APPENDIX C

Wetlands Functional Assessment at Mertarvik

Mertarvik Functional Assessment

1.0 Methods

Rapid assessment was employed to quantify the condition of Mertarvik wetlands, adapting the North Slope Rapid Assessment Methodology (NSRAM) developed by the Engineer Research and Development Center (ERDC) for the Alaska District using ArcMap 10.4.1. Three wetland data (WD) points were established based on general areas of development; WD1 is in the center of the town site located at longitude -164.497955, latitude 60.821286; WD2 is near the vertex of the runways located at longitude -164.504164, latitude 60.810319; and WD3 is en route to the quarry and landfill located at longitude -164.521752, latitude 60.815969. WD3 was moved east to avoid capturing the large areas of uplands proximal to the quarry and landfill. Eightymeter and 800-meter buffers were drawn around the wetland data points using ArcMap's buffer geoprocessing tool. (Figure 1)

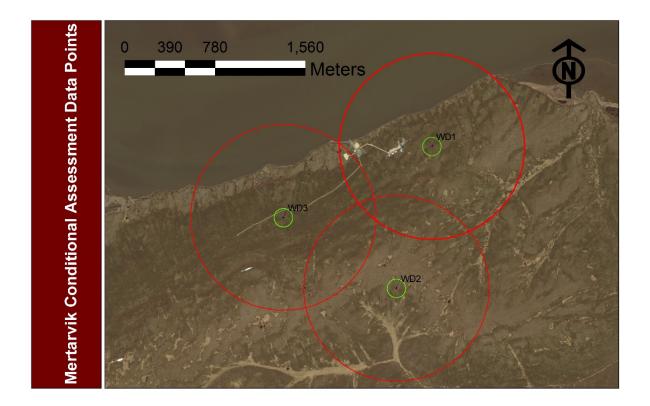


Figure 1. Mertarvik conditional assessment data points, 80m buffer (green), and 800m buffer (red).

The offsite protocols in accordance with the NSRAM were followed to develop numeric values for level of existing disturbance and post-project disturbance in order to quantify the conditional change due to construction of the Mertarvik Infrastructure Development project. All wetland

data points were evaluated as slope wetlands under the hydrogeomorphic classification system and assigned the foothills ecological region due to the geographic location and topographic setting. Open water of the Ninglick River and uplands were deducted from the area calculations of disturbance.

Existing impacts were calculated by analysis of imagery and survey data.

Geographical Information System (GIS) geometry supplied by the Alaska Native Tribal Health Consortium was applied to the wetland assessment areas to calculate the post project conditions. Best professional judgement was used to estimate post project effects of thermokarst and dust deposition.

2.0 Results

2.1 Wetland Assessment Area 1

Wetland assessment area #1 is situated in the center of the proposed town site development area. The area is fairly high gradient and the elevation changes from over 90 meters to 0 meter above sea level over about 1,100 horizontal meters. Some pioneering development exists within the assessment area: a few sheds, roads, evacuation center, barge landing, and staging areas. Trails throughout the assessment area are visible from aerial photography and about 25 percent of those trails contain anthropogenically derived surface water. (Figure 2)

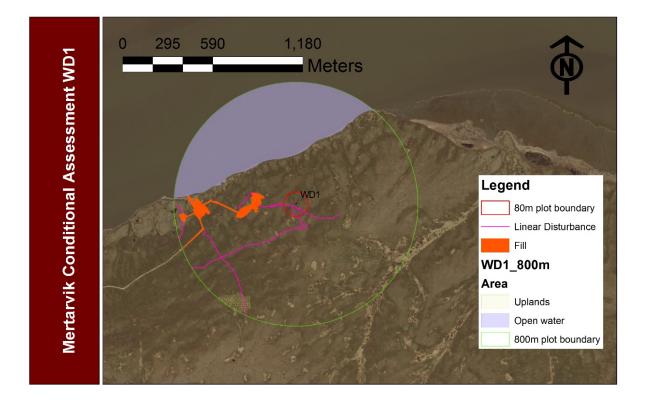


Figure 2. Wetland assessment area 1 pre-project condition

The majority of the development in this wetland assessment area is confined to the area west of plot center, but about 3,500 meters of trails visible from aerial photography intercross the 800-meter radius plot. Surface water is visible in about 25 percent of the trails. Within the 80-meter radius plot, 614 meters of linear disturbance averaging 4 meters wide was observed, creating 2456 m² of local landscape disturbance (LLD). Anthropogenically derived surface water (SW) was observed in about a quarter of the trail area for a total of 614m². No impediment to hydrology (IH) or evidence of dust accumulation (DD) was visible in the aerial photography. Within the 800 meter plot, 28,104m² of area disturbance and 2,857m of linear disturbance averaging 4m in width was measured. Total disturbance in the 800-meter plot (LD) was 40,596 m². Impediment to wildlife (IW) was present in two quadrants of the 800-meter plot and the plot center was 273 meters from plot center. No evidence of thermokarst was visible from aerial photography.

The relative conditional index for wetland assessment area is 0.85.

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		Date:	3/3/2017	Longitude/UTM Easting: -164.497			
	A	rctic Region:	Foothills Coordinate System: NAD83 500				
		HGM Class:	Slope	Imagery Source (Year): 6/3/2015			
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Figure 3. Wetland assessment area 1 data form

2.1.1 Wetland assessment area 1 post project

This wetland assessment area would host the majority of the Mertarvik town site, to include the house pads, school, offices, considerable amount of roads, and all the trails (Figure 4). Construction of the school, playground, and a section of road would add 1,665 m² of impacts to the 80-meter plot, contributing to a total of 2,729 m² of local land disturbance. Anthropogenic surface water would likely increase by 1 percent as a result of the hydraulic impediment created by the road construction in the northern portion of the 80-meter plot. Construction of the road

in the northern portion of the 80-meter plot would also create a hydrologic impediment in two quarter sections of the 80-meter plot.

Landscape disturbance within the 800-meter plot would increase to 137,978 m². Roads, house pads, a school, playground, office buildings, and other features would create an impediment to wildlife in four quarter sections of the 800-meter plot and the road would be 50 meters from plot center.

The conditional multiplier for the post construction wetland assessment area 1 is 0.59, a difference of 0.26 from the pre-project condition of 0.85.

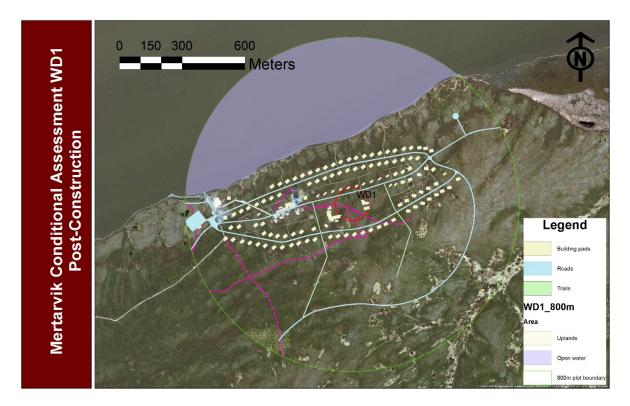


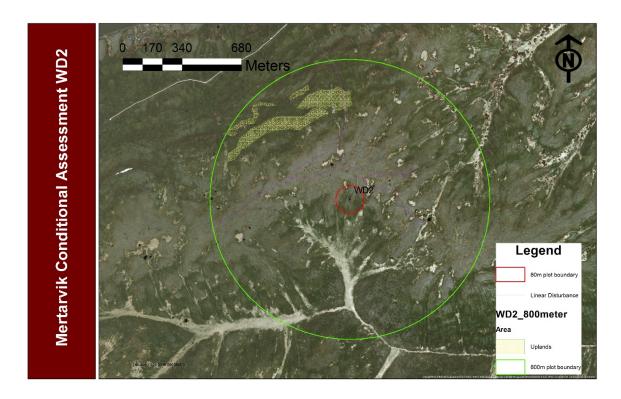
Figure 4. Wetland assessment area 1 post project condition

