Alaska District

US Army Corps of Engineers, Alaska District

Appendix B to the Record of Decision

Aquatic Site Assessments- Evaluation and Ratings On Functional Scoring of Wetlands

Applicant: ConocoPhillips, Alaska, Inc.
File Number: POA-2013-461
Waterway: Colville River
Project: Greater Moose's Tooth 1

I. General Description of ASA Components of Interest for the Analysis:

1. The applicant provided to USACE two Aquatic Site Assessments (ASAs), one for Alternative A and one for Alternative B. These assessments were supported by ecological land survey data collected by ABR for ARCO and CPAI in 2003, as well as geomorphic information developed by Kreig and Reger, 1982, and by the Alaska Division of Geological and Geophysical Survey for Alaska, 1983. Other sources of information included soil surveys from Schoeneberger, P. L. et al, 1998, and periglacial processes and environments from Washburn, A. L., 1973. The analysis of wetland/water functions was complemented by a one-day field map verification survey with wetland delineation data forms and photo plots produced on six (6) sampling sites.

   Wetlands were classified using the Cowardin Classification system and cross referenced with data from the ecological land survey. The ASAs used the same eight (8) wetland functions used in the USACE RGL 9-01 to form a value judgment, but modified the wetland function characterization forms to include questions pertinent to the natural conditions of the site. In some cases, questions under each function were made more specific, were eliminated, and/or were added. Among those changes were specifications on vegetation cover thresholds, flooding periodicity (10 years), vegetation/water interspersion (5-10%), thickness of organic layer, thresholds for high diversity (# of species) for mammal and avian species usage, support for subsistence activities, and whether the aquatic resource is used by Threatened and/or Endangered Species (T&E). No specific questions were added to evaluate habitat characteristics of water bodies based on aquatic/stream ecology criteria.

2. The ASAs identified eleven (11) wetland/water types, all of which were present in both alternatives. A wetland function characterization form was produced for each of the 11 wetland/water types; they are part of the ASA's attachment. Three of eleven wetland/water types correspond to lakes, ponds, and streams. Functions of wetlands were evaluated within the area directly impacted by the project under Alternative A and Alternative B, as well as within a 300-foot corridor measured from the edge of the proposed filled area (see table #1).

3. The eight (8) individual functions evaluated are:
   (1) Flood flow regulation
   (2) Sediment, nutrient, toxicant removal
   (3) Erosion control and shoreline stabilization
   (4) Organic matter production and export
   (5) General habitat suitability
   (6) Fish habitat
   (7) Educational, scientific, recreational or subsistence use; and
   (8) Uniqueness and special status

4. The series of questions associated with each of the 8 functions have a "yes" or "no" answer. Depending

on the number of "yes" questions, wetland/water performance was ranked high, moderate, and/or low. If the wetland type did not provide a function, the response was N/A.

5. For a wetland type to be considered a Category I it would have to perform at a high level in all eight (8) functions, which is rare because wetlands perform some functions better than others. In the ASAs one wetland type (PEM1F) scored high, but the rating was under the scoring system premise. If there is documented occurrence of a state or federally listed threatened or endangered species in a particular wetland, it is automatically rated as high functioning (see Uniqueness & special status function's question #1 in the ASAs). If a wetland or water ranked high for 6 of the eight evaluated functions it would still be considered for a Category I status.

   - Category I (High Functioning) → high relative functional ranking between 6 to 8 functions or providing habitat for T&E species.

   - Category II (Moderate) → relative functional ranking that do not fit Cat. I or Cat. III

   - Category III (Low) → low relative functional ranking in 6 of the 8 functions

6. A summary table with all eight (8) individual functional rankings for each wetland type was provided in both ASAs (table #1). The individual functional ranking was the same for each wetland type in both alternatives; for example PEM1SS1B was ranked low functioning for flood flow regulation in Alternative A and in Alternative B as well.

   The only wetland type with different individual ranking between alternatives was PSS1C, which ranked high under Alternative A and moderate under Alternative B for general habitat suitability. That was based on the determination that willows dominating this wetland type were not tall willows as initially determined in the Alternative A ASA, but closed low willow thickets (<1.5 m). Because close low willow thickets are not considered a rare wetland type, the general habitat suitability was changed to moderate in the Alternative B ASA. The change on the individual functional rankings between both alternatives did not affect the overall scoring of PSS1C as a Category II wetland.

II. USACE Observations and Adjustments to the ASAs:

1. The protocol provided in the ASAs was modified to strengthen the functional scoring based on simple calculations. Each relative functional ranking was assigned a numerical values as follows:

Table 2: Numerical values assigned to relative wetland functional rankings.

Relative Functional Score	Numerical Value
High	3
Moderate	2
Low	1
N/A (no inherent function)	No included in the calculation

2. To avoid penalizing wetlands for functions they do not inherently posses, the sum of the wetland's numerical values did not include the 'N/A.' The sum of all numerical values was divided by the wetland performance at "maximum capacity" using the following formula:

$$\text{Overall Functional Score} = \frac{\sum \text{Relative (individual) functional scores by wetland type}}{\text{Wetland Maximum Capacity}}$$

Wetland Maximum Capacity = 3 (High) x Total # of inherent functions (excluding N/A)

Numerical values and overall functional scores are for each wetland type is presented in table 4.

Table 1. Relative Functional Rankings and Overall Functional Categories for NWI codes occurring in Greater Mooses Tooth 1 Alternative A Study Area, NE NPR-A, North Slope, Alaska, as originally presented on ABR Aquatic Site Assessment for Alternative A and for Alternative B.

NWI Code*	Category	Flood Flow Regulation	Sediment, Nutrient, & Toxicant Removal	Erosion Control and Shoreline Stabilization	Organic Matter Production & Export	General Habitat Suitability	Fish Habitat	Subsistence/ Recreational/ Educational Value	Uniqueness & Special Status
PEM1/ SS1B	II	LOW (1)**	MODERATE (2)	N/A	MODERATE (2)	LOW (1)	N/A	HIGH (3)	LOW (1)
PEM1/ SS1E	II	HIGH (3)	MODERATE (2)	N/A	HIGH (3)	HIGH (3)	N/A	HIGH (3)	LOW (1)
PEM1F	I	HIGH (3)	MODERATE (2)	N/A	HIGH (3)	MODERATE (2)	HIGH (3)	HIGH (3)	MODERATE (2)
PEM1H	II	MODERATE (2)	MODERATE (2)	HIGH (3)	MODERATE (2)	HIGH (3)	HIGH (3)	HIGH (3)	LOW (1)
PSS1C	II	LOW (1)	MODERATE (2)	HIGH (3)	MODERATE (2))	MODERATE (2)	LOW (1)	HIGH (3)	LOW (1)
R2EME	II	LOW (1)	HIGH (3)	HIGH (3))	HIGH (3)	MODERATE (2)	LOW (1)	HIGH (3)	LOW (1)
PEM1T	II	HIGH (3)	HIGH (3)	HIGH (3)	HIGH (3)	MODERATE (2)	LOW (1)	MODERATE (2)	LOW (1)
PUSR	III	LOW (1)	MODERATE (2)	LOW (1)	LOW (1)	LOW (1)	LOW (1)	MODERATE (2)	LOW (1)
L1UBH	II	MODERATE (2)	MODERATE (2)	N/A	N/A	MODERATE (2)	HIGH (3))	HIGH (3)	LOW (1)
R2UBH	II	N/A	LOW (1)	N/A	N/A	MODERATE (2)	HIGH (3)	HIGH (3)	LOW (1)
PUBH	II	MODERATE (2)	MODERATE (2)	N/A	N/A	MODERATE (2)	HIGH (3)	HIGH (3)	LOW (1)

* *Functional capacity rankings High, Moderate and Low are represented by a color scale ranging from light blue (Low) to dark blue (High).*

** *See Table 1 for numerical value assigned to functional rankings.*

3. Wetland Maximum Capacity Calculation: When a wetland only performs six (6) of the 8 functions evaluated, the maximum performance score (capacity) for that particular wetland type would be 18 (6 x 3).

   For example, the sum of all relative functional score for PEM1/SS1B is 1 + 2 + 2 + 2 +3 + 1 = 11 (see table #4). This wetland only performs 6 of the 8 functions evaluated.

   The performance of PEM1/SS1B at maximum capacity 6 functions x 3 (High) = 18

   $$\text{Overall Functional Score} = \frac{\sum \text{Relative (individual)functional scores by wetland type}}{\text{Wetland Maximum Capacity}} = 11/18 = 0.61$$

   This calculation normalizes all wetland overall functional performance from zero (0) to one (1).

