



Pebble Project

NORTHERN DYNASTY MINES INC.

**DRAFT ENVIRONMENTAL BASELINE STUDIES
2004 PROGRESS REPORTS**

CHAPTER 19. DATA MANAGEMENT

NOVEMBER 2005

TABLE OF CONTENTS

TABLE OF CONTENTS.....	19-i
LIST OF FIGURES	19-ii
ACRONYMS.....	19-iii
19. DATA MANAGEMENT AND GIS.....	19-1
19.1 Introduction	19-1
19.2 Program Objectives	19-1
19.3 Scope of Work.....	19-2
19.3.1 GIS.....	19-2
19.3.1.1 GIS Management.....	19-2
19.3.1.2 Compile Base-map Data.....	19-3
19.3.1.3 Load Pebble Data.....	19-3
19.3.1.4 Environmental Data.....	19-3
19.3.1.5 Data Acquisition for Three Parameters Plus and Others	19-3
19.3.1.6 Ongoing support for 3PP and Others.....	19-4
19.3.1.7 Cartographic Services.....	19-4
19.3.2 Data Management.....	19-4
19.3.2.1 Document Repository	19-4
19.3.2.2 Calendar.....	19-5
19.3.2.3 Contacts	19-5
19.3.2.4 Logistics.....	19-5
19.3.2.5 Wetlands	19-5
19.3.2.6 Links	19-6
19.3.2.7 Field Forms.....	19-6
19.3.2.8 Analytical Data	19-7
19.3.2.9 GIS Map	19-8
19.4 Technologies Used	19-8
19.4.1 GIS Technology.....	19-8
19.4.2 Data Management Technology.....	19-8
19.5 References	19-8

LIST OF FIGURES

FIGURE 19-1, Document Repository, Files List.....	19-10
FIGURE 19-2, Document Repository Metadata Form	19-10
FIGURE 19-3, Calendar, Project Team View	19-11
FIGURE 19-4, Contacts.....	19-11
FIGURE 19-5, NDM Emergency Procedures.....	19-12
FIGURE 19-6, Helicopter Request Form	19-12
FIGURE 19-7, Bear Guard Support Form.....	19-13
FIGURE 19-8, Site Location Tab, Jurisdictional Wetlands Input Form.....	19-13
FIGURE 19-9, Vegetation Tab, Jurisdictional Wetlands Input Form	19-14
FIGURE 19-10, Hydrology Tab, Jurisdictional Wetlands Input Form.....	19-14
FIGURE 19-11, Soil Profile Tab, Jurisdictional Wetlands Input Form.....	19-15
FIGURE 19-12, Other Soil Tab, Jurisdictional Wetlands Input Form.....	19-15
FIGURE 19-13, Determination Tab, Jurisdictional Wetlands Input Form.....	19-16
FIGURE 19-14, Assessment Tab, Jurisdictional Wetlands Input Form	19-16
FIGURE 19-15, Jurisdictional Wetlands Plot Report, part 1.....	19-17
FIGURE 19-16, Jurisdictional Wetlands Plot Report, part 2.....	19-18
FIGURE 19-17, Master Plant List Report	19-19
FIGURE 19-18, Jurisdictional Wetland Determination Photo Report.....	19-20
FIGURE 19-19, Plant Community Report.....	19-21
FIGURE 19-20, Wetlands Functional Assessment Report.....	19-21
FIGURE 19-21, Pebble Links Table.....	19-22
FIGURE 19-22, Field Form Example, Physical Characterization	19-22
FIGURE 19-23, Data Loader Menu.....	19-23
FIGURE 19-24, Editing or Defining Data Definition.....	19-23
FIGURE 19-25, Data Loader History	19-24
FIGURE 19-26, GIS Map	19-24

ACRONYMS

AASHTO	American Association of State and Highway Transportation Officials
ABA	acid-base accounting
ac-ft	acre-feet
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
agl	above ground level
AHRS	Alaska Heritage Resource Survey
ALS	ALS Environmental Laboratory
ANCSA	Alaska Native Claims Settlement Act
AP	acid potential
APE	area of potential effect
ASCI	Alaska Stream Condition Index
ASTM	American Society for Testing and Materials
ASTt	Arctic Small Tool tradition
BBNA	Bristol Bay Native Association
BEESC	Bristol Environmental & Engineering Services Corporation
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BP	before present
BTEX	benzene, toluene, ethylbenzene, and xylenes
°C	degrees Celsius
¹⁴ C	Carbon 14
CEMI	Canadian Environmental and Metallurgical Laboratory
cfs	cubic feet per second
CIRCAC	Cook Inlet Regional Citizens Advisory Council
cm	centimeter(s)
CPUE	catch per unit effort
CQ	continuous flow
CRM	cultural resources management
CUEQ%	copper equivalent grade
DEM	digital elevation model
DI	deionized
DOT&PF	Alaska Department of Transportation and Public Facilities

DRO	diesel-range organics
EBD	environmental baseline document
EIS	environmental impact statement
EPT	Ephemeroptera, Plecoptera, or Trichoptera
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FL	fork length
fps	feet per second
ft	foot (feet)
ft ²	square foot (feet)
g	gram(s)
GIS	geographic information system
GLM	general linear model
GMU	Game Management Unit
gpm	gallons per minute
GPS	global positioning system
GRO	gasoline-range organics
GS	gauging station
HC-3	high-gradient, contained channel
HDR	HDR Alaska, Inc.
HGM	hydrogeomorphic
HWM	high-water mark
ICP	inductively coupled plasma
IIE	Iniskin/Iliamna Estuary
IQ	instantaneous flow
KC	Kaskanak Creek
kg	kilogram(s)
km ²	square kilometers
KP	Knight Piesold
KR	Koktuli River Main Stem
L	liter(s)
LC-1	low-gradient, contained channel
LIDAR	light detection and ranging
m	meter(s)
m ²	square meter(s)
M.A.	Master of Arts
MC-1	moderate-gradient, narrow, shallow, contained channel

MCHTWG	Mulchatna Caribou Herd Technical Working Group
MDC	mine development concept
MDL	method detection limit
me-Hg	methyl-mercury
MEND	mine environment neutral drainage
mg	milligram(s)
mi ²	square mile(s)
ml	milliliter(s)
ML/ARD	metal leaching/acid rock drainage
MLLW	mean lower low water
mm	millimeter(s)
MM-1	moderate-gradient, mixed-control channel
MMS	Minerals Management Service
MODIS	moderate resolution imaging spectroradiometer
mph	miles per hour
MRL	method reporting limit
m/s	meters per second
µg	microgram(s)
µL	microliter(s)
µmhos	micromhos
NASA	National Aeronautics and Space Administration
ND	non-detect
NDM	Northern Dynasty Mines Inc.
NEPA	National Environmental Policy Act
ng	nanogram(s)
NK	North Fork Koktuli River
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NP	neutralization potential
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
Nv	calculated variance
NWR	National Wildlife Refuge
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OHMP	Office of Habitat Management and Permitting
OHW	ordinary high water
PA-1	narrow, placid-flow habitat

PA-3	shallow-ground, water-fed slough
PA-5	palustrine beaver habitat
PAG	potentially acid-generating
PJD	preliminary jurisdictional determination
PSD	Prevention of Significant Deterioration
PVC	polyvinyl chloride
Q	discharge
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RBP	Rapid Bioassessment Protocols
RDI	Resource Data, Inc.
RRO	residual-range organics
SHPO	State Historic Preservation Officer
SK	South Fork Kaktuli River
SLR	SLR Alaska
SRB&A	Stephen R. Braund & Associates
SRK	SRK Consulting (Canada) Inc.
SVOC	semivolatile organic compound
SWE	snow/water equivalent
3PP	Three Parameters Plus
TDS	total dissolved solids
TOC	total organic carbon
TSS	total suspended solids
UAF	University of Alaska Fairbanks
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UT	Upper Talarik Creek
VHF	very high frequency
VOC	volatile organic compound
WMC	Water Management Consultants Inc.
WRIR	water-resources investigations report
WY	water year

19. DATA MANAGEMENT AND GIS

19.1 Introduction

This section presents the 2004 results of the data management and geographic information system (GIS) program currently in progress at Resource Data Inc. (RDI) for the Northern Dynasty Mines Inc. (NDM), Pebble Project. The GIS and scientific data generated as part of the permitting process are valuable assets to NDM. In the short term, NDM must make the data available to the environmental-baseline project team. In the long term, NDM must maintain the data to support the requisite environmental impact statement and permitting process and ultimately to support the monitoring of Pebble Mine activities throughout the life of the project. A sound data management strategy assures that the data are accurate, timely, and integrated into a multidisciplinary database.