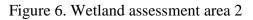
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Site	Name	/Location: Mertarvik Infra	structure Development WAA1	Latitude/UTM Northing: 60.821286			
		Date:	9/17/2017	Longitude/UTM Easting: -164.497955			
	Proje	ect Purpose:	Impact		nstruction		
		ctic Region:	Foothills	Coordinate System: NAD83 5008			
		HGM Class:	Slope	Imagery Source (Year): 6/3/2015			
	Inve	estigator(s):	M. F	erguson			
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		disturbance and/or ma	in-made features.				
				V _{LLD} Subindex Score	0.65		
2	Vsw	Anthropogenically Der	ived Surface Water - percent of	the plot (0 - 100) occupied by	2		
		surface water derived	from human activities, includin	g thermokarst if directly			
		associated, and conspi	cuously linked.				
				V _{sw} Subindex Score	0.88		
3	VIH	Impediment to Hydrol	ogy - number of quarter segme		2		
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				V IH Subindex Score	0.50		
4	V _{DD}	Evidence of Dust - accu	mulation of sediment on vege				
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7.8	VLD		- percent of the plot (0 - 100)		9		
		disturbance and/or ma					
				V _{1D} Subindex Score	0.91		
6	VIW	Impediment to Wildlife	- number of quarter segment	s (0 - 4) assignable in any direction	4		
	• IW		he free movement of wildlife.				
		with impedimento to t		V IW Subindex Score	0.00		
7	VDR	Distance to Roadway	0 - 800) to a roadway of any size,	50			
'	DR		50				
		class, or condition.		V DR Subindex Score	0.10		
8	VTK	Evidence of Thermokars		V DR SUBMUEX SCOPE	No		
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listu	Plot; rbanc ciated =4380 V _{LLD} V _{SW} V _{IH} V _{DD} V _{LD} V _{LD}	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically der Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife	06m2=14%. Assume no additio pacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder pance ved surface water 289	Hydrology Score Biogeochemical Cycling Score and playground+639m2 from road in onal anthropogenic surface water fr litional 1% anthropogenic surface w scale=44056m2, trails=9517m2, bu 7m2=9%	0.73 0.65 ntercrossi om areal vater		
lema Om listu ssoc	VLLD VSW VIH VDD VLD VDR	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically deri Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife Distance to roadway	06m2=14%. Assume no additio pacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder pance ved surface water 289	Hydrology Score Biogeochemical Cycling Score and playground+639m2 from road in onal anthropogenic surface water fr litional 1% anthropogenic surface w scale=44056m2, trails=9517m2, bu 7m2=9%	0.73 0.65 ntercrossi om areal vater		
lema Om listu ssoc	Plot; rbanc ciated =4380 V _{LLD} V _{SW} V _{IH} V _{DD} V _{LD} V _{LD}	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically der Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife	06m2=14%. Assume no additio pacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder pance ved surface water 289	Hydrology Score Biogeochemical Cycling Score and playground+639m2 from road in onal anthropogenic surface water fr litional 1% anthropogenic surface w scale=44056m2, trails=9517m2, bu 7m2=9%	0.73 0.65 ntercrossi om areal vater		
listu	VLLD VSW VIH VDD VLD VDR	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically deri Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife Distance to roadway	06m2=14%. Assume no additio pacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder pance ved surface water ogy	Hydrology Score Biogeochemical Cycling Score Ind playground+639m2 from road in onal anthropogenic surface water fr litional 1% anthropogenic surface w scale=44056m2, trails=9517m2, bu 7m2=9%	0.73 0.65 ntercrossi om areal vater		
listu	VLLD VSW VIH VDD VLD VDR	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically deri Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife Distance to roadway	06m2=14%. Assume no additio pacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder pance ved surface water 289 st Assessment Score	Hydrology Score Biogeochemical Cycling Score Ind playground+639m2 from road in onal anthropogenic surface water fr litional 1% anthropogenic surface w scale=44056m2, trails=9517m2, bu 7m2=9% x Scores 0.65 0.88 0.50 No 0.91 0.00 0.10 No	0.73 0.65 ntercrossi om areal vater		
Rema 30m listu	VLLD VSW VIH VDD VLD VDR	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically deri Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife Distance to roadway	06m2=14%. Assume no additio bacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder bance ved surface water DBY st Assessment Score Habita	Hydrology Score Biogeochemical Cycling Score Ind playground+639m2 from road in onal anthropogenic surface water fr litional 1% anthropogenic surface w scale=44056m2, trails=9517m2, bu 7m2=9% x Scores 0.65 0.88 0.50 No 0.91 0.00 0.10 No st t 0.39	0.73 0.65 ntercrossi om areal vater		
Rema 30m listu	VLLD VSW VIH VDD VLD VDR	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically deri Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife Distance to roadway	06m2=14%. Assume no additio bacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder bance ved surface water 28y st Assessment Score Habita Hydrology	Hydrology Score Biogeochemical Cycling Score and playground+639m2 from road in bonal anthropogenic surface water fr litional 1% anthropogenic surface water scale=44056m2, trails=9517m2, bu 7m2=9% x Scores 0.65 0.88 0.50 No 0.91 0.00 0.10 No st t 0.39 y 0.73	0.73 0.65 ntercrossi om areal vater		
Rema 30m listu	VLLD VSW VIH VDD VLD VDR	total VIId= 2729m2/2010 e because additional imp with road. Landscape di 19m2. Total VId=97382+4 Local landscape disturf Anthropogenically deri Impediment to hydrolo Evidence of dust Landscape disturbance Impediment to wildlife Distance to roadway	06m2=14%. Assume no additio bacts would be non-linear; add surbance from roads at 800m 40596m2=137978m2/150041 Off-Site Variable Subinder bance ved surface water DBY st Assessment Score Habita	Hydrology Score Biogeochemical Cycling Score Ind playground+639m2 from road in Ind playground+639m2 from	0.73 0.65 ntercrossi om areal vater		

Figure 5. Wetland assessment area 1 post project data form

2.2 Wetland assessment area 2

Wetland assessment area 2 is centered on a ridgeline near the vertex of the proposed main runway and crosswind runway, at about 325m above sea level. The elevation increases to 106m in the west, but drops off in all other directions. The area is currently undeveloped, but a few trails intercross the 800m radius plot boundary (Figure 6).





This wetland assessment area is near the site of the proposed airport, which would consist of a main runway, crosswind runway, and apron. It is currently undeveloped, but about 2,900 meters of trails intercross the 800-meter plot. These trails are about 4 meters wide and create an areal disturbance of about 11,590 m² within the 800-meter radius plot (LD). There is no disturbance, anthropogenically derived surface water, evidence of dust, or impediment to hydrology within the 80-meter radius plot.

Upland area of 77,999 meters was deducted from the 2,010,285 m² 800-meter radius, leaving 1,932,286 m² of wetlands. A trail entered the 800-meter plot due north of plot center, passing within 203 meters of center, and exiting the plot to the west, but about 3,500 meters of trails visible from aerial photography intercross the 800-meter radius plot. Surface water is visible in about 25 percent of the trails. Within the 80-meter radius plot, 614 meters of linear disturbance averaging 4 meters wide was observed, creating 2456 m² of local landscape disturbance (LLD). Anthropogenically derived surface water (SW) was observed in about a quarter of the trail area, a total of 614 m². There was no impediment to hydrology (IH) or evidence of dust accumulation (DD) visible in the aerial photography. Within the 800-meter plot, 28,104 m² of area disturbance and 2,857 meters of linear disturbance averaging 4 meters in width was measured. Total disturbance in the 800-meter plot (LD) was 40,596 m². Impediment to wildlife (IW) was

present in two quadrants of the 800-meter plot and the plot center was 273 meters from plot center. There was no evidence of thermokarst visible from aerial photography.

