

   No significant impacts.

   B. Predict impacts from increased nutrient loading (e.g. rapid growth of suboptimal non-native forage species, elimination of some invertebrates).

   No significant impacts.

C. Predict impacts from earthworks, if proposed:

No significant impacts.

☒ No negative impact likely. Impact on significant staging area is not a basis for denial of treatment wetland.

☐ Negative impact likely. Proceed to evaluation of mitigation.

If potential impact determined, examine potential mitigation of impacts

1. Restoration of habitat (e.g. creation of gentler grades (1:10) at wetland edges to encourage zonation of vegetation and development of mud flats).

   N/A

2. Further pretreatment of wastewater

   N/A

Final Analysis: Suggested Net Impacts and Mitigation

Mitigation Potential

N/A

Summary of net impacts after mitigation

N/A

Conclusions

The area of concern is a tiny component of a large area of similar tundra. No significant impacted is likely.

☒ No negative impact likely. Impact on significant staging areas is not a basis for denial of treatment wetland.

☐ Negative impact likely. Impact on significant staging areas is a basis for denial of treatment wetland.

Alberta Environment Treatment Wetland Evaluation

5.6: Function: Habitat for Breeding Area - and Disturbance-Sensitive Fauna (see list of species in Appendix H).

**Note: This part of the evaluation should be completed only in developed or agricultural areas where habitat is highly fragmented.*

Rationale: Some wildlife species appear to require large expanses of habitat (or many connected patches of habitat) at a distance from human development. These species are becoming increasingly rare in settled landscapes.

Office Evaluation

Contact agencies re. species lists for area (e.g. Alberta Environment Natural Resource Service). List sensitive species recorded (noted in Appendix H). Also note species recorded in contiguous or structurally similar habitat within 1 km.

No inventory conducted. The site is a tiny area within a huge area of similar tundra.

Contact local sources (naturalist clubs, FAN, birding groups) for species lists in area or in contiguous or structurally similar habitat within 1 km. Summarize findings.

No concerns noted by Hamlet staff.

☒ Sufficient data exist; no significant fauna found. Or no data available, but habitat consists of small (< 5 ha), isolated patches of natural vegetation in a landscape which consists of <10% of natural habitat.
Presence of area-, disturbance- or isolation-sensitive species is not a basis for denial of treatment wetland.

☐ Insufficient Data exist (i.e. no surveys within past 4 years): conduct field evaluation

Field Evaluation (to be conducted under the following circumstances):

- If large areas (>5 ha of grassland, woodland or wetland persist in an otherwise highly developed landscape).
- If candidate site is one of many fragments of habitat which together comprise greater than 10% of natural vegetation in the landscape.

*Note: In many cases, the requirement for inventories to detect rare species will provide the opportunity for concurrent surveys for these species.

Note habitat conditions, which indicate the possible presence of area- or disturbance- sensitive species (e.g. above factors).

N/A

Conduct breeding bird, amphibian and reptile, and mammal species as indicated for rare species function. Note area- or disturbance-sensitive indicator species found (refer to list in Appendix H): summarize findings.

N/A

☐ Sensitive species not found. Presence of sensitive species is not a basis for denial of treatment

wetland.

❑ Sensitive species found. Proceed to evaluation of impacts.

If indicator detected, determine potential for impact (refer to Appendix E for summary of impacts and Appendix H for habitat matrixes which aid in determination of affects of shifts in vegetation):

1. Summarize features, which likely contribute to the presence of sensitive species. N/A
   - Large and undisturbed habitat tract:
   - High percentage of habitat cover in the region:
   - Other:
2. Determine zone where impacts may be expected, and:
   A. Predict impacts from increase in hydroperiod (e.g. replacement of treed habitat by more water-tolerant species; see Appendix E for summary of impacts):

   N/A

   B. Predict impacts from increased nutrient loading (e.g. change in vegetation, change in water quality, decrease in plant species diversity):

   N/A

   C. Predict impacts from earthworks, if proposed:

   N/A

☒ No negative impact likely. Impact on area-, disturbance- or isolation- sensitive species is not a basis for denial of treatment wetland.

❑ Negative impact likely. Proceed to examination of mitigation.

If potential impact determined, examine potential mitigation of impacts; e.g. by creation of corridors to other suitable habitat, restoration of habitat outside area affected by creation of wetland to maintain habitat size, etc.).

N/A

Final Analysis: Suggested Net Impacts and Action

Mitigation Potential:

N/A

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Summary of Net Impacts after Mitigation:

N/A

Conclusions:

No significant concerns noted. Site is a small area within a huge area of similar tundra.

☒ No negative impact likely. Impact on area- , disturbance- or isolation-sensitive species is not a basis for denial of treatment wetland.

☐ Negative impact likely. Impact on area-, disturbance- or isolation-sensitive species is a basis for denial of treatment wetland: