Pebble Project

NORTHERN DYNASTY MINES INC.

DRAFT ENVIRONMENTAL BASELINE STUDIES 2006 STUDY PLANS

CHAPTER 10. WETLANDS

JULY 2006

TABLE OF CONTENTS

LIST OF TABLES (attached)

LIST OF FIGURES (attached)

10. WETLANDS

The objectives, process, and deliverables for the wetlands study in 2006 are the same as those described in the 2005 study plan, with the exceptions noted below.

With the exception of adding more area to the mine study area, the overall scope of the wetland study has not changed significantly. Digital mapping of areas visited in 2004 and 2005 is presently underway. Final jurisdictional wetland and vegetation mapping for many evaluation areas is expected to be complete in late 2006. Table 10-1 summarizes work for the wetlands study in 2004 through 2006.

10.1 Mine Studies

Minor changes in scope for the mine study since 2005 include the following:

- Thirty-six shallow groundwater-level monitoring wells were installed by SLR to support a small pools study designed by hydrologist Professor Mark Rains, of the University of South Florida. The purpose of this study is to test a hypothesis that certain characteristics of the ponds and adjacent vegetation—which are observable in the aerial photography—typically can be used to distinguish between those that are hydrologically isolated from the regional groundwater table and those that are consistently fed by groundwater. Figure 5.1-2 in Chapter 5, Groundwater Hydrology, shows the locations of the wells (the location labeled WL-PO9X on the figure is an abandoned well that is not used).

  To support this study and to provide a more complete inventory of these waters ("small pools," as the study is named) for the functional-assessment mapping efforts, field crews are photographing and collecting water pH readings and water conductivity (SPER) readings at most, if not all, water bodies that will be mapped in the mine study area..

- The field data collection and mapping area for the mine is now approximately 105,441 acres in size including the segment of road from the mine site to the Newhalen River. The following changes in wetlands study area for the mine have been made since the 2005 study plan was prepared:
  - Addition of a large portion of the Upper Talarik Watershed and
  - Addition of a small area in the North Fork Koktuli Watershed, near Wiggly Lake.

Figure 10-1 shows the wetlands study area for the mine, including the area to be examined in 2006.

As in 2004 and 2005, field data collected during the 2006 field season will use criteria found in the 1987 Corps of Engineers Wetland Delineation Manual. However, 2006 data collection will also use the new indicators outlined in the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (USACE 2006), and the results of the two methods will be directly compared.

Field data forms which had previously used the 1995 Supplement to the Alaska Wetland Indicator Plant List will also be re-evaluated in 2006, and references to this list will be removed as requested by the Alaska District of the Corps of Engineers in early May of 2006.

10.2 Transportation Corridor Studies

The 2004 field verification area for the transportation corridor and port sites was approximately 40,000 acres in size. However, the current mapping area is approximately 30,000 acres because the digital imagery used for mapping covers a corridor that is approximately 2,000 feet wide–narrower than the 3,300-foot-wide field verification area. The study area for the transportation corridor is shown on Figure 10-2. No field work is planned for the transportation corridor in 2006.

The 2005 study plan included a fly-over reconnaissance of a potential road route along the west side of the Newhalen River, from Lake Iliamna to the mine site. This was not accomplished and is not currently planned.

10.3 References

U.S. Army Corps of Engineers (USACE). 2006. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region. U.S. Army Engineer Research and Development Center. Document ERDC/EL TR-06-3. February 2006. 106 pp.

Table 10-1
Pebble Project Environmental Studies
Study Summary for Wetlands, 2004-2006
Consultants: Three Parameters Plus, Inc., and HDR Alaska, Inc.
Date: 05/05/06