RDI's data management solution is completely automated. This automated system helps eliminate errors caused by manual editing and analysis of scientific data. This methodology was used to define clear requirements for data deliverables and to provide data sources with the necessary tools to verify compliance with these requirements prior to delivery.

RDI's primary scope of work consists of the following activities:

- GIS work.
- Website and data management.

The GIS work covers managing all mapping data collected during baseline studies, creating and loading base-map and Pebble-specific data, supplying GIS support for the wetlands study, and providing cartographic services to support the entire project. Website and data management includes building a central data repository for the project, providing web-based tools to enter and report on project data, and developing tools to upload data into the project database. The website and database are being designed to provide long-term storage and access to baseline data throughout the projected 50-year life of the mine.

19.2 Program Objectives

The objectives of 2004 GIS activities were as follows:

- Develop standards for spatial data including datum, projection, and accuracy.
- Compile base-map data.
- Compile 2004 study data.
- Distribute data to all investigators.

The objectives of 2004 activities related to website and data management were as follows:

- Establish standards for data format, content, and transfer.
- Support 2004 field operations through the development of web-based software for data entry, document management, project management (calendar, logistics tools, etc.), and mapping.
- Support data analysis and reporting.
- Manage documents.
- Ensure NDM ownership of system hardware, software, and data.

19.3 Scope of Work

19.3.1 GIS

RDI's scope of services included developing GIS standards, building a GIS to support the permitting process, and providing GIS support to NDM and its contractors. The activities outlined below have been completed.

19.3.1.1 GIS Management

RDI created standards for managing the GIS data associated with the Pebble Project. Standards included creating or defining types and versions of software to be used, spatial data-naming conventions, standard projection, standard map templates, metadata requirements, and map and data transfer procedures.

The standard mapping software used in Pebble is ESRI ArcGIS 8.3. This ensures that all figures and maps produced for the project are compatible. Data-creation software is up to the individual consultants as long as the resulting data are 100 percent compatible with ArcGIS 8.3.

Standard map projection for the project is Alaska State Plane Zone 5 using the 1983 North American Datum.

Data storage and naming conventions include the following:

- All GIS data are stored in the GIS_FINAL folder.
- Data inside of GIS_FINAL are stored in subfolders named by a three- or four-character abbreviation of data originator.
- Inside of the data originator subfolders, consultants create CATEGORY folders at their discretion.
- All SHP-file (shape-file) names are limited to 13 characters and must contain a version number. An example is hydro_V02.
- Data are stored in ESRI SHP file format.

All data must have metadata populated using the ESRI metadata tool set.

Standard map templates for use by the project team also have been created. The templates were created as ArcGIS MXT files. They include the following:

- 8 ½" X 11" Portrait.
- 8 ½" X 11" Landscape.
- 11" X 17" Portrait.
- 11"X 17" Landscape.
- 24" X 36" Landscape.
- 35" X 50" Landscape.

RDI keeps the master GIS data repository and coordinates all data transfers from RDI to project consultants via portable hard drives or via the project data management website described in Section 19.3.2

19.3.1.2 Compile Base-map Data

RDI compiled base-map data for use by the project team. All data were converted from their native format for use in ArcGIS 8.3. Data include the following:

- U.S. Geological Survey (USGS) 1:63360 Digital Line Graph (DLG) hydrography.
- Fifty-foot contours generated from USGS 1:63360 Digital Elevation Models (DEMs).
- Hand-entered geographic labels and waterbody labels from USGS Digital Raster Graphs.
- 1:2400-scale ortho-photography for the inner mine area developed by Eagle/Kodiak Mapping.
- 1:2400-scale vector mapping for the inner mine area developed by Eagle/Kodiak Mapping.
- 1:2400-scale Lidar mapping produced by Eagle/Kodiak mapping developed for the inner mine area.
- 1:4800-scale ortho-photography for the outer mine area developed by Eagle/Kodiak Mapping.
- 1:4800-scale vector mapping produced by Eagle/Kodiak mapping developed for the outer mine area.
- Township, range, and section information.
- National Parks and Preserves data.
- Native regional corporation boundaries
- 1:2400-scale ortho-photography for the road corridor developed by AeroMap U.S.
- 1:2400-scale Lidar mapping produced by AeroMap U.S.

19.3.1.3 Load Pebble Data

RDI processed 34 individual mine development concepts and 7 road and port preliminary design concepts for the project. The mine design concepts were delivered to RDI from Knight Piesold in AutoCAD format. Upon receipt of the mine designs, RDI converted the data to polygonal ESRI SHP files for use in potential impact assessment and distribution to consultants. Road and port design concepts were delivered to RDI from PND Inc. as AutoCAD files. RDI converted the data into ESRI SHP files for use by the consultants.

19.3.1.4 Environmental Data

RDI gathered and converted various environmental data sets into ArcGIS 8.3 for the Pebble Project. In some cases data only existed in paper format and were digitized. Data sets include the following:

- Anadromous fish streams.
- U.S. Fish and Wildlife Service (USFWS) caribou habitat.
- Alaska Department of Fish and Game habitat mapping, including bear habitat, bird habitat, caribou habitat, clam habitat, crab habitat, fish habitat, marine mammal habitat, moose habitat, and sheep habitat.

19.3.1.5 Data Acquisition for Three Parameters Plus and Others

RDI acquired and processed data sets for use by Three Parameters Plus (3PP) and other environmental consultants. Certain data sets only existed in paper form and required digitizing. All data were converted into ESRI SHP format. Data include the following:

- Surficial geology.
- USFWS National Wetland Inventory (NWI).
- National Resource Conservation Service soil maps.
- USGS Earth Resources Observation Systems (EROS) Bristol Bay land cover.

19.3.1.6 Ongoing support for 3PP and Others

RDI supports 3PP and HDR Alaska, Inc., in the wetlands delineation process. The following activities were completed in 2004:

- Produced field maps and photo reports—RDI created field maps on Rite in the Rain paper for use by 3PP and HDR during the field season.
- Wetlands data scrubbing—RDI scrubbed wetlands data to remove slivers and close polygons and to maintain the integrity of the wetlands mapping.
- Processed photos and photo location information—HDR and 3PP delivered their digital photographs and location information to RDI for processing into the wetlands application described Section 19.3.2.5.
- Provided analysis of mapping—RDI provided 3PP with summary tables showing acres disturbed by vegetation type and hydrogeomorphic (HGM) classification.
- Impact analysis of alternatives—RDI provided data tables of potential impacts of mine development concepts. Data tables were generated by intersecting potential mine designs with environmental GIS data and creating tables which contained impact of habitat by species.

19.3.1.7 Cartographic Services

RDI provided cartographic services to the project team on an as-needed basis. Maps were typically for internal project meetings or agency meetings. Over 100 individual custom maps or variations of maps have been produced for the NDM team.

19.3.2 Data Management

RDI created a web-based data management application. The website is a secure site with varying levels of internal security. The role-based security allows different types of functionality based on a user's log-in. This document is a summary of functionality present in the system.

19.3.2.1 Document Repository

A document repository was created which allows members of the Pebble project team to share digital documents. The repository allows users to upload and download any type of digital file. Document information is captured via user-entered metadata and is tracked by version number. Role-based security determines user privileges for adding, viewing, editing, and deleting files. Because it is expected that the repository will hold a large number of documents, search functionality was created so that users could enter specific criteria to target specific documents and document types. Files are stored within folders and displayed in a “collapsible” tree-view allowing for easy viewing and retrieval of documents (Figures 19-1 and 19-2).

