APPENDIX E

WETLAND FUNCTIONAL ASSESSMENT TECHNICAL REPORT

E.1 INTRODUCTION

This report presents methods for the Qualitative Functional Assessment within the Juneau International Airport (JNU) project area. Additionally, it was necessary to quantify functional assessment data to create an accounting system of wetland acreage and functions that would potentially be lost under each of the alternatives. The methods used for quantifying these data are presented herein as well.

E.2 METHODS

E.2.1 QUALITATIVE ASSESSMENT

As agreed upon in meetings of the Interagency Working Group, the functions and values of wetlands within the project area were qualitatively assessed using the Adamus Wetland Evaluation Technique (WET) developed for the City and Borough of Juneau (CBJ) in 1987 (Adamus 1987). The functions and values evaluated by this technique are highlighted in Section 3.8.1, and included the following:

- Groundwater Recharge
- Groundwater Discharge & Lateral Flow
- Surface Hydrologic Control
- Sediment/ Toxicant Retention
- Nutrient Transform. & Export
- Riparian Support
- Fish Habitat
- Wildlife
- Regional Ecological Diversity
- Erosion Sensitivity
- Ecological Replacement Cost
- Downstream Beneficiary Sites

Wetland functions and values were evaluated within the JNU project area using the modified Wetland Functional Assessment Data Form, which integrated changes suggested by the Interagency Working Group. The qualitative wetland functional assessment provides a means of evaluating key wetland functions inherent to single wetlands or groups of wetlands in the project area. The functions of individual wetlands and groups of wetlands (separated by Cowardin wetland class) were qualitatively rated on a scale of "Very Low" to "Very High":

- Very Low = VL
- Low = L
- Moderate-Low = ML
- Moderate = M
- Moderate-High = MH
- High = H
- Very High = VH

E.2.2 Quantitative Assessment (Environmental Score)

The *Juneau Wetlands Management Plan* (JWMP) outlines a method for calculating an "Environmental Score" for the wetlands identified in Adamus (1987). The U.S. Army Corps of Engineers recognized that wetlands vary in ecological value by the types of functions they perform, and this Environmental Score has the potential to aid in the permitting process (CBJ 1997).

The Environmental Score calculations used in this EIS emulate the JWMP Environmental Score calculation methods, but this method is applied to single wetlands and groups of similar wetlands. The JWMP used broader wetland areas delineated by Adamus (1987). The Environmental Score calculation was modified to maintain consistency with data collected during the 2001 and 2002 field seasons. Eleven of twelve wetland functions listed above were accounted for in the Environmental Score calculations; as in the JWMP, the ecological replacement cost (ERC) was not included in calculations (CBJ 1997).

The recreation wetland function was not included in the Environmental Score calculation due to the lack of current, comparable public survey data. Additionally, since no changes in recreation opportunities are predicted, the recreation value for wetlands will remain constant.

The following subsections describe preliminary calculations, the division of functions into "support categories", and the steps required to calculate the Environmental Score.

E.2.2.1 Qualitative Rating to Quantitative Functional Score

The qualitative rankings from the Adamus WET Rapid Assessment technique were assigned a numerical score for each function (Table E-1).

Table E-1. Adamus WET Rapid Assessment Technique Numerical Scores

Very Low (VL)	Low (L)	Moderately-Low (ML)	Moderate (M)	Moderately-High (MH)	High (H)	Very High (VH)
1	2	3	4	5	6	7

E.2.2.2 Support Categories

The method used to calculate the Environmental Score employed WET Rapid Assessment ratings devised by Adamus (1987). The Adamus wetland functions were divided into three Support Categories (CBJ 1997):

- support for aquatic habitat (Aquatic Support)
- support for human uses (Human Use Support)
- support for terrestrial habitat (Terrestrial Support)

Wetland functions are listed by support category in Table E-2.

E.2.2.3 Total Weighting Factor

CBJ derived a numerical total weighting factor for each of the Adamus functions based on the following criteria:

- Confidence (reliability) of the qualitative functional rating
- Relative contribution of the function to its support category
- The sensitivity to human presence (the effects of dredge and fill on each function)
- The economic value based on availability of substitutes (ability of man-made solutions to replace a given function)

Table E-2 displays the total weighting factor for each Adamus function.