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Tasks to be Completed
Wetlands	**Mine Study Area**		
	Information Gathering		
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary
	With RDI, Initial Design and Testing of Wetlands Application in the NDM Database	With RDI, Design and Testing of Reports and QC Tools in Wetlands Application of the NDM Database.	With RDI, Design New Forms Related to New Alaska Delineation Manual, and Test Wetland Application in the NDM Database
	With RDI, Initial Design and Layout of Project GIS and Data Management Proceedures	GIS and Data Management Coordination	GIS and Data Management Coordination
	Preliminary Wetland Impact Analysis Using Historical Data Sources and NDM Mine Development Concept Footprints	Preliminary Wetland Impact Analysis Using Historical Data Sources and NDM Mine Development Concept Footprints	Preliminary Wetland Impact Analysis Using Historical Data Sources and NDM Mine Development Concept Footprints
	Jurisdictional Wetland Determinations Using the 1987 Corps of Engineers Manual (Portions of the South Fork Koktuli, North Fork Koktuli, Upper Talarik, and Newhalen Watersheds)	Jurisdictional Wetland Determinations Using the 1987 Corps Manual (Same Area as 2004)	Jurisdictional Wetland Determinations Using the 1987 Corps Manual and the 2006 Alaska Delineation Manual (Upper Talarik Watershed)
	Rapid Wetland Functional Assessments Using the Magee/Hollands Method	Rapid Wetland Functional Assessments Using the Magee/Hollands Method	Rapid Wetland Functional Assessments Using the Magee/Hollands Method
	Photo Documentation of Streams, Various Habitat Features, Representative Wetlands and Uplands	Photo Documentation of Streams, Various Habitat Features, Representative Wetlands and Uplands	Photo Documentation of Streams, Various Habitat Features, Representative Wetlands and Uplands
		Two-Day Work Plan/Database Overview with Corps and EPA Project Staff	
		Initial SWANCC Field Review with Corps and EPA Staff	
		Problem Soil Evaluations with Joe Moore of NRCS and Chien-Lu Ping of UAA	
		Small Pools Study Design & Piezometer Installation (Dr. Mark Rains)	Small Pools Study Implementation (Dr. Mark Rains)
		Water Body Evaluations with Photos and pH and SPER Data to Support Small Pools Study.	Water Body Evaluations with Photos and pH and SPER Data to Support Small Pools Study.
		Rapid Evaluations of Willow and Mixed Willow/Alder Shrub Thickets to Support Jurisdictional Mapping Work	Rapid Evaluations of Willow and Mixed Willow/Alder Shrub Thickets to Support Jurisdictional Mapping Work
	Data Entry and QC	Data Entry and QC	Data Entry and QC
	Digital Mapping of Jurisdictional Wetland Boundaries, HGM Type, Vegetation Type, and Existing Disturbance	Digital Mapping of Jurisdictional Wetland Boundaries, HGM Type, Vegetation Type, and Existing Disturbance	Digital Mapping of Jurisdictional Wetland Boundaries, HGM Type, Vegetation Type, and Existing Disturbance
		Develop Basic Mitigation Concepts with Other Study Leaders	Basic Abandoned Mine Database/GIS Evaluations and Search for Compensatory Mitigation Opportunities.
	Coordination with NDM & Agencies	Coordination with NDM & Agencies, Monthly Reporting, Fall Agency Summary Presentation	Coordination with NDM, agency meetings, and monthly reporting
		2004 Progress Report	Preliminary Environmental Baseline Document

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Date: 05/05/06

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Tasks to be Completed
Wetlands	**Transportation Corridor**		
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary
		Two Day Work Plan/Database Overview with Corps and EPA Project Staff	
		Initial SWANCC Field Review with Corps and EPA Staff	
	Jurisdictional Wetland Determinations Using the 1987 Corps Manual (including work for minor route variations and for two routes from Pile Bay to Cook Inlet)	Jurisdictional Wetland Determinations Using the 1987 Corps Manual (field work, same area as 2004 plus Y Valley)	
	Rapid Wetland Functional Assessments Using the Magee/Hollands Method	Rapid Wetland Functional Assessments Using the Magee/Hollands Method	Analysis of Wetland Function Data
	Photo Documentation of Streams, Various Habitat Features, Representative Wetlands and Uplands	Photo Documentation of Streams, Various Habitat Features, Representative Wetlands and Uplands	
	Data Entry	Data Entry	Data QC and Update
	Digital Mapping of Jurisdictional Wetland Boundaries, HGM Type, Vegetation Type, and Existing Disturbance	Digital Mapping of Jurisdictional Wetland Boundaries, HGM Type, Vegetation Type, and Existing Disturbance	Digital Mapping of Jurisdictional Wetland Boundaries, HGM Type, Vegetation Type, and Existing Disturbance
		Communications w/ Design Team Regarding Constraints	
		2004 Progress Report	Preliminary Environmental Baseline Document