19.3.2.2 Calendar

RDI developed a project calendar for use by the project team. The calendar has two views: project team view and NDM management team view. A user has access to one or both calendar views based on their login. The calendar allows users to schedule meetings, set recurring meetings, and attach digital documents to meetings (Figure 19-3).

19.3.2.3 Contacts

A project team contact list was created. The list is generated dynamically and is updateable by administrators. The contact list (Figure 9-4)—exportable to Microsoft Excel—captures, stores, and reports the following information:

- Name.
- Title.
- Phone Number.
- Fax Number.
- Email Address.
- Area of Expertise.
- Company.
- Company Description.
- Address.

19.3.2.4 Logistics

RDI created a series of logistics forms to support the project. Logistics information includes the following:

- Emergency Procedures—Lists contact information and procedures to follow in the event of an emergency (Figure 19-5).
- Helicopter Request Form—Allows users to enter information to schedule helicopters for field work (Figure 19-6).
- Bear Guard Support Form—Allows users to enter information for scheduling bear guard support when conducting field work at sites where wildlife could pose a potential threat to team members (Figure 19-7).

19.3.2.5 Wetlands

The wetlands application allows certain users to enter field information on wetlands and to create reports using this information. The application stores all information related to the wetlands program, including field data, site location maps, and digital photographs of each wetland plot location.

Primary input for wetlands information is accomplished using the Jurisdictional Wetlands Input Form. The input form allows users to enter applicable information based on the following sections:

- Site Location—Information relating to the location of an individual field plot including a site location map (Figure 19-8).
- Vegetation—Information relating to the vegetation located at a field-plot location (Figure 19-9).

- Hydrology—Information relating to the hydrology present at a field-plot location (Figure 19-10).
- Soil Profile—Information relating to the soil profile present at a field-plot location (Figure 19-11).
- Other Soil—Additional information on the soil present at a field-plot location (Figure 19-12).
- Determination—Final information on whether or not the field plot is a wetland; also allows for storage of multiple digital photographs of the field plot and surrounding area (Figure 19-13).
- Assessment—If the wetland is designated as a wetland on the Determination tab, an Assessment tab will appear, allowing the user to select from a pre-defined list of wetland variables (e.g., hydrologic, landscape, and vegetation variables; Figure 19-14).

Wetlands reports include the following:

- Jurisdictional Wetland Plot Report—Retrieves all data related to a specific wetland field plot and displays a comprehensive report with detailed information on vegetation, hydrology, soil profiles and indicators, determination, and assessment (Figures 19-15 and 19-16).
- Master Plant-list Report—Allows a user to search for plant types by watershed and firm. Report is exportable to MS Excel (Figure 19-17).
- Jurisdictional (JD) Wetland Determination Photo Report—Provides photos and basic information about a wetland plot including location, soils, hydrology, and dominant plants by stratum. Report is exportable to MS Word (Figure 19-18).
- Plant Community Report—Allows user to search for plant life based on a variety of criteria. Report includes information on species location, composition, soil horizon, and wildlife observations in a specified range. Entire report is exportable to MS Word with some table sections exportable to MS Excel (Figure 19-19).
- Functional Assessment Models—Eight models used to determine functional capacity of a wetland as described in *A Rapid Procedure for Assessing Wetland Functional Capacity, Based on Hydrogeomorphic (HGM) Classification* (Magee, 1998). The models run in an automated format based on user input and administrative settings. Model results are exportable in MS Word format (Figure 19-20).

19.3.2.6 Links

Links are provided to relevant web-based resources for associations, publications, and government and regional agencies (Figure 19-21).

19.3.2.7 Field Forms

Field forms were developed to capture information relating to studies conducted during the 2004 and 2005 field seasons. Data captured in these forms will be exportable to MS Excel for future analysis. Forms include the following (Figure 19-22):

- Water Quality Monitoring.
- Habitat Assessment.
- Diatom Live/Dead Count.
- Diatom Identification.
- Subsampling.

- Physical Characterization.
- Benthos/Water Quality.
- Chironomidae ID.
- Periphyton Field Data Sheet.
- Periphyton Sample Lab Processing Sheet.
- Sample Login Sheet.
- Sample Login/Tracking Sheet.
- Spawning Count
- Removal Form
- Identification
- Iliamna Lake Study
- Macroinvertebrate/Periphyton/Water Quality

19.3.2.8 Analytical Data

The analytical data application contains a generic data loader which is user configurable. The data loader checks incoming data for a variety of problems such as duplicate sample numbers, missing rows within a column, previously loaded samples, etc. It is composed of the following functionality (Figure 19-23):

- Create New Data Loader—Allows users to create a new data loader for the system. The data loader controls the electronic data definition (EDD), which specifies the format of the columns to be added to the database.
- Edit Data Loader—Provides the ability for users to edit an existing data loader (Figure 19-24).
- Delete Data Loader—Removes a data loader from the system.
- View Loader History—Allows users to search through a history log of all data loaded to the system (Figure 19-25).
- Load Data—Allows users to load analytical data to the system in the format specified in the electronic data definition.
- Reload Data—Allows users to reload data which has been loaded to the system previously.
- Data Extractor, Run Existing Report - Allows user to run an existing report by selecting the columns to display and performing simple filtering on those columns using boolean operations
- Data Extractor, Define New Report - Allows user to define a new report by binding metadata with a Oracle view.
- COC List Reports - Allows users to access filter page and result screen for reporting COC Header information (Date, Company, Location, etc.)
- COC Details Report - Allows users to access filter page and result screen that shows all COC samples collected.
- COC Sample Exception Report - Report that shows samples that are on the COC, but are not in the laboratory reported samples.
- COC Lab Analysis vs. Requested Method - Report that shows samples whose tested methods differ from the field requested methods.

19.3.2.9 GIS Map

The GIS map is an interactive web-based mapping application. It allows users to view GIS data which has been collected and generated for the Pebble Project (Figure 19-26).

19.4 Technologies Used

19.4.1 GIS Technology

The Pebble Project GIS is based on ESRI technology.

- ArcView 3.3 is used for habitat mapping.
- ArcGIS 8.3 is used for all other functionality, including map production and data creation.
- Vector data are stored as ESRI shape files.
- Raster imagery is stored as Geotiffs with ESRI pyramids.
- Data are distributed via portable hard drives or the project website.
- Web-based GIS is developed on ArcIMS 9.02.
- All GIS data are documented using the metadata tools in ArcGIS.
- Standard map projection is Alaska State Plane Zone 5 Feet.
- Datum is 1983 North American Datum.

19.4.2 Data Management Technology

The project website was developed using the following technologies:

- Oracle 10g.
- Microsoft Advanced Server 2003.
- Microsoft Internet Information Server.
- Microsoft C#.NET.
- Dell Poweredge 2600 XEON Server.

19.5 References

Magee, D.W. 1998. A Rapid Procedure for Assessing Wetland Functional Capacity, Based on Hydrogeomorphic (HGM) Classification. Bedford, NH. Normandeau Associates.