4. Once each wetland overall functional score was calculated, they were grouped in 4-quantiles or quartiles (Q) (see table 3). Until a standardized regional functional assessment is developed and considering that other large projects in the North Slope have recently started to use quartiles to categorize wetland

functions, this is probably one of the simplest ways to categorize wetlands while providing some level of consistency and mathematical strength in the analysis.

Table 3: Overall Functional Score organized by simple quartiles.

Overall Functional Score (Simple Quartile)	Wetland Ranking	Category
0.76-1.00 (Q1)	High Functioning	I
0.51-0.75 (Q2)	Moderate Functioning	II
0.26-0.50 (Q3)	Low Functioning	III
0.00-0.25 (Q4)	Degraded	IV

III. Changes of Individual Functional Score by Wetland Type:

Based on data presented in tables 1, 2, 3, and 4, as well as other sources of information, each wetland type was evaluated and when necessary individual functions were adjusted. These resulted in the lift of general habitat suitability from moderate to high in five wetland/water types, and from low to moderate in two wetland types. It also resulted in the lift of organic matter production and export from low to moderate in one wetland type, the lift of fish habitat from low to high in one wetland type and from low to moderate in one wetland type, and the lift of uniqueness of lakes from low to moderate. The lifting did change the overall functional score and category in five wetland/water types. The lifting occurred in PEM1/SS1E, PEM1H, R2EME, PEM1T, and PUBH, as follows:

WETLAND TYPES

PEM1/SS1B (Saturated Persistent Emergent and Broad-leaf Deciduous Scrub Shrub Wetland):

The general habitat suitability was changed from Low to Moderate based on the following: these are undisturbed wetlands that offer free movement of animals along the landscape. They display limited patterned ground features or high center polygons with less than 5% aerial cover of inundated depressions and are typically dominated by tall grass (*Eriophorum angustifolium*), sedges (*Carex bigelowii*), and shrubs, like willows (*Salix pulchra*), dwarf birch (*Betula glandulosa*), and Cassiope (*Cassiope tetragona*).

This wetland type offers a high diversity of plant species when compared with inundated wetlands, which are mainly dominated by graminoids. Due to the abundance of this wetland type in a large non fragmented landscape, it provides habitat for a variety of common wildlife species in conjunction with other similar wetland types found in the area. It offers free range for large mammals and nesting habitat to several bird species, including passerine birds known to nest on the tundra ground. A limitation for some wildlife species may be a lower interspacing between surface water and drier vegetated grounds when compared to similar wetland types.

These wetlands provide high functions for subsistence; moderate functions for wildlife habitat, sediment/toxicant removal, and organic matter export; and low function for flow regulation and uniqueness. These wetlands do not provide shoreline stabilization or fish habitat functions. Using the maximum performance capacity formula, the overall functional score resulted in 0.61, which is in Q2 (table #3), therefore, PEM1/SS1B is ranked overall as Category II (Moderate) (see table 4).

PEM1/SS1E (Seasonally Flooded/Saturated Persistent Emergent and Broad-leave Deciduous Scrub Shrub Wetland):

Relative functional scores for this wetland type remained as presented in the ASAs. These wetlands provide high functions for wildlife habitat, subsistence, flow regulation and organic matter export; moderate functions for sediment/toxicant removal; and low functions for uniqueness. These wetlands do not provide functions for shoreline stabilization or fish habitat. Using the maximum performance capacity formula, the overall functional score resulted in 0.83, which is in Q1 (table #3), therefore, PEM1/SS1E is ranked as Category I (High) (see table 4).

Table 4. Modified Relative Functional Rankings and Overall Functional Scores for each Cowardin wetland type occurring in Greater Mooses Tooth 1 proposed Alternative A, NE NPR-A, North Slope, Alaska.

NWI Code*	Category	Overall Functional Score	Flood Flow Regulation	Sediment, Nutrient, & Toxicant Removal	Erosion Control & Shoreline Stabilization	Organic Matter Production & Export	General Habitat Suitability	Fish Habitat	Subsistence/ Recreational & Educational Value	Uniqueness & Special Status
WETLANDS										
PEM1/ SS1B	II	0.61*** (11/18)	1	2	N/A	2	**2+**	N/A	3	1
PEM1/ SS1E	I	0.83 (15/18)	3	2	N/A	3	3	N/A	3	1
PEM1F	I	0.90 (19/21)	3	2	N/A	3	**3**	3	3	2
PEM1H	I	0.79 (19/24)	2	2	3	2	3	3	3	1
PSS1C	II	0.71 (17/24)	1	2	3	**3**	**3**	1	3	1
R2EME	I	0.83 (20/24)	1	3	3	3	**3**	**3**	3	1
PEM1T	I	0.79 (19/24)	3	3	3	3	**3**	1	2	1
PUSR	III	0.50 (12/24)	1	2	1	1	**2**	**2**	2	1
WATERS.										
L1UBH	II	0.72 (13/18)	2	2	N/A	N/A	2	3	3	**2**
R2UBH	II	0.67 (10/15)	N/A	1	N/A	N/A	2	3	3	1
PUBH	I	0.77 (14/18)	2	2	N/A	N/A	**3**	3	3	1

* *Wetlands have been placed in descending order from category I to category III wetlands. Functional capacity rankings High, Moderate and Low are represented by a color scale ranging from light blue (Low) to dark blue (High).*

** *Wetland ranking: High Functioning Wetlands=3, Moderate Functioning Wetlands=2, Low Functioning Wetlands=1*

*** *See sections II.2 and II.3 and Overall Functional Score formula.*

\+ *Red bold indicate the functional ranking has been modified from the ranking determined in the initial ASAs.*

PEM1F (Semi-permanently Flooded Persistent Palustrine Emergent Wetland):

The general habitat suitability function was changed from Moderate to High, because these wetlands provide a good mix of surface water and graminoid cover on non-patterned or low-centered polygon relief areas throughout the growing season. These wetlands are characterized by the dominance of tall cottongrass (*Eriophorum angustifolium*) and water sedge (*Carex aquatilis*). Tall cottongrass is used extensively by snow geese and other waterfowl. Water sedge is considered excellent forage equal to clover in nutritional value and exceeds it in protein content. Water sedge provides cover to some birds, waterfowl, and small mammals; and it has been reported as a semi-essential dietary item for caribou, providing nutrients not present in lichens.

The general habitat suitability function determination in the original ASA was based on six questions. Question two (2) refers to wetlands supporting a high diversity of mammal species. The cutoff is no less than six (6) mammal species; this is a very restricted criterion because it is not clearly explain how mammal usage of this wetland type was measured. It seems that the mammal species diversity

threshold is referring to mammal usage of particular vegetative communities at the landscape level associated with the Colville River Delta and not specifically to a particular wetland type. USACE staff has not found enough information to support the statement that no more than six species of mammals (including voles, lemmings, and weasels) fail to use this wetland type. Based on dominant plant communities, proximity to other wetland types, and the existence of more than three (3) species of voles, two (2) species of lemmings, two (2) species of weasels, and one (1) species of shrew in the area, it is reasonable to assume this wetland is used by more than six (6)species of mammals. Therefore, this question can be realistically answered 'yes.' That would be positive answers for 4 of the 6 questions, resulting in a high general habitat suitability function. It is also known these wetlands are preferred habitat for focal avian species (yellow billed loon, tundra swans, Brant, and Spectacle Eider).

These wetlands provide a high function for flow regulation due to their proximity to riparian systems. They also provide high functions for organic matter export, wildlife habitat, fish rearing habitat when flooded, and subsistence; moderate functions for sediment/toxicant removal and uniqueness. These wetlands do not provide functions for shoreline stabilization.
Using the maximum performance capacity formula, the overall functional score resulted in 0.90, which is in Q1 (table #3), therefore, PEM1F is ranked as Category I (High) (see table 4).

PEM1H (Permanently Flooded Palustrine Persistent Emergent Wetland):
Relative functional scores for this wetland type remained as presented in the ASAs (see table 3). These wetlands provide high functions for shoreline stabilization, wildlife habitat, fish habitat, and subsistence; moderate functions for flow regulation, sediment/toxicant removal, and organic matter export; and low functions for uniqueness. Using the maximum performance capacity formula, the overall functional score resulted in 0.79, which is in Q1 (table #3), therefore, PEM1H is ranked as Category I (High) (see table 4).