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59°48'0"N

59°44'0"N

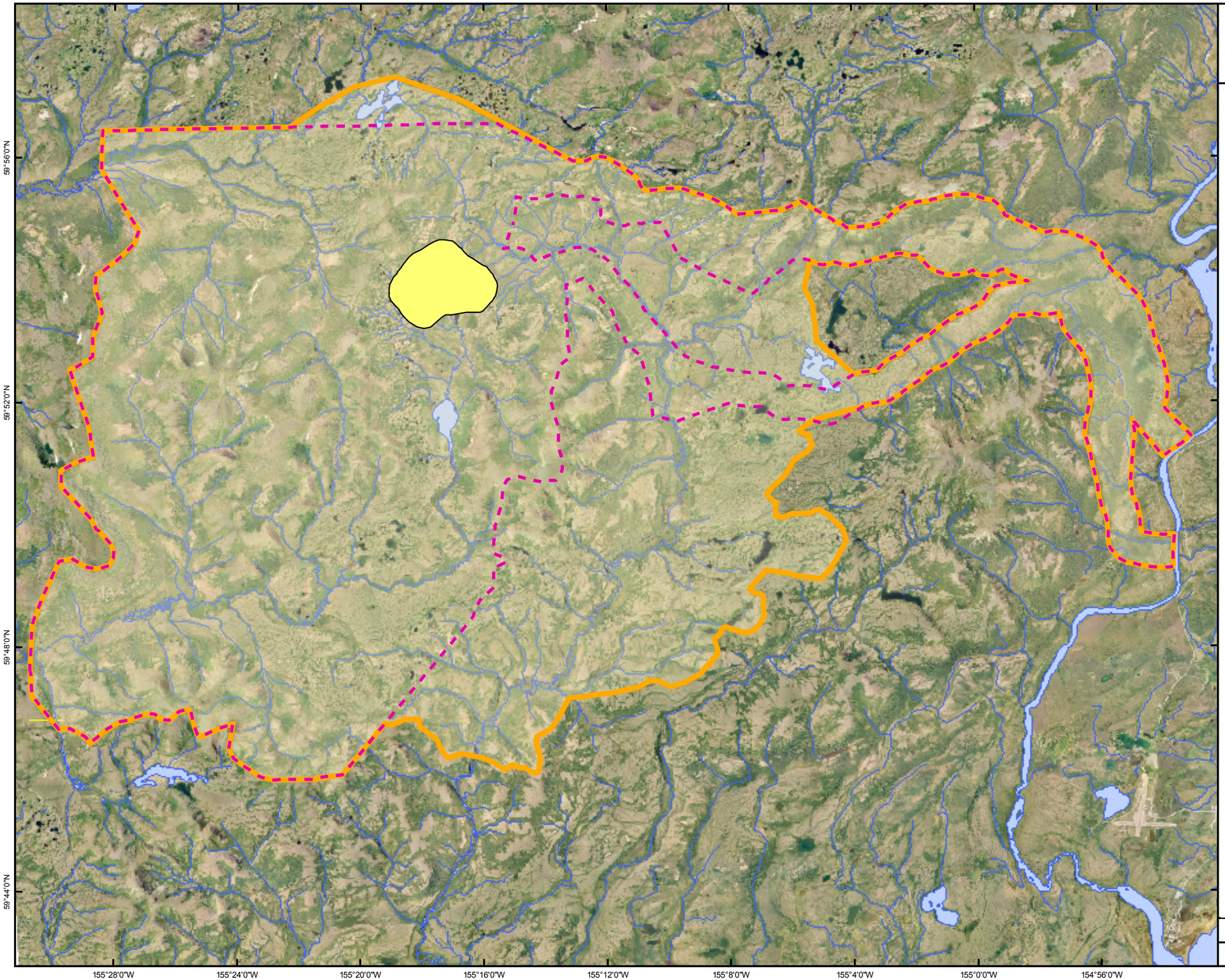

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Figure No. 10-1
Wetland Study Area, Mine
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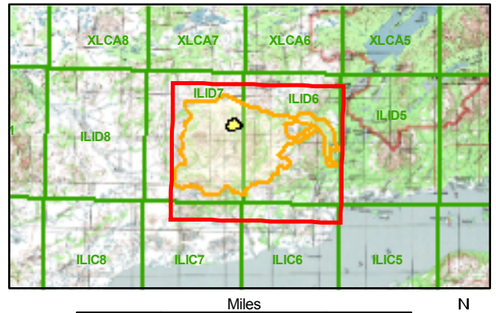
Legend

- 2005 Pit Outline
- 3PP 2006 Field Study Area
- 3PP 2004/2005 Field Study Area



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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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Version: 3	**Author: RDI-LS**