The relative conditional index for wetland assessm	ent area 2 is 0.97.
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0		-	Section A: C	Offsite Data				
Sit	e Name	e/Location: Mertary	k Infrastructure Developme	nt Latitude/UTM	Northing: 60.810319			
		Date: 9/9/2017 Longitude/UTM Easting: -164.50						
	Ar	ctic Region:	Foothills	Coordinat	Coordinate System: NAD83 5008			
		HGM Class:						
		estigator(s):		M. Ferguson				
100	10 C		es 1-4 using an 80 meter r					
1	VLLD		Disturbance - percent of		upled by	0		
		anthropogenic d	isturbance and/or man-n			100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100		
	-				LLD Subindex Score	1.00		
2	Vsw		ly Derived Surface Water			0		
		by surface water derived from human activities, including thermokarst if directly associated, and conspicuously linked.						
		unectly associate	eu, and conspicuously ini			4 00		
		1			sw Subindex Score	1.00		
3	VIH		lydrology - number of qu		assignable in any	0		
		unection that ha	ve hydrologic impedime					
					V IH Subindex Score	1.00		
4	VDD		- accumulation of sedim	ent on vegetation, a	ppearing as areas	No		
lata	mina	of discoloration.	es 5-8 using an 800 meter	radius plat		in the second		
-	V _{LD}		bance - percent of the p		by anthropogenic	1		
5	VLD		or man-made features.	or (0 - 100) occupied	by antihopogenic	1		
		distandance and	or man made reatores.		/ Cubinday Coora	1 00		
6		Impodiment to 1	Vildlife number of quar		V LD Subindex Score	1.00 0		
0	V _{IW} Impediment to Wildlife - number of quarter segments (0 - 4) assignable in an							
		direction with impediments to the free movement of wildlife.						
-		Distance to Dead	uusu minimum distance		/ IW Subindex Score	1.00		
'	VDR		way - minimum distance	in meters (0 - 800) t	o a roadway or any	406		
		size, class, or condition.						
-				4	/ _{DR} Subindex Score	0.81		
8	V _{TK}	Evidence of Therm	lokarst			No		
					Habitat Score	0.91		
					Illudrology Cooro			
				Riagaachar	Hydrology Score	1.00		
			rail NW of plot center; do	oubled distance to re	nical Cycling Score	1.00 1.00 dex		
alua	ation f		n plot 2897m linear distu	oubled distance to re	nical Cycling Score	1.00 1.00 dex		
alua	ation f	or low traffic. 800n	n plot 2897m linear distu	oubled distance to re bance * 4m width=1	nical Cycling Score	1.00 1.00 dex		
alua	ation f	or low traffic. 800n	n plot 2897m linear distu 0285=1932286m2. Off-Site Variable	oubled distance to re bance * 4m width=1	nical Cycling Score	1.00 1.00 dex		
alua	ation f bined	or low traffic. 800n area 77,999m2-201 Local landscape	n plot 2897m linear distu 0285=1932286m2. Off-Site Variable	bubled distance to re bance * 4m width=1 Subindex Scores	nical Cycling Score	1.00 1.00 dex		
alua	otion f bined V _{LLD}	or low traffic. 800n area 77,999m2-201 Local landscape	oplot 2897m linear distur 0285=1932286m2. Off-Site Variable disturbance ly derived surface water	bubled distance to re bance * 4m width=1 Subindex Scores	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical	Off-Site Variable Off-Site Variable Disturbance Iy derived surface water ydrology	Subindex Scores	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{DD}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h	n plot 2897m linear distur D285=1932286m2. Off-Site Variable disturbance ly derived surface water ydrology	Subindex Scores	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{DD}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur	oplot 2897m linear distur D285=1932286m2. Off-Site Variable disturbance ly derived surface water ydrology bance	Subindex Scores 1.00 1.00 1.00 1.00 1.00 1.00	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{DD} V _{LD}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v	Off-Site Variable Off-Site Variable disturbance ly derived surface water ydrology bance vildlife	Subindex Scores 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{LD} V _{LD} V _{LD} V _{IW}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v Distance to road	Off-Site Variable Off-Site Variable disturbance ly derived surface water ydrology bance vildlife way	Subindex Scores 1.00 1.00 1.00 1.00 1.00 1.00 0.00 0.00 0.81	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{DD} V _{LD}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v	Off-Site Variable Off-Site Variable disturbance ly derived surface water ydrology bance vildlife way	Subindex Scores 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{LD} V _{LD} V _{LD} V _{IW}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v Distance to road	Off-Site Variable Off-Site Variable Disturbance ly derived surface water ydrology bance vildlife way mokarst	Subindex Scores 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.81 No	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{LD} V _{LD} V _{LD} V _{IW}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v Distance to road	Off-Site Variable Off-Site Variable Disturbance Ily derived surface water lydrology bance vildlife way mokarst Assessme	Subindex Scores	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{LD} V _{LD} V _{LD} V _{IW}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v Distance to road	Off-Site Variable Off-Site Variable Disturbance Ily derived surface water lydrology bance vildlife way mokarst Assessme Hd	Subindex Scores	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{LD} V _{LD} V _{LD} V _{IW}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v Distance to road	Off-Site Variable Off-Site Variable Disturbance Iy derived surface water ydrology bance vildlife way mokarst Assessme Ho Hydr	Subindex Scores	nical Cycling Score	1.00 1.00 dex		
alua	V _{LLD} V _{LLD} V _{SW} V _{IH} V _{LD} V _{LD} V _{LD} V _{IW}	or low traffic. 800n area 77,999m2-201 Local landscape Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to v Distance to road	Off-Site Variable Off-Site Variable Disturbance Ily derived surface water lydrology bance vildlife way mokarst Assessme Hd	Subindex Scores	nical Cycling Score	1.00 1.00 dex		

Figure 7. Wetland assessment area 2 data form

2.2.1 Wetland Assessment Area 2 post-project

Wetland assessment area 2 was centered near the vertex of the proposed main and crosswind runways on the ridge top south of the Mertarvik townsite (Figure 8). No local landscape disturbance, anthropogenic surface water, or impediments to hydrology would occur within the 80-meter plot, but it is likely dust deposition would be observed due to the quantities of gravel required for the construction of the two runways.

Roads and runways would create $110,413 \text{ m}^2$ of landscape disturbance within the 800-meter plot, impede wildlife in three quarter segments, and would be constructed within 100 meters of the plot center.

The conditional multiplier for the post construction wetland assessment area 1 is 0.80, a difference of 0.17 from the pre-project condition of 0.97.