PSS1C (Seasonally Flooded Broad-leave Deciduous Scrub Shrub Wetland):
Organic matter export and general habitat suitability functions were changed from Moderate to High. PSS1C occurs on inactive buried peat/sandy riverine deposits, oxbows, and/or active riverine deposits and is seasonally flooded due to its proximity to the Ublutuoch River. PSS1C is characterized by abundance of willows (*Salix richardsonii*), reaching 85% cover on the shrub upper-canopy stratum, tall enough to clearly stand above the typical tundra grounds. It contains a variety of deciduous shrubs and forbs in the undercanopy (*Petasites frigidus*, *Astragalus robbinsii*, and *Tephroseris atropurpurea*). Wetlands with two easily differentiated strata are important in the North Slope because they provide good shelter and nesting habitat for some species of passerine birds. Waterfowl use willow thicket edges for nesting, especially if they are in close proximity to open water; willow ptarmigan may use these wetlands for nesting and/or brood-rearing as well. These wetlands provide high functions for organic matter export due to the abundance of deciduous plant species in at least two vertical vegetation strata (willows and smaller shrubs and forbs), which would produce a reasonable volume of organic matter for export through flooding. These wetlands provide high functions for shoreline stabilization, organic matter export, wildlife habitat, and subsistence; moderate functions for sediment/toxicant removal; and low functions for flow regulation, fish habitat, and uniqueness. Using the maximum performance capacity formula, the overall functional score resulted in 0.71, which is in Q2 (table #3), therefore, PEM1H is ranked as Category II (Moderate) (see table 4).

R2EME (Seasonally Flooded/Saturated Lower Perennial Riverine System with Emergent Vegetation):
The general habitat suitability function was changed from Moderate to High and the fish habitat function was changed from Low to High. These wetlands are in flat to concave areas that abut small beaded streams like Barely and Crea creeks and the Ublutuoch River and are exposed to seasonal flooding. Dominated by water sedge (*Carex aquatilis*) and tall cottongrass (*Eriphorum angustifolium*), these wetlands provide excellent forage to waterfowl. The white basal portions of sedge shoots are known for high carbohydrate and nitrogen contents. Water sedge reaches more than 8 inches tall in the summer, providing good rearing habitat, escapement, and hiding spots for brood-reading waterfowl. When flooded, these wetlands provide feeding and rearing habitat for juvenile fish, either anadromous or resident species. These wetlands provide high functions for sediment/toxicant removal, shoreline stabilization, organic matter export, wildlife and fish habitat, and subsistence; and low function for uniqueness. Using the maximum performance capacity formula, the overall functional score resulted in

0.83, which is in Q1 (table #3), therefore, R2EME is ranked as Category I (High) (see table 4).

PEM1T (Semi-permanently Flooded Tidal Palustrine Persistent Emergent Wetland:
The general habitat suitability function was changed from Moderate to High. PEM1T wetlands are located along inland main freshwater river channels but are influenced by seasonal brackish/saline inputs during Beaufort Sea tide/wind surges. These wetlands are connected to the Sakoonang Channel within the Colville River Delta and support a lush growth of sedges adapted to saline and/or brackish environments. Dominant vegetation include Hoppner's sedge (*Carex subspathacea*), fisher's tundra grass (*Dupontia fisheri*), and oval leaf willow (*Salix ovalifolia*), which are typically associated to coastal estuaries systems or lagoons flooded with salt or brackish waters for at least part of the year.

These wetlands are not as common as other wetland types in the area and provide preferred habitat for nesting and brood-rearing tundra swans and fall staging habitats for tundra swans, brant and spectacled eiders, as well as other shorebird species. These wetlands provide high functions for flow regulation, sediment/toxicant removal, shoreline stabilization, organic matter export, and wildlife habitat; moderate functions for subsistence; and low functions for fish habitat and uniqueness. Using the maximum performance capacity formula, the overall functional score resulted in 0.79, which is in Q1 (table #3); therefore, PEM1T is ranked as Category I (High) (see table 4).

PUSR (Seasonally Flooded Tidal Palustrine Unconsolidated Shore):
General habitat suitability and fish habitat functions were changed from Low to Moderate. These wetlands are found along the shoreline of the Sakoonang channel of the Colville River, a fresh water body that has seasonal maritime influence during storm surges. They are also exposed to seasonal snowmelt floods. Within the project area, these wetlands occur beneath an existing pipeline and next to an active road; however, they are still used by a relatively high number of avian species.