E.2.2.4 Equalization Factor

To make certain that each support category received equal weight, the equalization factor for each support category was determined. The average of the total weighting factors within each support category was calculated:

Aquatic Support average = (9+6+7+10+11+7)/6 = 8.33

Human Use Support average = [7+9+9]/3 = 8.33

Terrestrial Support average = (11+12)/2 = 11.50

Table E-2. Total Weighting Factor by Wetland Function

Functional Category Wetland Function	**Total Weighting Factor**
Aquatic Support Category	
Groundwater Discharge and Lateral Flow	9
Sediment/Toxicant Retention	6
Nutrient Export	7
Riparian Support	10
Fish Habitat	11
Erosion Sensitivity	7
Human Use Support Category	
Groundwater Recharge	7
Surface Hydrologic Control	9
Downslope Beneficiary Sites	9
Terrestrial Support Category	
Wildlife	12
Regional Ecological Diversity	11

The averages for aquatic, human use, and terrestrial support were averaged (i.e., the average of the averages was determined):

[8.33+8.33+11.5]/3 = 9.39

In turn, this number was divided back into each categorical average to yield the equalization factor for each support category:

Aquatic Support equalization factor = 8.33/ 9.39 = 0.89

Human Use Support equalization factor = 8.33/9.39 = 0.89

Terrestrial Support equalization factor = 11.50/9.39 = 1.22

E.2.2.5 Environmental Score Calculation

Accounting for the total weighting factor and the support category equalization factors, the Environmental Score for each wetland can be calculated in five steps:

1. Change the qualitative functional rating to a quantitative functional score
2. The product of the total weighting factor and the quantitative functional score for each function yields the raw weighted score

3. The average of raw weighted score for functions within each support category (i.e., Aquatic, Human Use, and Terrestrial Support Categories) yields the support category mean raw score
4. The product of the support category mean raw score and equalization factor for that support yields the support category final score
5. The sum of the support category final scores yields the Environmental Score:

   $\text{Final Score}_{(\text{aquatic})} + \text{Final Score}_{(\text{human})} + \text{Final Score}_{(\text{terrestrial})} = \text{Environmental Score}$

The final environmental score calculations for JNU project area wetlands appear in Attachment E-1. For these calculations, it was assumed that groundwater recharge in the project area wetlands does not support the public water supply (this would change the total weighting factor for groundwater recharge and all three equalization factors).

E.2.2.6 APPLYING THE ENVIRONMENTAL SCORE (FUNCTIONAL UNITS)

One obvious problem in using the Environmental Score to quantify impacts to wetlands alone is that acreage is not accounted for in the Environmental Score calculations. That is, the value of a wetland relative to others can be determined, but the consequences of its loss cannot be quantified. A simple solution is to take the product of the Environmental Score and the acreage generating "functional units" of wetlands. The functional units can be used as the final currency to measure wetland impacts and determine the appropriate level of mitigation to compensate for these impacts. The functional units for project area wetlands are presented at the end of Attachment E-1.

E.3 DISCUSSION

The calculation of functional units can be applied to single wetlands or groups of related wetlands (i.e., wetlands within the same locality in the same Cowardin class) effectively throughout the project area. While CBJ (1997) applied this method to large groups of wetlands, a higher-resolution quantitative functional assessment was necessary to assess the potential impacts to wetland functions and values associated with the JNU expansion alternatives. Additionally, high-resolution functional assessment of the JNU study area wetlands allows for a more thorough accounting system for determining project-related impacts and appropriate mitigation projects.

Conversely, functional units can be applied to Adamus (1987) wetlands or larger-scale areas (i.e., the Northwest Development Area). This scenario becomes useful if the Duck Creek channel is shifted within the Northwest Development Area. Existing functions for the Northwest Development Area can be assessed at the wetland analysis area-level and mitigation/restoration project design can be manipulated to fully compensate for wetland impacts. Additionally, mitigation/restoration projects can be designed to reduce less desirable functions (e.g., wildlife hazard) while increasing other functions such as surface hydrologic control.

Though similar to the JWMP methods, it should be kept in mind that these Environmental Score and functional unit calculations do not include the actual or potential recreation functions. Recreation data tend to be subjective and field observations of the recreation function display a low

degree of correlation with actual public surveys. That is, a rapid assessment technique for recreation would be unreliable, relative to a function such as wildlife for which hard data can be acquired. Additionally, current recreation data from public surveys were not available for this analysis. As mentioned earlier, the recreation value would stay constant regardless of the alternatives implemented. Therefore, it was not factored into the Environmental Score and functional unit calculations.

ATTACHMENT E-1
QUANTITATIVE FUNCTIONAL ASSESSMENT WORKSHEET

Numerical Values for Qualitative Ratings

Qualitative Rating	Abbrev.	Numerical Score
Very High	VH	7
High	H	6
Moderately High	MH	5
Moderate	M	4
Moderately Low	ML	3
Low	L	2
Very Low	VL	1

Total Weighting Factor (Twf) for Each Function, Grouped by Support Category

Aquatic Support	TWF
Groundwater Discharge	9
Sed./Toxicant Retention	6
Nutrient Export	7
Riparian Support	10
Fish Habitat	11
Erosion Sensitivity	7
Human Use Support	**TWF**
Groundwater Recharge	7
Surface Hydrologic Control	9
Downslope Beneficiary Sites	9
Terrestrial Support	**TWF**
Wildlife	12
Regional Ecological Diversity	11

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