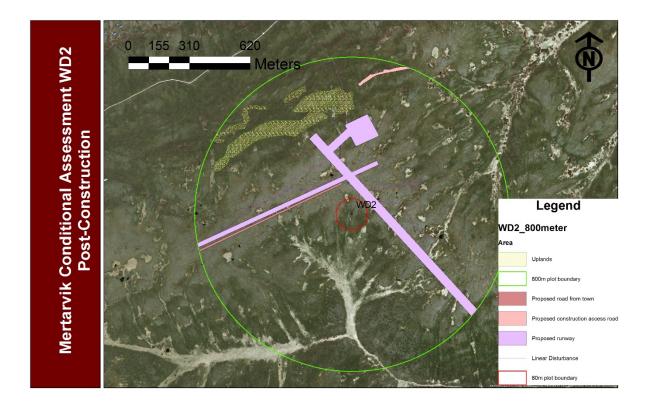


Figure 8. Wetland Assessment Area 2 post project condition

20211002		ALASI		ction A: Offsite D					
Site Na	me	Location: Mertarvi				Northing: 60.81	0319		
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Date: 9/17/2017		Longitude/UTM Easting: -164.504164					
Pr	rojec	ect Purpose: Impact						struction	
		rctic Region: Foothills Coordinate System: NAD83 5008							
		HGM Class:	Slope		Imagery Source (Year): 6/3/2015				
ľ	Inve	stigator(s):		M.	Ferguson				
		values for variable	es 1-4 using an a	80 meter radius p	lot.				
1 V _{II}	D	Local Landscape	Disturbance - pe	ercent of the plot	(0 - 100) occ	upied by		0	
		anthropogenic di	sturbance and/	or man-made feat	ures.				
	- 1					ULD Subindex S	Score	1.00	
2 V _{sv}	w	Anthropogenical	y Derived Surfa	ce Water - percen				0	
				uman activities, ir					
		associated, and o							
	1					sw Subindex S	Score	1.00	
3 V		Impediment to H	vdrology - num	ber of quarter seg			_	0	
		direction that ha				,		-	
	1				1.2	V IH Subindex S	Score	1.00	
4 V _D		Evidence of Dust	- accumulation	of sediment on ve	getation an				
• • D	U	discoloration.	accumulation	or scument off ve	Beration, ap	pearing as alea	501	Yes	
Determ	ine	values for variable	as 5-8 using an	800 meter radius	nlot				
5 V.	-	and the second se		of the plot (0 - 10	internet in the second s	by anthronoge	nic	6	
J V []	D	disturbance and			o) occupicu	ву антнорове		0	
	ł	alocar barree array				V LD Subindex S	Score	0.98	
6 V.		Impadiment to V	/ildlifa_numbo	r of quarter com				3	
O VIV	V _{IW} Impediment to Wildlife - number of quarter segments (0 - 4) assignable in any direction with impediments to the free movement of wildlife.					′ –	Э		
	-	unection with m	pediments to ti	ne nee movemen		Cubinday		0.25	
7 V	+	Distance to Dead		distance in moto		V IW Subindex S		Talada	
7 V _D	R			distance in mete	rs (U - 800) t	o a roadway of	any	100	
	- 1-	size, class, or cor	altion.					0.00	
						V DR Subindex S	core	0.20	
0 V		1 (71	- Anna		-		1		
8 V _T	ĸ	Evidence of Therm	okarst					No	
8 V _T	к	Evidence of Therm	okarst			Habitat S	Constants -	0.59	
8 V ₁	пк [Evidence of Therm	okarst			Hydrology S	core	0.59 0.99	
lemark	s: 1	00m to runway, 9	8886m2 runwa		m2 access ro	Hydrology S mical Cycling S ad, 7359m2 ro	core core ad fron	0.59 0.99 0.80 n town.	
Remark Total dis 201028	s: 1 stur		8886m2 runwa within 800m r 10,413/1,932,21	adius. Three upla 86=5.7%. Dust de	m2 access ro nd polygons position exp	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Total dis 201028 Required	stur 5=1 d fo	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site	adius. Three upla	m2 access ro nd polygons position exp ex Scores	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Total dis 201028 Required Vi	s: 1 stur 5=1 d fo	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape o	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Total dis 201028 equired Vi Vi	stur stur 5=1 d fo	00m to runway, 9 bance 110,413m2 932286m2. Vid 1 r runway Local landscape o Anthropogenical	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance y derived surface	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Total dis 201028 Required Vi Vi Vi	stur 5=1 d fo	00m to runway, 9 bance 110,413m2 932286m2. Vid 1 r runway Local landscape o Anthropogenical Impediment to h	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance y derived surface	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Fotal dis 201028 Required V V V	ss: 1 stur 5=1 d fo	00m to runway, 9 bance 110,413m2 932286m2. Vid 1 r runway Local landscape o Anthropogenical	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance y derived surface	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Fotal dis 201028 Required V V V	stur 5=1 d fo	00m to runway, 9 bance 110,413m2 932286m2. Vid 1 r runway Local landscape o Anthropogenical Impediment to h	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance ly derived surface ydrology	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark otal dis 201028 equired V ₁ V ₂ V ₁ V ₁	ss: 1 stur 5=1 d fo	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape of Anthropogenical Impediment to h Evidence of dust	8886m2 runwa within 800m ra 10,413/1,932,2: Off-Site listurbance ly derived surfac ydrology bance	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00 Yes	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
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Remark Total dis 201028 equired V ₁ V ₂ V ₁ V ₁ V ₁ V ₁ V ₁ V ₁	ss: 1 stur 5=1 d fo sw in DD LD	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape of Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to w	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance ly derived surface yderology bance rildlife way	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00 Yes 0.98 0.25	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Total dis 201028 equired V ₁ V ₂ V ₁ V ₁ V ₁ V ₁ V ₁ V ₁	ss: 1 stur 5=1 d fo sw in DD LD iw DR	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape of Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to w Distance to road	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance ly derived surface yderology bance rildlife way	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00 Yes 0.98 0.25 0.20	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Fotal dis 201028 equired V ₁ V ₂ V ₁ V ₁ V ₁ V ₁ V ₁ V ₁	ss: 1 stur 5=1 d fo sw in DD LD iw DR	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape of Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to w Distance to road	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance y derived surfac ydrology bance rildlife way nokarst	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00 Yes 0.98 0.25 0.20 No	Hydrology S mical Cycling S ad, 7359m2 ro combined area	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Fotal dis 201028 equired V ₁ V ₂ V ₁ V ₁ V ₁ V ₁ V ₁ V ₁	ss: 1 stur 5=1 d fo sw in DD LD iw DR	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape of Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to w Distance to road	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance y derived surfac ydrology bance rildlife way nokarst	adius. Three upla 86=5.7%. Dust de Variable Subinde	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00 Yes 0.98 0.25 0.20 No	Hydrology S mical Cycling S ad, 7359m2 ro combined area ected due to g	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
Remark Fotal dis 201028 equired V ₁ V ₂ V ₁ V ₁ V ₁ V ₁ V ₁ V ₁	ss: 1 stur 5=1 d fo sw in DD LD iw DR	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape of Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to w Distance to road	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance y derived surfac ydrology bance rildlife way nokarst	Adius. Three upla 86=5.7%. Dust de Variable Subinde ce water Assessment Score Habitat	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00 Yes 0.98 0.25 0.20 No	Hydrology S mical Cycling S ad, 7359m2 ro combined area ected due to g	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	
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Remark Fotal dis 201028 required V ₁ V ₂ V ₁ V ₁ V ₁ V ₁ V ₁ V ₁	ss: 1 stur 5=1 d fo sw in DD LD iw DR	00m to runway, 9 bance 110,413m2 932286m2. Vld 1 r runway Local landscape of Anthropogenical Impediment to h Evidence of dust Landscape distur Impediment to w Distance to road	8886m2 runwa within 800m ra 10,413/1,932,23 Off-Site listurbance y derived surfac ydrology bance rildlife way nokarst	Adius. Three upla 86=5.7%. Dust de Variable Subinde ce water Assessment Score Habitat	m2 access ro nd polygons position exp ex Scores 1.00 1.00 1.00 Yes 0.98 0.25 0.20 No	Hydrology S mical Cycling S ad, 7359m2 ro combined area ected due to g	core core ad fron 77,999	0.59 0.99 0.80 n town. 9m2-	

Figure 9. Wetland assessment area 2 post construction data form

2.3 Wetland assessment area 3

Wetland assessment area 3 is centered along the route from the townsite to the quarry and landfill. The plot center was shifted east to avoid capturing a large area of uplands in the vicinity of the quarry and landfill. The topography in the 800-meter plot slopes 375 meters in the southern extent of the 800-meter plot boundary to sea level in the north, over a distance of about 1,200 meters. A road extend from the townsite through the plot about 1,250 meters towards the quarry, then converts to a trail for the remaining 388 meters before exiting the plot. Several trail systems intercross the plot, primarily in the northern half. Three homes occupy about 240 m² along the bank of the Ninglick River in the northern half of the 800-meter plot and the is another 160 m² of disturbance in proximity to the houses. The barge terminal complex occupies 2,063 m² of the 800-meter plot. A total of 6,439 meters of roads and trails intercross the 800-meter plot.