The dominant substrate is mud or unconsolidated fine material with sparse salt-killed tundra vegetation. Mudflats are considered valuable for their infaunal abundance that supports shorebird foraging, migration, and reproductive biology. Due to their high infaunal diversity, mudflats have the potential to function as bioremediation during recovery and cleanup of oil spill events. Young anadromous fish use shallow brackish waters for acclimation and osmoregulation while avoiding predation from larger fish.

Due to its proximity to an existing pipeline and active road, PUSR wetlands provide moderate functions for sediment/toxicant removal, subsistence, and wildlife and fish habitat; and low functions for flow regulation, shoreline stabilization, organic matter export, and uniqueness. Using the maximum performance capacity formula, the overall functional score resulted in 0.50, which is in Q3 (table #3); therefore, PUSR is ranked as Category III (Low) (see table 4).

OPEN WATERS

L1UBH (Permanently Flooded Limnetic Lacustrine System with an Unconsolidated Bottom-Lakes):
Uniqueness was changed from Low to Moderate because lakes are usually more than 20 acres and/or deeper than 6 feet, therefore they tend to no freeze to the bottom. Therefore, they provide overwintering habitat for fish and benthic macroinvertabrates and are an important source of potable water for domestic use, especially in winter, and fresh water that support oil development operations. Lakes provide high functions for fish habitat and subsistence; moderate functions for flow regulation, sediment/toxicant removal, wildlife habitat, and uniqueness. Although lakes performed high as fish habitat and uniqueness, they perform low on the remaining functions. Using the maximum performance capacity formula, the overall functional score resulted in 0.72, which is in Q2 (table #3), therefore, L1UBH is ranked as Category II (Moderate) (see table 4).

R2UBH (Permanently Flooded Lower Perennial Riverine System with an Unconsolidated Bottom-Streams):

Individual functional scores for R2UBH remained as presented in ASA (see table 3). Streams were evaluated under the same criteria as wetlands; therefore, the ranking scores do not reflect their functions. This approach needs to be adjusted to reflect the real functions of streams based on stream ecology fundamentals. This would require further scientific and ecological research and consultation with U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and other local experts; this effort is, however, beyond the scope of the current ASA analysis. They provide high functions for fish habitat and subsistence; moderate functions for wildlife habitat; and low functions for sediment/toxicant removal and uniqueness. They were considered to not provide flow regulation, shoreline stabilization, or organic matter export functions.

Using the maximum performance capacity formula, the overall functional score resulted in 0.67, which is in Q2 (table #3), therefore, R2UBH is ranked as Category II (Moderate) (see table 4). This categorization is questionable because the characterization forms contain questions on whether there is presence of herbaceous vegetation, woody plants, and interspersion of vegetation and water to determine that the stream is functioning appropriately in producing/exporting organic matter. General habitat suitability was based on whether the stream was used by a high diversity of mammal and avian species, and whether there was good vegetation interspersion. These questions resulted in an inadequate assessment of streams' functions. Further efforts would be required to develop a more suitable system to evaluate functions provided by streams.

PUBH (Permanently Flooded Palustrine Unconsolidated Bottom-Ponds):

The general habitat suitability function was changed from Moderate to High. Ponds, and shallow lakes, generally begin to freeze in September, freeze to the bottom by mid-winter, and become ice-fee between by mid-June to early July, about a month earlier than deeper lakes. They provide important summer rearing fish habitat if they are connected to a stream by a channel or intermittently flooded by nearby streams. They provide important habitat to emergent vegetation, invertebrates, and migratory birds due to the earlier availability of ice-fee areas. Spectacled eiders feed primarily by dabbling in shallow freshwater or brackish ponds, where they find insect larvae, benthic organisms, and aquatic plants or seeds; pre-nesting eiders prefer shallow ponds with islands, emergent grasses and sedges. Although ponds are generally shallow, cumulatively, ponds replenish during spring break-up when most lakes are frozen. Ponds, like lakes, store substantive volumes of water through the summer, decreasing peak flows in the lower sections of the watershed. They provide high functions for subsistence, wildlife, and fish habitat; moderate functions for flow regulation and sediment/toxicant removal; and low function for uniqueness. Using the maximum performance capacity formula, the overall functional score resulted in 0.77, which is in Q1 (table #3); therefore, PUBH is ranked as Category I (High) (see table 4).