FIGURES

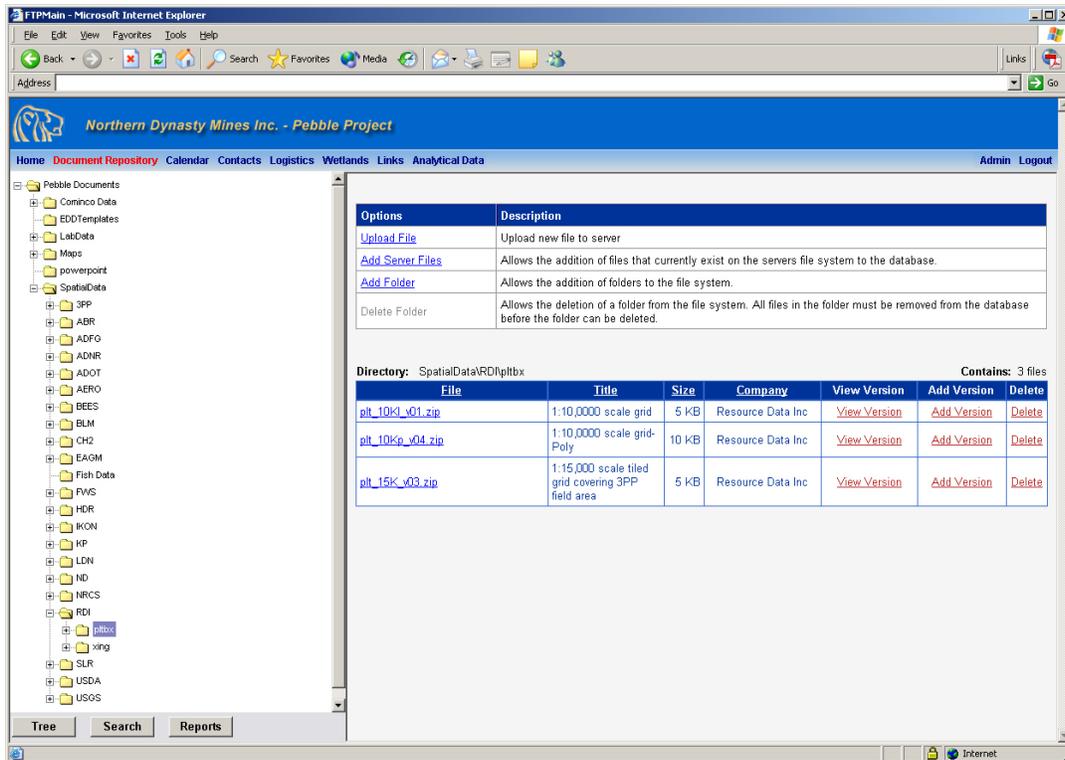


FIGURE 19-1. Document Repository, Files List

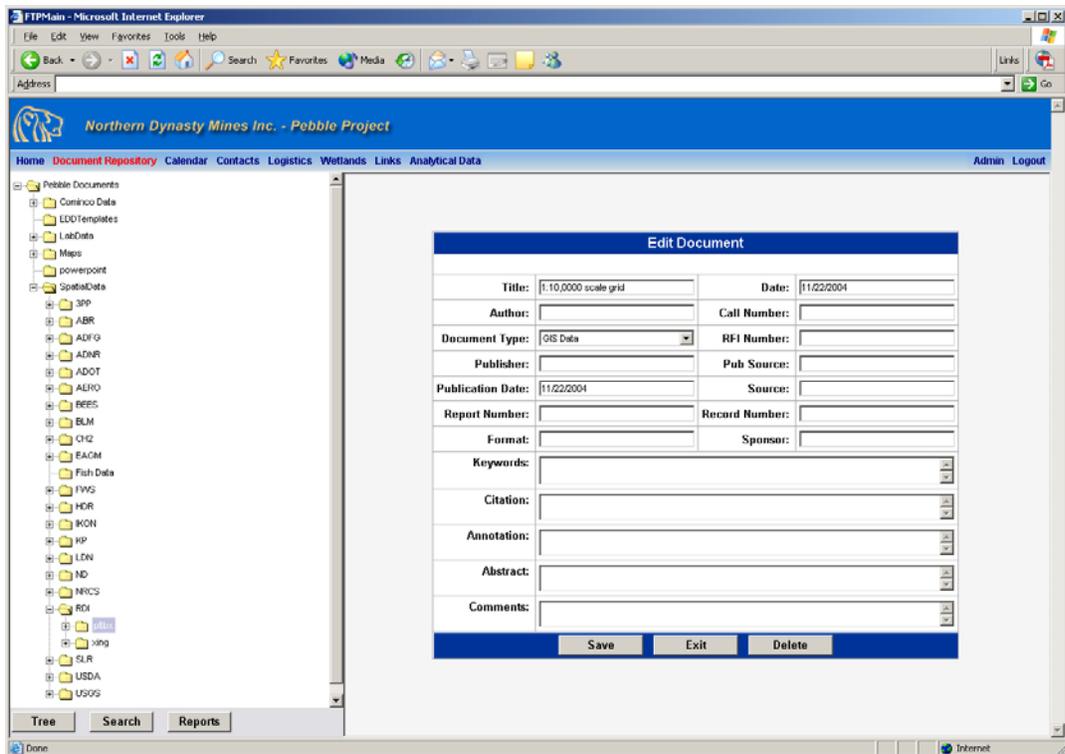


FIGURE 19-2, Document Repository Metadata Form

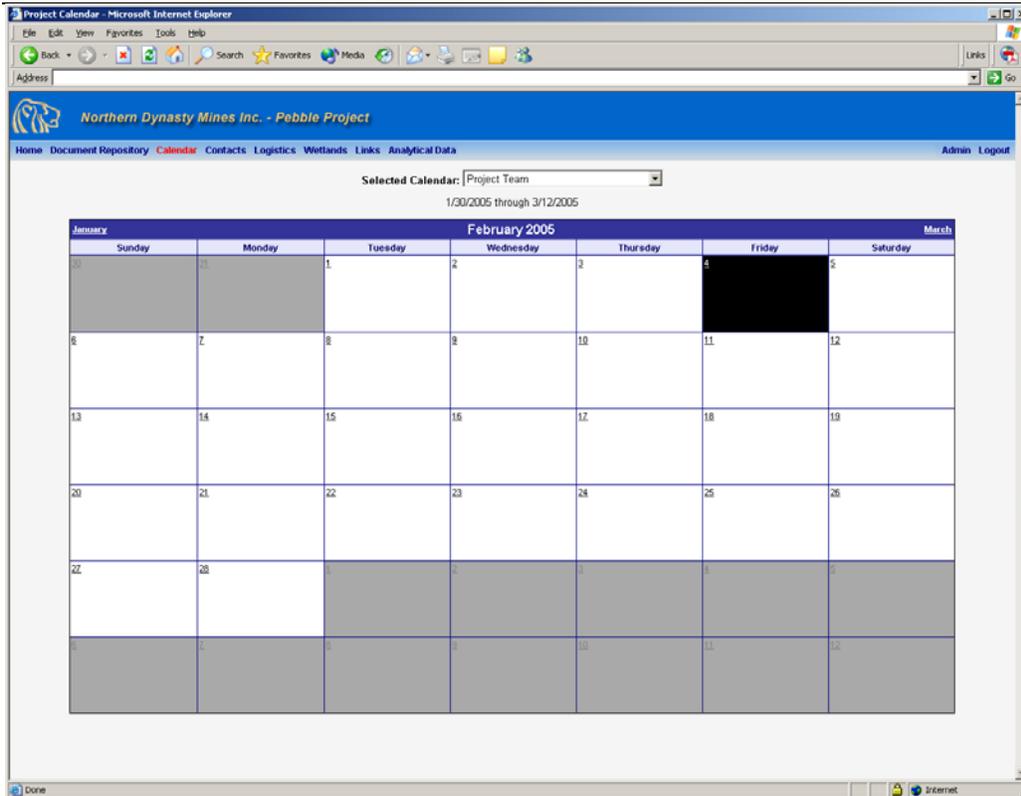


FIGURE 19-3, Calendar, Project Team View

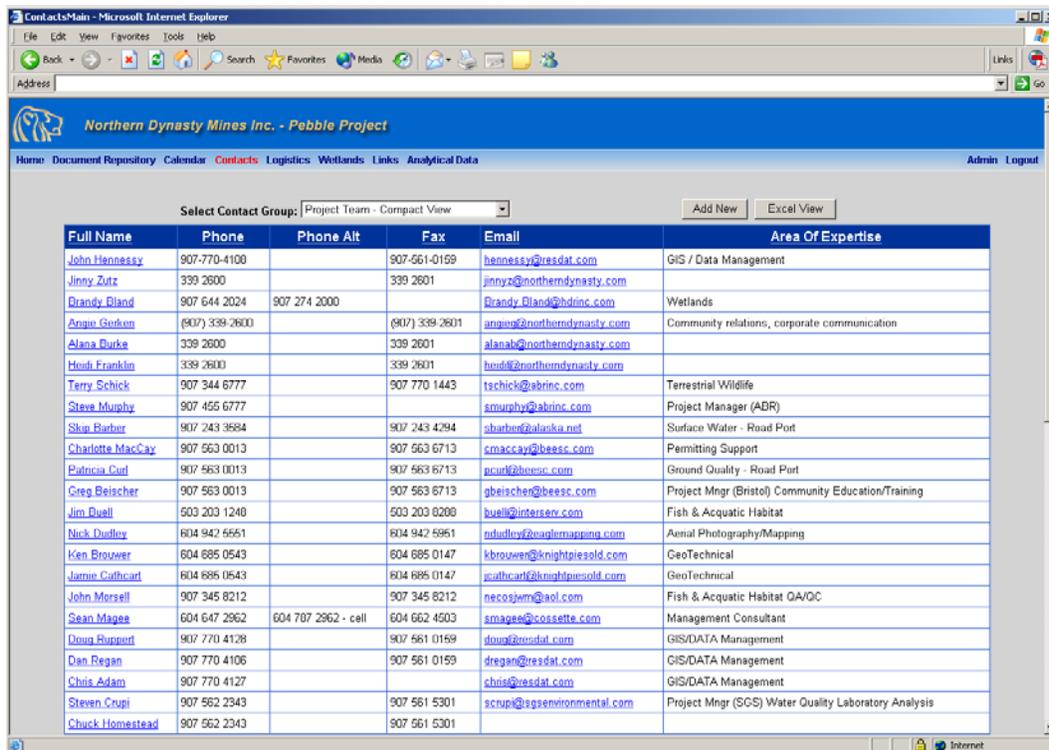


FIGURE 19-4, Contacts

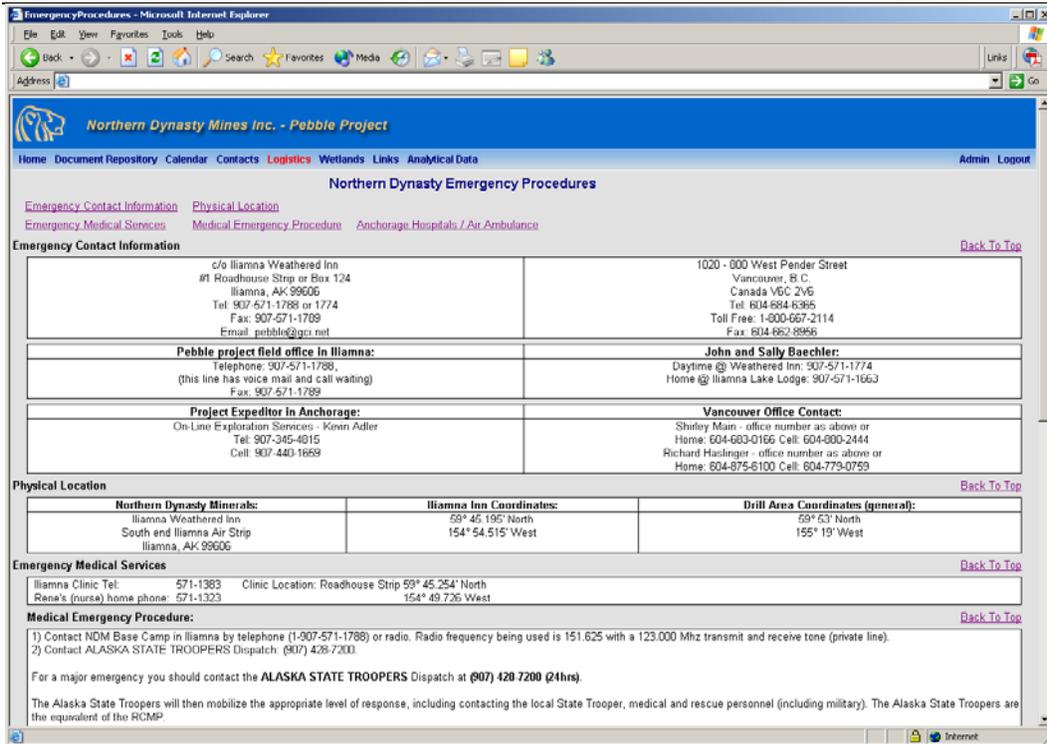


FIGURE 19-5, NDM Emergency Procedures

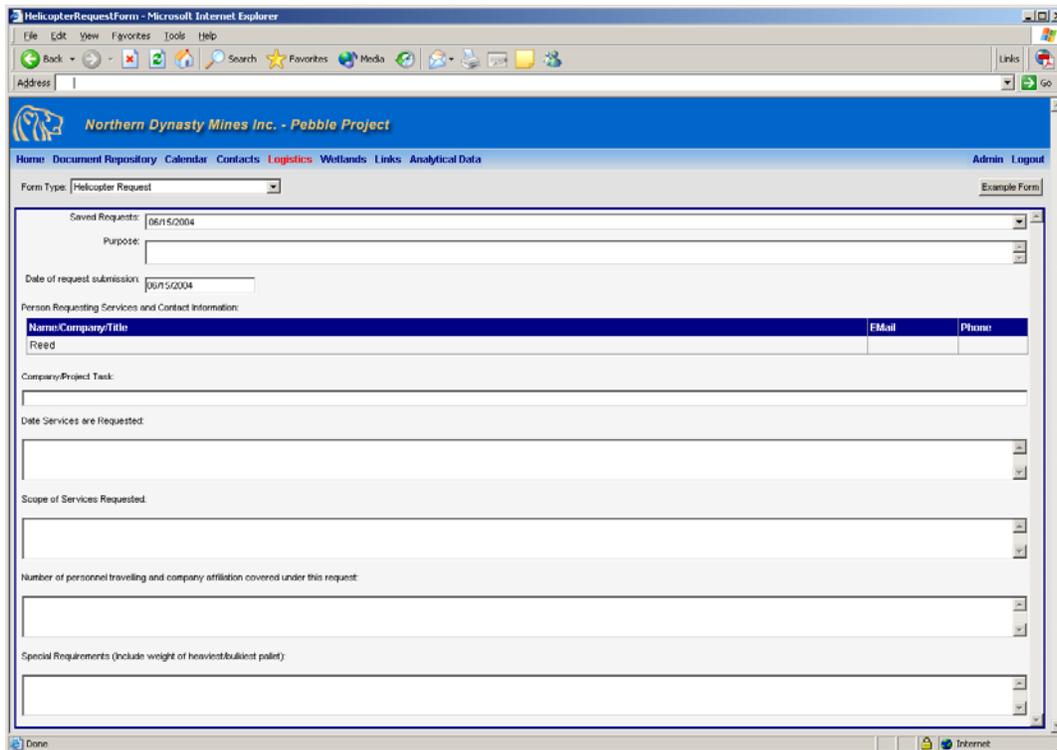


FIGURE 19-6, Helicopter Request Form

Subsistence Request Form - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Northern Dynasty Mines Inc. - Pebble Project

Home Document Repository Calendar Contacts **Logistics** Wetlands Links Field Forms Analytical Data Admin Logout

Form Type: Bear Guard Support [Save] [Submit] [Example Form]

Saved Requests: New Request

Purpose: []

Date of request submission: 11/4/2005

Person Requesting Services and Contact Information: [Add]

Edit	Delete	Name/Company/Title	E-Mail	Phone
[Update] [Cancel]	[Delete]	[]	[]	[]

Company/Project Task: []

Date Services are Requested: []

Scope of Services Requested: []

Number of personnel travelling and company affiliation covered under this request: [Add]

Edit	Delete	Name	Company	Arrival	Departure	Notes
[Update] [Cancel]	[Delete]	[]	[]	[]	[]	[]

Special Requirements (Include weight of heaviest/bulkiest pallet): []

FIGURE 19-7, Bear Guard Support Form

WetlandsFormInputMain - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Routine Wetland Determination

Last Saved: Plot is read only. Find Plot: 3PP [Go] Plot: 3PP0003 QC Status: QC Complete Type: RW Status: Y

Site Location | Vegetation | Hydrology | Soil Profile | Other Soil | Determination | Assessment | Show Model | Main Menu

Project/Site: Pebble Project

Applicant/Owner: Northern Dynasty Minerals, Inc.