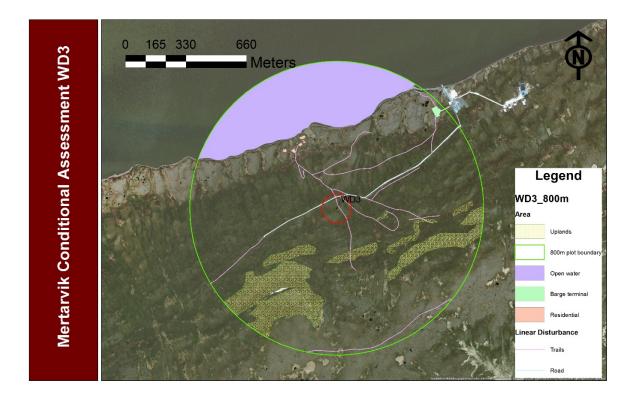


Figure 10. Wetland assessment area 3

This wetland assessment area includes the road and trail extending from the townsite to the quarry and landfill. Uplands covering $175,127 \text{ m}^2$ and $350,534 \text{ m}^2$ of open water fall within the 800-meter plot. Three houses and some attendant disturbance are in the northern portion of the assessment area. Approximately 6,439 meters of roads and trails cross the wetland assessment area; the trails and roads have a 4-meter average width of disturbance. Total disturbance from linear features is 1,432 m² inside the 80-meter plot and 25,756 m² inside the 800-meter plot.

Most of the wetland assessment area is currently undeveloped, but the trails and roads passing through the 80-meter plot result in 7 percent local land disturbance (LLD) and 2 percent anthropogenically derived surface water (SW). Hydrology is impeded by the road (IH) in two quadrants of the 80-meter plot, and there is no evidence of dust deposition (DD) visible in the aerial photography.

After removing the surface water of the Ninglick River and uplands from the area of the 800meter plot, 1,484,339 m² of wetlands remain in the assessment area. The combined percentage of disturbance to the wetlands in the 800-meter plot is 2 percent; there is no impediment to the free movement of wildlife, the road is 55 meters from plot center, and no evidence of thermokarst is visible from aerial photography.

The relative conditional index for wetland assessment area 3 is 0.71

			Section A: Of	APID VETLAND ASSESSMENT				
ite	Name/L	ocation: Mert	arvik Infrastructure Developme					
		Date:	8/16/2016					
		ic Region:	Foothills	Coordinate System: NAD83 50(08			
		GM Class:	Slope	Imagery Source (Year): 6/3/2015				
_		stigator(s):		M. Ferguson				
Del	_		variables 1-4 using an 80					
1	Yus		ape Disturbance - percent of th		7			
	- 8	anthropogeni	c disturbance and/or man-mad					
_				¥ 110 Subindez Score	0.85			
2	¥ 5¥	by surface wa		percent of the plot (0 - 100) occupied es, including thermokarst if directly	2			
			104 415	Y sy Subindez Score	0.88			
3	۷	1. O	Hydrology - number of quarter have hydrologic impediments.	segments(0 - 4) assignable in any	2			
			240 25 25	V IN Subindez Score	0.50			
4	×	Evidence of D discoloration.		on vegetation, appearing as areas of	No			
Det	termin		rariables 5-8 using an 80					
5	۷		sturbance - percent of the plot nd'or man-made features.	t (0 - 100) occupied by anthropogenic	2			
ļ	1			¥ 10 Subindez Score	1.00			
6	♥ me Impediment to Wildlife - number of quarter segments(0 - 4) assignable in any direction with impediments to the free movement of wildlife.				0			
ļ				F ny Subindez Score	1.00			
7	¥.se	Distance to R size, class, or	- 1997 - 2012 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997	neters (0 - 800) to a roadway of any	55			
ļ				V se Subindez Score	0.11			
8	٧,	Evidence of Thermokarst						
8				Habitat Score	0.51			
8				Habitat Score Hydrology Score	0.51			
Rei			rer 175127m2 and open w	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	ils an	d roads 4m x	rer 175127m2 and open w	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800 sturbance. 2463m2 areal disturb m plot center.	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	ils an	d roads 4m x ses and barg	rer 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800 sturbance. 2463m2 areal disturb m plot center.	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	nils an n hou	d roads 4m x ses and barg Local landsca	rer 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro Off-Site Yariable S	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindez Scores	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	nils an In hou Yu	d roads 4m x ses and barg Local landsca Anthropogeni	rer 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	vils an hou Vu Vs Vu	d roads 4m x ses and barg Local landsca Anthropogeni	er 175127m2 and open w 6433=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water hydrology	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	vils an hou Yu Yu Yu Yu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d	er 175127m2 and open w 6433=25756m2 linear di e terminal. Road 55m fro Off-Site Yariable S ope disturbance cally derived surface water hydrology ust	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores 0.83 0.88 0.50	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vs Vu Vs Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di	er 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S pe disturbance cally derived surface water hydrology ust sturbance	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores 0.83 0.88 0.50 No 1.00	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vu Vu Vu Vu Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di Impediment to	er 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water hydrology ust sturbance wildlife	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores 0.83 0.88 0.50 No 1.00 1.00	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vs Vu Vu Vu Vu Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di Impediment to Distance to ro	rer 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water hydrology ust sturbance wildlife iadway	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores 0.83 0.88 0.50 No 1.00 1.00 0.11	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vs Vu Vu Vu Vu Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di Impediment to	rer 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water hydrology ust sturbance wildlife iadway	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores 0.83 0.88 0.50 No 1.00 1.00	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vs Vu Vu Vu Vu Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di Impediment to Distance to ro	er 175127m2 and open w 6439=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water hydrology ust sturbance wildlife sadway termokarst Assessment	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb plot center. ubindez Scores 0.83 0.88 0.50 No 1.00 1.00 0.11 No Scores	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vs Vu Vu Vu Vu Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di Impediment to Distance to ro	er 175127m2 and open w 6433=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water hydrology ust sturbance wildlife sadway hermokarst Assessment Kabitat	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb plot center. ubindex Scores 0.83 0.88 0.50 No 1.00 0.10 0.11 No Scores	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vs Vu Vu Vu Vu Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di Impediment to Distance to ro	er 175127m2 and open w 6433=25756m2 linear di e terminal. Road 55m fro Off-Site Yariable S ape disturbance cally derived surface water hydrology ust sturbance wildlife sadway termokarst Assessment Habitat Hydrology	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb a plot center. areal disturb ubindex Scores 0.83 0.88 0.50 No 1.00 1.00 0.11 No Scores Ø.51 Ø.79	<i>0.79</i> <i>0.83</i> plot.			
Rei Tra	Vu Vu Vs Vu Vu Vu Vu Vu	d roads 4m x ses and barg Local landsca Anthropogeni Impediment to Evidence of d Landscape di Impediment to Distance to ro	er 175127m2 and open w 6433=25756m2 linear di e terminal. Road 55m fro Off-Site Variable S ope disturbance cally derived surface water hydrology ust sturbance wildlife sadway hermokarst Assessment Kabitat	Hydrology Score Riogeochemical Cycling Score ater occupies 350534m2 of 800m sturbance. 2463m2 areal disturb m plot center. ubindex Scores 0.83 0.88 0.50 No 1.00 1.00 1.00 1.00 5 cores 0.51 0.79 0.63	<i>0.79</i> <i>0.83</i> plot.			