V. A Quantitative Comparison of Wetlands Impacts from Alternative A and Alternative B Based on Adjusted Overall Functions

Table 5 summarizes data presented in table #4 and table #6, which includes the adjustment of relative and overall functional scores for wetland types impacted by Alternative A and by Alternative B. Table #6 presents a more detailed calculation of impacted wetland acreages, functional category, and percentages of partial wetland impacts. Information used to generate the data analyzed include the 2004 Alpine Satellite Development Plan FEIS, Mammals Section; 2014 BLM FEIS-Wetlands Section; data contained in two aquatic site assessments for the Greater Mooses Tooth One Development Project, letters provided by USEPA and USFWS, HDR Inc. Memo of November 12, 2014, and wetland delineation shapefiles generated for the 300-foot buffer zone.

Table 5: Acreage of direct and indirect impacts on aquatic resources by functional category.

Functional Category	Wetland Types	Alternative A		Alternative B	
		Direct Impact (acres)	Indirect Impact (acres)	Direct Impact (acres)	Indirect Impact (acres)
I	PEM1/SS1E, PEM1F, PEM1H, R2EME, PEM1T, PUBH	28.65	286.95	36.60	293.70
II	PEM1/SS1B, PSS1C, L1UBH, R2UBH	44.05	295.00	42.85	358.30
III	PUSR	0.05	0.05	0.05	0.05
Total		72.75	582.00	79.50	652.05

Alternative A

Alternative A would result in direct impacts on 72.75 acres of waters of the U.S., including wetlands, of which 0.25-acre is open waters (lakes, streams, or ponds) and 72.5 acres are wetlands (see table 6). Approximately 28.65 acres of wetlands, including ponds, were ranked as high functioning aquatic resources. Approximately 44.05 acres of wetlands, lakes, and streams, were ranked as moderate functioning aquatic resources. Approximately 0.05-acre of wetlands was ranked as a low functioning water resource (see table 5). No degraded wetlands were identified within Alternative A's area of direct impact.

Within the 300-foot buffer zone, Alternative A would indirectly impact 582 acres of waters of the U.S., including wetlands, of which 10 acres are open waters (lakes, streams, or ponds) and 572 acres are wetlands (see table 6). Approximately 286.95 acres of wetlands, including ponds, were ranked as high functioning aquatic resources. Approximately 295 acres of wetlands, lakes, and streams, were ranked as moderate functioning aquatic resources. Approximately 0.05-acre of wetlands was ranked as a low functioning water resource (see table 5). No degraded wetlands were identified within Alternative A's area of indirect impact.

Alternative B

Alternative B would result in direct impacts on 79.50 acres of waters of the U.S., including wetlands, of which 0.20-acre is open waters (lakes, streams, or ponds) and 79.30 acre are wetlands (see table 6). Approximately 36.60 acres of wetlands, including ponds, were ranked as high functioning aquatic resources. Approximately 42.85 acres of wetlands, lakes, and streams, were ranked as moderate functioning aquatic resources. Approximately 0.05-acre of wetlands was ranked as a low functioning water resource (see table 5). No degraded wetlands were identified within Alternative B's area of direct impact.

Within the 300-foot buffer zone, Alternative B would indirectly impact 652.05 acres of waters of the U.S., including wetlands, of which 14.8 acres are open waters (lakes, streams, or ponds) and 637.25 acres are wetlands (see table 6). Approximately 293.70 acres of wetlands, including ponds, were ranked as high functioning aquatic resources. Approximately 358.30 acres of wetlands, lakes, and streams, were ranked as moderate functioning aquatic resources. Approximately 0.05-acre of wetlands was ranked as a low functioning water resource (see table 5). No degraded wetlands were identified within Alternative B's area of indirect impact.

Summary

Direct Impacts:

Overall Alternative B would result in larger direct impacts when compared with Alternative A by 6.75 acres. Alternative B would result in 7.95 acres more direct impacts on high functioning wetlands, including ponds, when compared with Alternative A (see table 5). On the other hand, Alternative A would result in 1.2 acres more direct impacts on moderate functioning wetlands, including lakes and streams. There is no difference between Alternative A and Alternative B direct impacts on low functioning wetlands; both alternatives would result in direct impacts equal to 0.05-acre.