Investigator 1: SR Steve Reidsma (3PP)

Investigator 2: CK Cal Kerr (3PP)

Investigator 3: []

Do Normal Circumstances Exist? Yes

Is the Site Significantly Disturbed (atypical)? No

Is the Site a Potential Problem Area? No

Approximate Distance to Nearest Disturbance (ft): []

Type of Disturbance (if any): []

General location: []

Lat Long Elev (Form): 0 0 0

Lat Long Elev (GPS): 59.868067 -155.30655 0

Photo Date: 6/27/2004

Summary Date: 6/27/2004

County: Lake & Peninsula Borough

State: Alaska

Watershed: South Fork Koktuli

Community ID: []

Paper Plot/Tile No: []

Ortho No: []

Air Photo No: []

Township: 3S (gps)

Range: 35W (gps)

Section: 0 33 (gps)

Quad No: LID7 (gps)

Legend: Stream Crossing, Water Body, Reference Data, Functional Assess, Uplands, Trans. Upland, Wetlands, Trans. Wetland, Rep. Upland, Rep. Wetland, Photo Point, SH-Wetland, SH-Trans. Wetland, SH-Upland, SH-Trans. Upland, SH-Review

0003

0 100 200 Feet

Plot 5 of 4668 [Unlock Plot] << previous 1 next >> [Go To Next Tab]

FIGURE 19-8, Site Location Tab, Jurisdiction Wetlands Input Form

Routine Wetland Determination

Plot: 3PP0002 QC Status: Data Entry Complete
 Find Plot: 3PP Go Type: JD Status: N-T

Site Location | **Vegetation** | Hydrology | Soil Profile | Other Soil | Determination

Acronym	Latin Name	Common Name	Stratum	Ind. Status	% Cover	Dom.	Tree Height	Tree DBH	Magee Stratum
ALSI	Alnus sinuata (shrub)	Sitka alder (shrub)	S	FAC	30	Y			TS
BEGL	Betula glandulosa	Tundra dwarf birch	S	FAC	5	N			SS
SAPL1	Salix pulchra	Diamond-leaf willow	S	FAOW	30	Y			SS
VAVI	Vaccinium vitis-idaea	Mountain cranberry	S	FAC	10	N			DS
CACA	Calamagrostis canadensis	Blue-joint reedgrass	H	FAC	10	Y			SH
EPAN1	Epilobium angustifolium	Fireweed	H	FACU	10	Y			SH
EQAR	Equisetum arvense	Field horsetail	H	FAC*	5	Y			SH
TREU	Trientalis europaea	European starflower	H	FAC	T	N			SH

of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 80 Calculated: 80%
 Project Veg Type: _____
 Field BBMP Veg Type: Open Alder-Willow Tall Shrub (D6)
 Field JD Wet Code: _____
 Field ERM Code: _____
 Field EROS Veg. Type: _____
 Eros GIS: Open low shrub ericaceous/conifer woodland/mesic bog/eric
 Trace =< (%): 3 Method: 50/20-Stratum

Vegetation Remarks: _____

% By Stratum (Magee - Wetlands Only)

TREE = Canopy: 0 %	SAP = Sapling: 0 %	TS = Tall Shrub: 30 %
SS = Short Shrub: 35 %	DS = Dwarf Shrub: 10 %	TH = Tall Herb: 0 %
SH = Short Herb: 26.5 %	ML = Moss-Lichen: 0 %	F = Floating: 0 %
SUB = Submerged: 0 %	Number of Layers: 4	

Plot 4 of 4668 << previous 1 next >> Go To Next Tab

FIGURE 19-9, Vegetation Tab, Jurisdictional Wetlands Input Form

Routine Wetland Determination

Plot: 3PP0002 QC Status: Data Entry Complete
 Find Plot: 3PP Go Type: JD Status: N-T

Site Location | Vegetation | **Hydrology** | Soil Profile | Other Soil | Determination

Recorded Data (Describe in Remarks):
 Stream, Lake or Tide Gauge
 Aerial Photographs (Years: 1978, 1990,)
 Other
 No Recorded Data Available

Hydrology Comments: A horizon very moist but not saturated

FIELD OBSERVATIONS (INCHES):
 Depth of Surface Water: N/A
 Depth to Free Water/Ice in Pit: H2O: N/A Ice: N/A
 Depth to Saturated Soil: N/A

2005 DRAFT REGIONAL SUPPLEMENT INDICATORS

Mat or Crust of Algae or Marl (B4)	
Iron Deposits (B5)	
Surface Soil Cracks (B6)	
Inundation Visible on Aerial Photography (B7)	
Dry Season Water Table (C3)	
Salt Deposits (C5)	
Unvegetated Concave Surface (D1)	
Stunted or Stressed Plants (D2)	
Geomorphic Position (D3)	
Shallow Aquifer (D4)	
Microtopographic Relief (D6)	

WETLAND HYDROLOGY INDICATORS

Primary Indicators:	Secondary Indicators (2 or more required):
<input type="checkbox"/> Inundated	<input type="checkbox"/> Oxidized Root Channels in Upper 12"
<input type="checkbox"/> Saturated	<input type="checkbox"/> Water-Stained Leaves
<input type="checkbox"/> Water Marks	<input type="checkbox"/> Local Soil Survey Data
<input type="checkbox"/> Drift Lines	<input type="checkbox"/> FAC- Neutral Test
<input type="checkbox"/> Sediment Deposits	<input type="checkbox"/> Other (Explain in Comments)
<input type="checkbox"/> Drainage Patterns in Wetlands	

Aspect (degrees): 150 (direction): Southeast
 Percent Slope: 2 %
 Elevation (ft): 1135
 Landform: Hillside
 Macro-Topography: Concave
 Micro-Topography: _____
 HGM Class: Slope
 Waterbody Type: _____
 Specific Conductance: 0

Plot 4 of 4668 << previous 1 next >> Go To Next Tab

FIGURE 19-10, Hydrology Tab, Jurisdictional Wetlands Input Form

FIGURE 19-11, Soil Profile Tab, Jurisdictional Wetlands Input Form

FIGURE 19-12, Other Soil Tab, Jurisdictional Wetlands Input Form

WetlandsFormInputMain - Microsoft Internet Explorer

Routine Wetland Determination

Last Saved: Soil Profile Tab @ 3:17:46 PM

Show Menu: Plot: 3PP0002 QC Status: Data Entry Complete

Find Plot: 3PP Go Type: JD Status: N-T

Site Location | Vegetation | Hydrology | Soil Profile | Other Soil | **Determination** | Save Plot | Main Menu

Hydrophytic Vegetation Present? Yes

Wetland Hydrology Present? No

Hydric Soils Present? Marginal

HGM Class: Slope

FA Cross Reference Plot No:

Site Marked on Map? Yes

Site Flagged? No

Is This Sampling Point Within a Wetland? N-T

Plot Photographs Are: Digital APS Roll #:

Remarks:

Wildlife Observations: None

Engineering Concerns: None

WILDLIFE OBSERVATIONS:

Animal	Sign	Observation
Caribou:	<input type="checkbox"/>	<input type="checkbox"/>
Bear:	<input type="checkbox"/>	<input type="checkbox"/>
Wolf:	<input type="checkbox"/>	<input type="checkbox"/>
Fox:	<input type="checkbox"/>	<input type="checkbox"/>
Beaver:	<input type="checkbox"/>	<input type="checkbox"/>
Ground Squirrel:	<input type="checkbox"/>	<input type="checkbox"/>
Waterfowl:	<input type="checkbox"/>	<input type="checkbox"/>
Moose:	<input type="checkbox"/>	<input type="checkbox"/>
Ptarmigan:	<input type="checkbox"/>	<input type="checkbox"/>
Game Trails:	<input type="checkbox"/>	<input type="checkbox"/>

Plot 4 of 4668

Photo Type: Vegetation Photo Bearing: SE

FIGURE 19-13, Determination Tab, Jurisdictional Wetlands Input Form

WetlandsFormInputMain - Microsoft Internet Explorer

Routine Wetland Determination

Last Saved:

Show Menu: Plot: 3PP0007 QC Status: Data Entry Complete

Find Plot: 3PP Go Type: JD Status: Y-T

Site Location | Vegetation | Hydrology | Soil Profile | Other Soil | Determination | **Assessment** | Save Plot | Main Menu

MISC. FACTORS

- Public ownership
- Wildlife Management Area
- Fisheries Management Area
- Historic/archaeologic area
- Designated State or Federal Protected Wetland
- Documented habitat for listed species
- Regionally scarce wetland category
- Recreational Use Area
- Subsistence Use Area

LANDSCAPE VARIABLES

Size: (acres)

- Small (<10 acres)
- Medium (10-100 acres)
- Large (>100 acres)

Ratio of Wetland Area to Watershed Area:

- High (>10%)
- Low (<10%)

Wetland Justification:

- Connected up to downstream
- Only connected above
- Only connected below
- Other wetlands nearby, but not connected
- Wetland isolated

Watershed Land Use:

- >50% urbanized
- 25-50% urbanized
- 0-25% urbanized

Wetland Land Use:

- High intensity (agriculture)
- Moderate intensity (forestry)
- Low intensity (open space)

SOIL VARIABLES

- Soil lacking
- Histosol Fabric

HYDROLOGIC VARIABLES CONT.