Figure 11. Wetland assessment area 3 data form

2.3.1 Wetland Assessment Area 3 post-project

Wetland assessment area 3 is situated between the town site and the quarry (Figure 12). No additional features would be constructed within the 80-meter plot. Dust deposition is not expected to occur within the plot.

Landscape disturbance within the 800-meter plot would double to 4 percent as a result of the 26,074 m² associated with the construction of a road though the northern portion of the plot. Construction of the road would add impediment to the movement of wildlife through three quarter segments of the 800-meter plot. Thermokarst features are likely to develop

along the south margin of the road due to the impoundment potential created by its perpendicular to the gradient path across the entire 800-meter radius plot.

The conditional multiplier for the post construction wetland assessment area 3 is 0.64, a difference of 0.07 from the pre-project condition of 0.71.

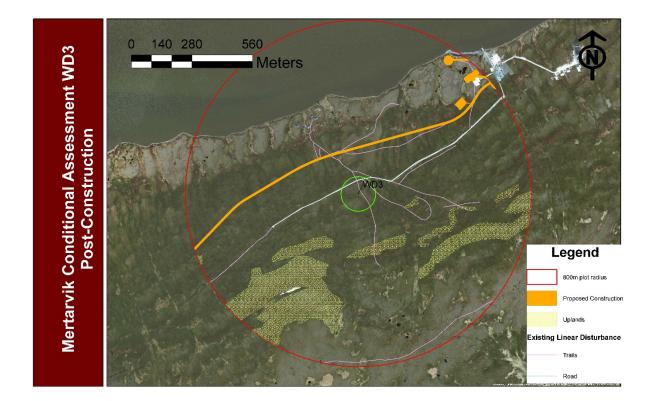


Figure 12. Wetland assessment area 3 post project condition

		Section A:	Offsite D	ata			
Site Name	/Location:	Mertarvik Infrastructure Developme	ent WAA3	Latitude/UT	M Northing:	60.815969	
	Date:	9/17/2017 Longitude/UTM Easting: -164.521752		V MARTINE AND AND AND AND AND			
Proje	ct Purpose:	Impact		Asses	sment Type:	Post-con	struction
Ar	ctic Region:	Foothills		Coordinate System: NAD83 5008			
	HGM Class:	Slope	lope Imagery Source (Year): 6/3/2015				
Inve	estigator(s):		м.	Ferguson			
Determine	values for	variables 1-4 using an 80 meter	r radius p	lot.			
1 V _{LLD}		Local Landscape Disturbance - percent of the plot (0 - 100) occupied by					7
	anthropo	ogenic disturbance and/or man-r	made feat				
	1				V LLD Subin		0.83
2 V _{SW}		ogenically Derived Surface Water					2
	by surface water derived from human activities, including thermokarst if directly						
	associate	ed, and conspicuously linked.					
					V _{sw} Subin		0.88
3 V _{IH}		ent to Hydrology - number of qu that have hydrologic impedime		ments (0 -	4) assignab	le in any	2
	unection	that have hydrologic impedime	ints.		V IH Subin	dex Score	0.50
4 V _{DD}	Evidence	of Dust - accumulation of sedim	ent on ve	addation a			0.50
4 VDD	discolora		ient on ve	egetation, a	hheat tilk as	aleas of	No
Determine	12 24	variables 5-8 using an 800 met	er radius	plot.			
5 V _{LD}		e Disturbance - percent of the p		1. S. 20	d by anthro	pogenic	4
		nce and/or man-made features.			C21010723		
					V _{LD} Subin	dex Score	1.00
6 V _{IW}	Impedim	ent to Wildlife - number of quar	ter segme	ents (0 - 4)			3
		with impediments to the free m	-		-		
		The second s			V IW Subin	dex Score	0.25
7 V _{DR}	Distance	to Roadway - minimum distance	e in meter	rs (0 - 800)			55
	B Distance to Roadway - minimum distance in meters (0 - 800) to a roadway of any size, class, or condition.						
					V DR Subin	dex Score	0.11
8 V _{TK}	Evidence o	f Thermokarst					Yes
					Hab	itat Score	0.51
					Hydrold	gy Score	0.70
				Biogeoch	emical Cycl		0.70
		ruction would add 26074m2 dis n2=3.6% Vld	turbance	within the	800m plot	radius.	
		Off-Site Variable	e Subinde	x Scores			
VLLD		dscape disturbance		0.83			
V _{sw}		ogenically derived surface water		0.88			
VIH	Impedim	ent to hydrology		0.50			
V _{DD}	Evidence	of dust		No			
VLD	Landscap	e disturbance		1.00			
Viw	Impedim	ent to wildlife		0.25			
VDR	Distance	to roadway		0.11			
V _{TK}	Evidence	of thermokarst		Yes			
				-			
			ent Score				
			Habitat	0.5			
				1 A.			
			drology	0.3			
		Biogeochemica	l Cycling	0.3 0.3			
			l Cycling ier Score		70		

Figure 13. Wetland assessment area 3 post project data form

3.0 Functional Assessment

3.1 Methods

A functional assessment was performed to quantify the functions provided by the six Cowardin classes of wetlands that would be impacted by the construction of the Mertarvik Infrastructure Development Project. The Alaska Regulatory Best Professional Judgement Characterization (ARBPJC) methodology presented in Regulatory Guidance Letter (RGL) 09-01 was used, absent a more appropriate method. No implication of compensatory mitigation was included in the assessment. Data forms from the 2005 wetland delineation conducted by USACE Regulatory were used to complete the ARBPJC forms. The functional assessment multipliers for each Cowardin class were applied to the acreage of impact associated with each infrastructure feature. The product was multiplied by the pre and post project conditional assessment in order to generate a functional differential between pre and post project conditions, expressed as a functional capacity unit.

3.2 Assumptions and caveats

Wetlands with six or more plant species are considered to have high plant diversity. Breakup falls outside the growing season, so is not considered inundation during the growing season. Water detention was assumed high if the soils was overlain by 8 inches or more of organic material. Aerial cover greater than 50% was considered dense. In the event requisite data was not included on the 2005 wetland delineation data forms, that subindex was removed from consideration; e.g., the palustrine emergent persistent data form 2b did not include soils data due to the presence of primary hydrology indicators and obligate wetland plant species, so subindex C5 was removed from the total calculation and reduced the potential score from 43 to 42.

3.3 Results

3.3.1 Palustrine Emergent Persistent

Palustrine emergent persistent (PEM1) wetlands represent about 12 percent of the total delineated area. They are usually located in drainage ways and in depressions where snow persists until late spring. The communities are typically dominated by bluejoint grass with few herbs and almost no willows. Herbs within these communities include *Petasites frigidus, Equisetum sp., Athyrium filix-femina*, dwarf dogwood (*cornus suecica*), and *Angelica lucida*. They are well distributed within the delineated area but are usually common near willow thickets. Palustrine emergent persistent wetlands also include wet sedge meadow tundra dominated by *Carex aquatilis, Potentilla palustris,* and green sphagnum. Wet sedge meadow tundra is usually found in areas with standing water along drainages that cross the bottom hills, lake fringes, and crisscross the top plateau tundra.