Indirect Impacts:

Overall Alternative B would result in larger indirect impacts when compared with Alternative A by 70.05 acres. Alternative B would result in 6.75 acres more indirect impacts on high functioning wetlands, including ponds, when compared with Alternative A (see table 5). Alternative B would also result in 63.3 acres more indirect impacts on moderate functioning wetlands. There is no difference between Alternative A and Alternative B indirect impacts on low functioning wetlands, both alternatives would result in indirect impacts equal to 0.05-acre.

In conclusion, Alternative B would result in a larger overall impacted area, including direct and indirect, which would result in 76.8 acres more than Alternative A.

Table 6. Waters of the U.S. impact comparison of GMT1 Alternatives A and B

NWI Type	NWI Description	Functional Category	Alternative A		Alternative B	
			Direct Impact (acres) [%] [a]	Indirect Impact (acres) [%] [b]	Direct Impact (acres) [%] [a]	Indirect Impact (acres) [%] [b]
	WETLANDS					
PEM1/ SS1B	Saturated persistent emergent and broad-leave deciduous scrub shrub wetland	II	**43.4** [60]	**281.6** [48]	**42.3** [53]	**284.2** [43]
PEM1/ SS1E	Seasonally flooded/saturated persistent emergent and broad-leave deciduous scrub shrub wetland	I	**20.7** [28]	**176.2** [30]	**23.2** [29]	**201.7** [31]
PEM1F	Semi-permanently flooded persistent emergent wetland	I	**6.9** [9]	**85.7** [15]	**13.2** [17]	**131.6** [20]
PEM1H	Permanently flooded persistent emergent wetland	I	**0.8** [1]	**22.4** [4]	**0.05** [<0.1]	**16.6** [3]
PSS1C	Seasonally flooded broad-leave deciduous scrub shrub wetland	II	**0.4** [0.6]	**3.4** [1]	**0.4** [1]	**3.0** [<1]
R2EME	Seasonally flooded/saturated lower perennial riverine system with emergent vegetation	I	**0.2** [0.3]	**2.6** [0.4]	**0.05** [d] [<0.1]	**0.05** [d] [<0.1]
PEM1T	Semi-permanently flooded tidal persistent emergent wetland	I	**0.05** [d] [<0.1]	**0.05** [d] [<0.1]	**0.05** [d] [<0.1]	**0.05** [d] [<0.1]
PUSR	Seasonally flooded tidal palustrine unconsolidated shore	III	**0.05** [d] [<0.1]	**0.05** [d] [<0.1]	**0.05** [d] [<0.1]	**0.05** [d] [<0.1]
	Wetlands Impacts [c]		***72.5*** [>99]	***572.0*** [97]	***79.3*** [>99]	***637.25*** [97]
	OPEN WATERS					
L1UBH	Permanently flooded limnetic lacustrine system with an unconsolidated bottom (Lakes)	II	—	**3.8** [<1]	**0.05** [d] [<0.1]	**5.3** [<1]
R2UBH	Permanently flooded lower perennial riverine system with an unconsolidated bottom (Streams/Waterways)	II	**0.2** [<0.1]	**2.5** [<1]	**0.10** [<1]	**1.2** [<1]
PUBH	Permanently flooded palustrine unconsolidated bottom (Ponds)	I	**0.05** [d] [<0.1]	**3.7** [<1]	**0.05** [d] [<0.1]	**8.3** [<1]
	Open Waters Impacts [c]		***0.25*** [<0.3]	***10.0*** [<2%]	***0.2*** [<0.3]	***14.8*** [2]
	TOTAL OPEN WATERS & WETLANDS IMPACTS [c]		***72.75*** [~99.9%]	***582.0*** [>99%]	***79.5*** [>99]	***652.05*** [>99]
UPL	Uplands [c]		**0.1** [<0.1%]	**5.4** [<1%]	**0.2** [<1]	**2.5** [<1]
	TOTAL WATERS, WETLANDS & UPLAND IMPACTS		**72.85**	**587.4**	**79.7**	**654.55**

[a] The percentage of impacts by wetland type is indicated in brackets *[%]* to the right of the acreage of impacts (**bold**).
[b] Indirect impact acreages were determined in a 300-foot buffer from edge of proposed gravel fill. Percentage of indirect impacts by wetland type is indicated in brackets *[%]* to the right of acreage of impacts (**bold**).
[c] Total acreage present may not reflect the sum of the individual cells due to rounding.
[d] Any acreage of impacts less than 0.10-acre was rounded to 0.05-acre to facilitate quantification and analysis.