Wetland Water Regime:

- Wet: Perm flooded, intermittently exposed, semiperm flooded
- Dry: Seasonally flooded, temporarily flooded, saturated

Surface Water Level Fluctuations:

- High fluctuation
- Low fluctuation
- Never inundated

Frequency Overbank Flooding:

- >5 yrs. Return Interval
- 2-5 yrs.
- 1-2 yrs.
- No overbank flooding

Evidence of Sedimentation:

- No evidence
- Fluvial/soils
- Sediment observed on substrate

Basin Topographic Gradient:

- High gradient (>2%)
- Low gradient (<2%)

Degree of Outlet Restrictions:

- Restricted outflow
- Unrestricted outflow
- No outflow

Inlet/Outlet Class:

- No inlet/outlet
- No wet/intermittent outlet
- Intermittent inlet/outlet
- Intermittent inlet/intermittent outlet
- Perennial inlet/outlet
- Perennial wet/intermittent outlet
- Perennial inlet/perennial outlet

Water pH:

VEGETATION VARIABLES

- Vegetation lacking
- Forested-evergreen-needle-leaved
- Forested-deciduous-broad-leaved
- Forested-deciduous-needle-leaved
- Scrub shrub-evergreen-broadleaved
- Scrub shrub-evergreen-needleleaved
- Scrub shrub-deciduous-broadleaved
- Scrub shrub-deciduous-needleleaved
- Emergent-persistent
- Non-persistent
- Aquatic bed

Number of Types:

- 3 or more types
- 3 - 4 types
- 1 - 2 types

Type Distribution:

- Even distribution
- Moderately even distribution
- Highly uneven distribution

Vegetation Density/Dominance:

- Sparse (0-20%)
- Low density (20-40%)
- Medium density (40-60%)
- High density (60%-80%)
- Very high density (80-100%)

Vegetative Interspersion:

- High (small groupings, diverse and interspersed)
- Moderate (broken, irregular rings)
- Low (large patches, concentric rings)

Plant Species Diversity:

- Low (1-2 plots sampled)
- Medium (3-4 plots sampled)
- High (5 or more plots sampled)

Proportion of Animal Food Plants:

- Low (5-25% cover)
- Medium (25-50% cover)

Plot 7 of 1238

FIGURE 19-14, Assessment Tab, Jurisdictional Wetlands Input Form

http://www.pebbleproject.com - Wetlands Plot Report - Microsoft Internet Explorer

Pebble Gold Copper Project: Jurisdictional Wetland Plot Report

Plot Number: 3PP0010 QC Status: QC Complete
 Type: JD Status: Y

Site Location:

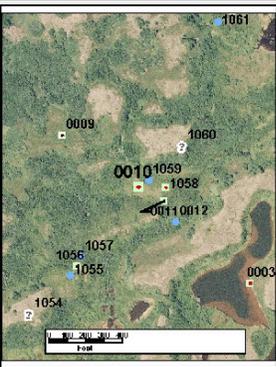
Project Site: 1 Date: 6/27/2004
 Applicant Owner: Northern Dynasty Minerals, Inc. County: Lake & Peninsula Borough
 Investigator(s): Steve Reidema (3PP) Christopher Love (3PP) State: Alaska
 Watershed: South Fork Koktuli

Do Normal Circumstances Exist?: Yes
 Is the Site Significantly Disturbed (atypical)? No
 Is the Site a Potential Problem Area? No

Approximate Distance to Nearest Disturbance (ft):
 Type of Disturbance (if any):

Community Id:
 Paper Plot/ Tile No: 2145
 Ortho No: Air Photo No: 3-7
 Township: 03S 3S
 Range: 35W 35W (gps)
 Section: 33 33 (gps)
 Quad No: ILID7 ILID7 (gps)
 General location: Bottom of slope west of Frying Pan Lake

Lat Long Elev (Form): 59.52126 -155.18278 1152
 Lat Long Elev (GPS): 59.8695 -155.30995 0



Vegetation:

Acronym	Latin Name	Common Name	Stratum	Ind. Status	% Cover	Dom.	Tree Height	Tree DBH	Magee Stratum
BENA	Betula nana	Swamp Birch	S	FAC	T	N			SS
EMNI	Empetrum nigrum	Black Crowberry	S	FAC	T	N			DS
LEDE	Ledum decumbens	Narrow-Leaf Labrador-Tea	S	FAOW	T	N			DS
SAFU	Salix fuscescens	Alaska Bog Willow	S	FAOW	5				SS
SPBE	Spiraea beauverdiana	Beauvered Spiraea	S	FAC	T	N			SS
VACO	Vaccinium oxycoccos	Small Cranberry	S	OBL	t	N			DS
VAIL	Vaccinium uliginosum	Bog Blueberry	S	FAC	T	N			DS
	Carex sp.	Sedge	H		10				SH
EQFL	Equisetum fluviatile	Water Horsetail	H	OBL	T	N			SH
ERSC	Eriophorum scheuchzeri	Scheuchzers Cotton-Grass	H	OBL	10				SH
POPA1	Potentilla palustris	Marsh Cinquefoil	H	OBL	15				SH
RUCH	Rubus chamaemorus	Cloudberry	H	FAOW	T	N			SH
TREU	Trientalis europaea	European Starflower	H	FAC	T	N			SH
	Sphagnum sp.	Unkeyed Sphagnum Moss	B		75	N			ML

% of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 75 Calculated: 75 %

Vegetation Remarks:

% By Stratum (Magee - Wetlands Only)

trEE = Canopy: 0 % SAP = Sapling: 0 % TS = Tall Shrub: 0 %
 SS = Short Shrub: 8 % DS = Dwarf Shrub: 6 % TH = Tall Herb: 0 %
 SH = Short Herb: 39.5 % ML = Moss-Lichen: 75 % F = Floating: 0 %
 SUB = Submerged: 0 % Number of Layers: 4

Final BBMP Veg Type: Subarctic Lowland Sedge-Moss Bog Meadow (L2)
Field BBMP Veg Type: Subarctic Lowland Sedge-Moss Bog Meadow
Field JD Wet Code: u
Field ERWI Code: PEMIB TG
Field EROS Veg. Type: Subarctic Lowland Sedge-Moss Bog Meadow
Eros GIS: Closed shrub - graminoid
Trace =< (%): 3 **Method:** 50/20-Stratum

Hydrology:

Recorded Data: Yes
 Stream, Lake or Tide Gauge: No
 Aerial Photographs (Years: 1978, 1990, 2004)
 Other: No

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
 Inundated: Yes
 Saturated: Yes
 Water Marks: No
 Drift Lines: No
 Sediment Deposits: No
 Drainage Patterns in Wetlands: Yes

Secondary Indicators:
 Oxidized Root Channels in Upper 12": No
 Water-Stained Leaves: No
 Local Soil Survey Date: No
 FAC-Neutral Test: Yes
 Other: No

FIELD OBSERVATIONS (RICHES):
 Depth of Surface Water: 0
 Depth to Free Water Ice in Pit: H2O: 1 Ice: N/A
 Depth to Saturated Soil: 0

Hydrology Comments:
 Area is saturated. No surface water, but wet shoes when walking.