These wetlands would be impacted primarily by the construction of the runways, which would cause the loss of 5.3 acres including the apron. Roads would destroy 1.2 acres and the quarry would remove .2 acres (Figure 14). These wetlands received a functional score of 21/42 (0.5) and function at a high level in terms of nutrient and toxicant removal, production and export of organic material, and educational or scientific value. Moderate scores were returned in flood flow alteration, sediment removal, general habitat suitability, and native plant richness. This class

provides low uniqueness and heritage functions. Erosion control, shoreline stabilization, and general fish habitat were not evaluated.

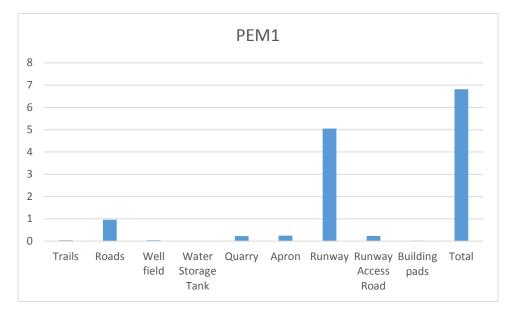


Figure 14. Acreage of impacts to palustrine emergent wetlands arranged by feature type

Wetland assessment area 2 (WAA2) was selected as the most appropriate conditional multiplier to calculate functional capacity differential because most of the impacts to this wetland type would result from the construction of the runway. Palustrine emergent persistent wetlands totaling 6.8 acres would be impacted by the project, applying the pre-project conditional multiplier of 0.97 for WAA2 equals 6.6 conditional units. Subtract the pre-project condition from the post project conditional value (6.8 acres multiplied by post-project conditional multiplier of 0.8); 5.4, to calculate the 1.2 conditional differential. This value is multiplied by the functional score of 0.5 provided by the ARBPJC to derive -0.6 functional capacity units from the impact of the proposed activity on palustrine emergent persistent wetlands in the project area.

3.3.2 Palustrine scrub-shrub

The palustrine scrub-shrub wetlands represent about 58 percent of the delineated area and were separated into the following subclasses depending on the habitat of the dominant species: palustrine scrub-shrub evergreen wetlands dominated by crowberry tundra and birch-ericaceous shrub communities (937 acres), palustrine scrub-shrub/moss peat wetlands where sphagnum and low growing shrubs are the main component of the vegetation community (580 acres), and palustrine scrub-shrub broad leaved-deciduous dominated by willow (*Salix pulcha*) (324 acres). Palustrine scrub-shrub evergreen wetlands were found within the proposed village townsite location. The palustrine scrub-shrub/moss peat wetlands are located at a slightly higher elevation, usually on mounds of about 1 foot in height. Palustrine scrub-shrub broad-leaved deciduous wetlands are well spread out in the general sampled area along several drainage ways and depressions.

3.3.2.1 Palustrine emergent persistent/scrub-shrub

Palustrine emergent persistent/scrub-shrub wetlands represent approximately 16 percent of the total delineated area. They were divided into two groups: palustrine emergent persistent/scrub-shrub broad-leaved deciduous (240 acres). Palustrine emergent persistent/scrub-shrub/moss are wetlands located at the foot hills, with a similar component of low growing evergreen species as the palustrine scrub-shrub evergreen wetlands (top plateau), but with a conspicuous cover of tussock cottongrass (*Eriophorum vaginatum*). These wetlands also have a large component of rust-color sphagnum, which gives this community a rusty color and a deep 16-foot peat layer. Palustrine emergent persistent/scrub-shrub deciduous wetlands are dominated by bluejoint grass, but have about 25 percent of willow cover. The vegetation community seems to be an intermediate state between willow-dominated communities and bluejoint grass meadows. They are found along drainage ways, depressions and slopes, and have a large component of wildflowers, herbs, and ferns.

Palustrine emergent persistent/palustrine scrub-shrub wetlands would be impacted primarily by the construction of the runways, which would cause the loss of 4 acres including the apron. Roads would destroy 0.7 acres (Figure 15). These wetlands received a functional score of 20/43 (0.47) and function at a high level in terms of production and export of organic material, general habitat suitability, and educational or scientific value. Moderate scores were returned in nutrient and toxicant removal, flood flow alteration, sediment removal, and native plant richness. This class provides low uniqueness and heritage functions. Erosion control, shoreline stabilization, and general fish habitat were not evaluated.

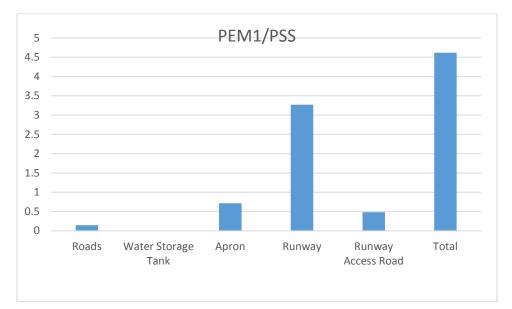


Figure 15. Acreage of impacts to palustrine emergent/scrub-shrub wetlands arranged by feature type

Wetland assessment area 2 (WAA2) was selected as the most appropriate conditional multiplier to calculate functional capacity differential because most of the impacts to this wetland type would result from the construction of the runway. Palustrine emergent persistent/scrub-shrub wetlands totaling 4.6 acres would be impacted by the project, applying the pre-project conditional

multiplier of 0.97 for WAA2 equals 4.5 conditional units. Subtract the pre-project condition from the post-project conditional value (4.6 acres multiplied by post-project conditional multiplier of 0.8); 3.7, to calculate the 0.8 conditional differential. This value is multiplied by the functional score of 0.47 provided by the ARBPJC to derive -0.0376 functional capacity units from the impact of the proposed activity on palustrine emergent persistent/scrub-shrub wetlands in the project area.

3.3.2.2 Palustrine scrub-shrub broad leafed deciduous

Palustrine scrub-shrub broad leafed deciduous wetlands would be impacted primarily by the construction of the roads, which would cause the loss of 3.4 acres. Building pads would destroy 2.8 acres, the lagoon would fill 1.8 acres, and trails would cover 0.6 acres (Figure 16). These wetlands received a functional score of 17/43 (0.395) and function at a high level in terms of production and export of organic material, general habitat suitability, and educational or scientific value. Moderate scores were returned in nutrient and toxicant removal, flood flow alteration, sediment removal, and native plant richness. This class provides low uniqueness and heritage functions. Erosion control, shoreline stabilization, and general fish habitat were not evaluated.

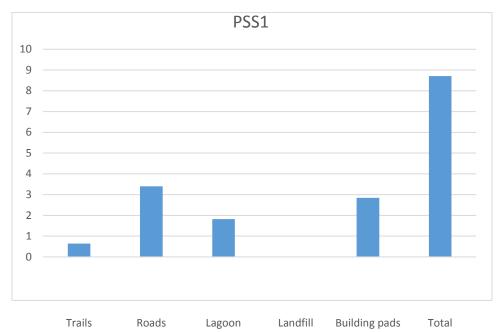


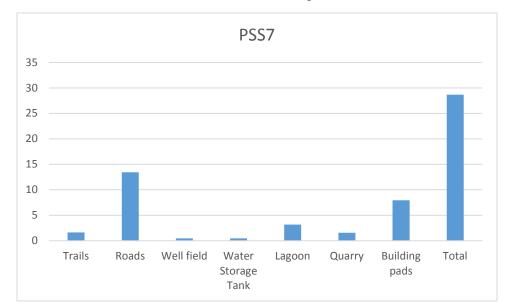
Figure 16. Acreage of impacts to palustrine scrub-shrub broad leafed deciduous wetlands arranged by feature type

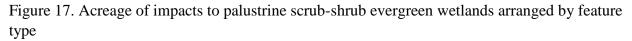
Wetland assessment area 1 (WAA1) was selected as the most appropriate conditional multiplier to calculate functional capacity differential because most of the impacts to this wetland type would result from the construction of the townsite. Palustrine scrub-shrub broad leafed deciduous wetlands totaling 8.7 acres would be impacted by the project; applying the pre-project conditional multiplier of 0.85 for WAA1 equals 7.4 conditional units. Subtract the pre-project condition from the post-project conditional value (8.7 acres multiplied by post-project conditional multiplier of 0.59); 5.1, to calculate the 2.3 conditional differential. This value is

multiplied by the functional score of 0.395 provided by the ARBPJC to derive -0.9085 functional capacity units from the impact of the proposed activity on palustrine emergent persistent/scrub-shrub wetlands in the project area.