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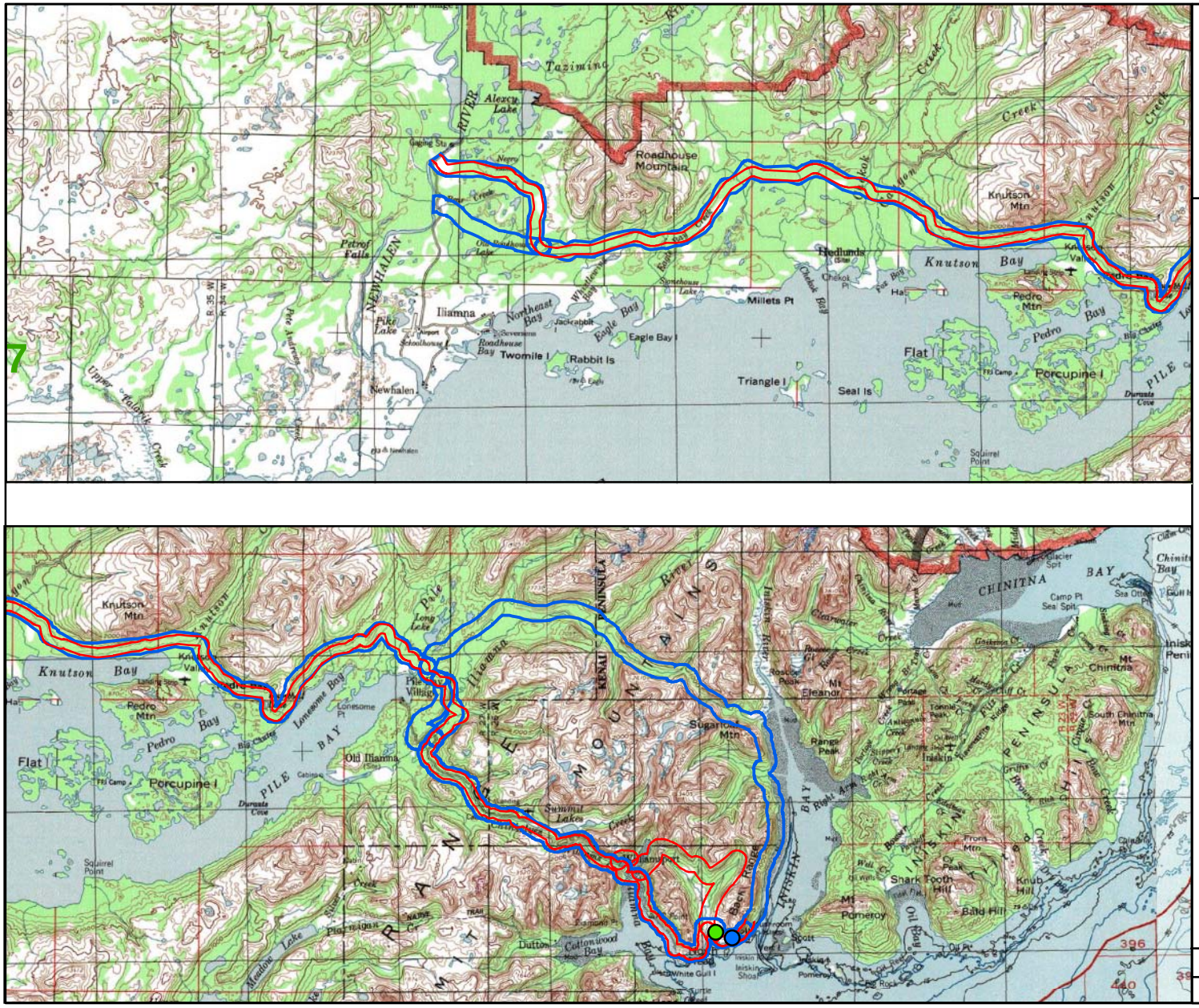

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2004-2005
Wetland Study Areas
Transportation Components

Figure 10-2

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Legend

- 2005 Study Area (2,000-ft road corridor and Y valley)
- 2004 Study Area (3,300-ft road corridor)
- Potential Port Site
- Potential Port Development Area

The road corridors are the study area for jurisdictional wetland mapping, vegetation mapping, HGM typing, and quantitative wetland functional assessments.

Privileged and Confidential

N

0 1 2 4 6 8 Miles

0 1 2 4 6 8 10 Kilometers

Scale 1:400,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: Studyplan2006_Fig10_2.mxd	Date: June 12, 2006
Version: 6	Author: HDR - DW, AM

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