3.3.2.3 Palustrine scrub-shrub evergreen

Palustrine scrub-shrub evergreen wetlands would be impacted primarily by the construction of the roads, which would cause the loss of 13.5 acres. Building pads would destroy 7.9 acres, the lagoon would fill 3.2 acres, trails would cover 1.6 acres, the quarry would impact 1.6 aces, and the well field and water storage tanks would displace 0.9 acres (Figure 17). These wetlands received a functional score of 14/43 (0.326) and function at a high level in terms of educational or scientific value. Moderate scores were returned in flood flow alteration, sediment removal, nutrient and toxicant removal, production and export of organic matter, general habitat suitability, and native plant richness. This class provides low uniqueness and heritage functions. Erosion control, shoreline stabilization, and general fish habitat were not evaluated.





Wetland assessment area 1 (WAA1) was selected as the most appropriate conditional multiplier to calculate functional capacity differential because most of the impacts to this wetland type would result from the construction of the townsite. Palustrine scrub-shrub evergreen wetlands totaling 28.7 acres would be impacted by the project; applying the pre-project conditional multiplier of 0.85 for WAA1 equals 24.4 conditional units. Subtract the pre-project condition from the post-project conditional value (28.7 acres multiplied by post-project conditional multiplier of 0.59); 16.9, to calculate the 7.5 conditional differential. This value is multiplied by the functional score of 0.395 provided by the ARBPJC to derive -2.445 functional capacity units from the impact of the proposed activity on palustrine scrub-shrub evergreen wetlands in the project area.

3.3.2.4 Palustrine scrub-shrub/moss-lichen

Palustrine scrub-shrub/moss-lichen wetlands would be impacted primarily by the construction of the runway, which would cause the loss of 18.4 acres. The runway access road would impact 1.8 acres and infrastructure roads would fill another 0.2 acres (Figure 18). These wetlands received a functional score of 21/43 (0.488) and function at a high level in terms of nutrient and toxicant removal, general habitat suitability, native plant richness, and educational or scientific value. Moderate scores were returned in flood flow alteration, sediment removal, and production and export of organic matter. This class provides low uniqueness and heritage functions. Erosion control, shoreline stabilization, and general fish habitat were not evaluated.

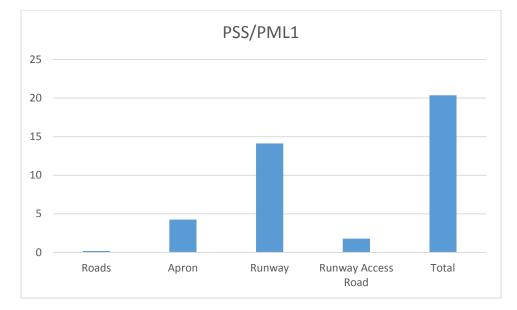


Figure 18. Acreage of impacts to palustrine scrub-shrub/moss-lichen wetlands arranged by feature type

Wetland assessment area 2 (WAA2) was selected as the most appropriate conditional multiplier to calculate functional capacity differential because most of the impacts to this wetland type would result from the construction of the runways. Palustrine scrub-shrub/moss lichen wetlands totaling 20.4 acres would be impacted by the project; applying the pre-project conditional multiplier of 0.97 for WAA2 equals 19.8 conditional units. Subtract the pre-project condition from the post-project conditional value (28.7 acres multiplied by post-project conditional multiplier of 0.8); 16.3, to calculate the 3.5 conditional differential. This value is multiplied by the functional score of 0.488 provided by the ARBPJC to derive -1.698 functional capacity units from the impact of the proposed activity on palustrine scrub-shrub evergreen wetlands in the project area.

3.3.2.5 Palustrine emergent persistent/scrub-shrub/moss-lichen

Palustrine emergent persistent/scrub-shrub/moss-lichen wetlands would be impacted primarily by the construction of the roads, which would cause the loss of 2.7 acres. Trails and building pads would cumulatively impact 0.05 acres (Figure 19). These wetlands received a functional score of 23/43 (0.534) and function at a high level in terms of nutrient and toxicant removal,

production and export of organic matter, general habitat suitability, native plant richness, and educational or scientific value. Moderate scores were returned in flood flow alteration, and sediment removal. This class provides low uniqueness and heritage functions. Erosion control, shoreline stabilization, and general fish habitat were not evaluated.

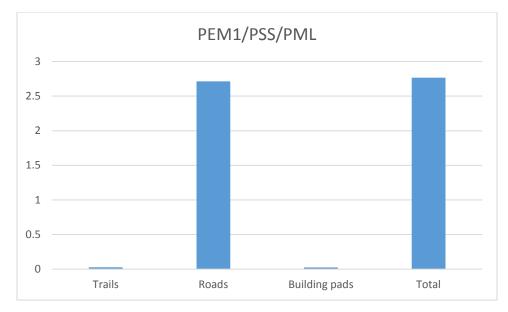


Figure 19. Acreage of impacts to palustrine emergent persistent/scrub-shrub/moss-lichen wetlands arranged by feature type

Wetland assessment area 3 (WAA3) was selected as the most appropriate conditional multiplier to calculate functional capacity differential because most of the impacts to this wetland type would result from the construction of the roads. Palustrine emergent persistent/scrub-shrub/ moss lichen wetlands totaling 2.8 acres would be impacted by the project; applying the pre-project conditional multiplier of 0.71 for WAA2 equals 2.0 conditional units. Subtract the pre-project conditional multiplier of 0.64); 1.8, to calculate the 1.0 conditional differential. This value is multiplied by the functional score of 0.534 provided by the ARBPJC to derive -0.534 functional capacity units from the impact of the proposed activity on palustrine emergent persistent/scrub-shrub/moss-lichen wetlands in the project area.

4.0 Summary

The construction of the Mertarvik Infrastructure Development project has the potential to impact 72 acres of wetlands. These wetlands have varying degrees of intrinsic value, as expressed by the functional assessment performed in the previous sections. The functions provided by the wetlands in the project area would be degraded to a certain extent by the construction of the proposed project through direct impact, hydrologic disruption, habitat fragmentation, and other anthropogenic influences (Figure 20). The assessment in the preceding sections quantifies those impacts in a repeatable and objective way in order to determine the significance of the proposed action.

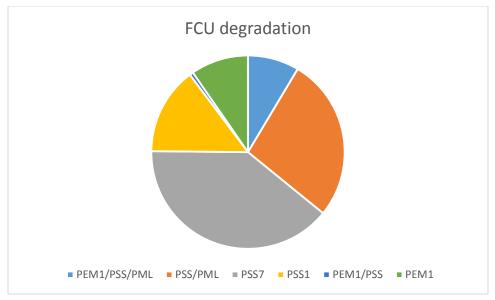


Figure 20. Functional capacity unit degradation arranged by wetland class

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