Aspect (degrees): 118 **(direction):** E
Percent Slope: 4
Elevation (ft): 1152
Landform: Swale
Topography: Concave
HGM Class: Slope

Soil Profile:

Soil Survey Map Unit Name: Field Drainage Class: Poorly Drained Field Taxonomy: Hydric Sphagnolobrist
 (Series and Phase): e55
 Soil Profile Description: Color Moist Unless Otherwise Noted

UL Depth	Name	Matrix Color - (%)	Feature Type	Color	Abundance	Size	Contrast	Coarse Frags - (%)	Texture	Structure	Roots	pH	Fe+	Mv
0/19	Oi													

Comments:

FIGURE 19-15, Jurisdictional Wetlands Plot Report, Part 1

http://www.pebbleproject.com - Wetlands Plot Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Soil Indicators:

COE 1987 MANUAL HYDRIC SOIL INDICATORS:

Hydric Per 1987 COE Manual? Yes

Histosol (16+"): Yes	High Organic Content Surface Layer Sandy Soils: No
Histic Epipedon (8-16"): No	Organic Streaking in Sandy Soils: No
Sulfidic Odor: Yes	Listed on Local Hydric Soils List: No
Aquic Moisture Regime: Yes	Listed on National Hydric Soils List: No
Reducing Conditions: Yes	
Oleyed or Low-Chroma Colors: No	

OTHER SOIL REMARKS:

Depth of Organic Mat(inches):	19
Depth to Permafrost(inches):	N/A
Major Rooting Zone(inches):	4
Soil Temperature(12" Below Surface):	N/A (F)
Cryoturbated: No	Thixotropic: No

HIRCS-HITCHS:

Hydric Per HIRCS Field Taxonomy? Yes

Year	Soil Code
1996	A1
1996	A4
2004	1
2004	2
2004	3

Profile Comments:
All organic mat

Determination:

Hydrophytic Vegetation Present? Yes
Wetland Hydrology Present? Yes
Hydric Soils Present? Yes

FA Cross Reference Plot ID:
Site Marked on Map? Yes
Site Flagged? No

Is This Sampling Point Within a Wetland? Y
Plot Photographs Are: Digital
APS Roll #:

Remarks:
Wildlife Observations:
Moose tracks

Animal	Sign	Observation
Caribou	<input type="checkbox"/>	<input type="checkbox"/>
Bear	<input type="checkbox"/>	<input type="checkbox"/>
Wolverine	<input type="checkbox"/>	<input type="checkbox"/>
Fox	<input type="checkbox"/>	<input type="checkbox"/>
Beaver	<input type="checkbox"/>	<input type="checkbox"/>
Ground Squirrel	<input type="checkbox"/>	<input type="checkbox"/>
Waterfowl	<input type="checkbox"/>	<input type="checkbox"/>

Engineering Concerns:
 Game Trails
 Ptarmigan



Subject: Vegetation Bearing: SW



Subject: Vegetation Bearing: N



Subject: Soils Bearing: NW

Assessment:

<p>MISC. FACTORS</p> <p>Public ownership Subsistence Use Area</p> <p>LANDSCAPE VARIABLES</p> <p>Size: > (acres) Medium (10-100 acres)</p> <p>Ratio of Wetland Area to Watershed Area: High (>10%)</p> <p>Wetland Juxtaposition: Other wetlands nearby, but not connected</p> <p>Watershed Land Use: 0-25% urbanized</p> <p>Wetland Land Use: Low Intensity (open space)</p> <p>SOIL VARIABLES</p> <p>Histosol: Fibric</p> <p>Geology: Surficial: 1 Bedrock:</p> <p>HYDROLOGIC VARIABLES</p> <p>Surficial Deposit Under Wetland: Low Permeability Stratified</p> <p>Microrelief of Wetland Surface: Poorly Developed 15 cm</p>	<p>HYDROLOGIC VARIABLES CONT.</p> <p>Wetland Water Regime: Wet. Perm flooded, intermittently exposed, semiperm flooded</p> <p>Surface Water Level Fluctuation: Low fluctuation</p> <p>Frequency Overbank Flooding: No overbank flooding</p> <p>Evidence of Sedimentation: No evidence</p> <p>Basin Topographic Gradient: High gradient (>2%)</p> <p>Degree of Outlet Restriction: Unrestricted outflow</p> <p>Inlet/Outlet Class: Perennial inlet/perennial outlet</p> <p>Water pH: Circumneutral (5.5-7.4)</p> <p>Nested Piezometer Data: Not available</p> <p>Relationship of Wetland's Substrate Elevation to Regional Piezometric Surface: Not available</p> <p>Evidence of Seeps & Springs: Seeps</p>	<p>VEGETATION VARIABLES</p> <p>Emergent-persistent</p> <p>Number of Types: 2 1 - 2 types</p> <p>Vegetation Density/Dominance: Very high density (80-100%)</p> <p>Vegetative Interspersion: Moderate (broken, irregular rings)</p> <p>Plant Species Diversity: Medium (3-4 plots sampled)</p> <p>Proportion of Animal Food Plants: Medium (25-50% cover)</p> <p>Cover Distribution: 1 or more large patches, part open</p> <p>Interspersion of Cover & Open Water: 100% cover or open water</p> <p>Presences of Islands: None</p> <p>Dead Woody Material: Low abundance(0-25% wetland surface)</p>
---	---	---

FIGURE 19-16, Jurisdictional Wetlands Plot Report, Part 2

Wetlands Master Plant List - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Pebble Gold Copper Project: Master Plant List

Search Criteria:

Watershed(s): Pile Bay
 Firm(s): HDR

Master Plant List: Export to Excel

Latin Name	Common Name	Stratum	Magee Stratum	Ind. 1995	Ind. 1988
Betula kenaica	Kenai Birch	T/S	TREE		FACU
Picea glauca (Trees)	White Spruce (Trees)	T	TREE		FACU
Alnus sinuata (shrub)	Sitka Alder (shrub)	S	TS		FAC
Andromeda polifolia	Bog Rosemary	S	DS		OBL
Betula nana	Swamp Birch	S	SS		FAC
Empetrum nigrum	Black Crowberry	S	DS		FAC
Ledum decumbens	Narrow-Leaf Labrador-Tea	S	DS		FACW
Linnaea borealis	Twinflower	S	DS	FACU	UPL
Menziesia ferruginea	Mock-Azalea	S	SS	FACU*	UPL
Picea glauca (Saplings)	White Spruce (Saplings)	S	SAP		FACU
Potentilla fruticosa	Shrubby Cinquefoil	S	SS		FAC
Ribes laxiflorum	Trailing Black Currant	S	SS		NL
Salix barclayi	Barclay Willow	S	SS		FAC
Salix fuscescens	Alaska Bog Willow	S	SS		FACW
Salix pulchra	Diamond-Leaf Willow	S	SS		FACW
Sorbus sitchensis	Mountain-Ash	S	SS	FACU*	NL
Spiraea beauverdiana	Beauvered Spiraea	S	SS		FAC
Vaccinium microcarpus	Blueberry	S	DS		OBL
Vaccinium ovalifolium	Early Blueberry	S	SS		FAC
Vaccinium uliginosum	Bog Blueberry	S	DS		FAC
Vaccinium vitis-idaea	Mountain Cranberry	S	DS		FAC
Viburnum edule	Squashberry	S	SS		FACU
Achillea borealis	Yarrow	H	SH		NL
Calamagrostis canadensis	Blue-Joint Reedgrass	H	SH		FAC
Carex aquatilis	Water Sedge	H	SH		OBL
Carex canescens	Hoary Sedge	H	SH		OBL
Carex lyngbyei	Lyngbye's Sedge	H	SH		OBL
Carex pauciflora	Few-Flower Sedge	H	SH		OBL
Carex phyllomanica	Coastal Stellate Sedge	H	SH		OBL
Carex pluriflora	Several Flowered Sedge	H	SH		OBL
Carex rariflora	Loose Flowered Sedge	H	SH		OBL
Carex saxatilis	Russet Sedge	H	SH		FACW
Carex sp.	Sedge	H	SH		
Comus suecica	Swedish Dwarf Dogwood	H	SH		FAC

FIGURE 19-17, Master Plant List Report

Wetlands Field Photo Report - Microsoft Internet Explorer

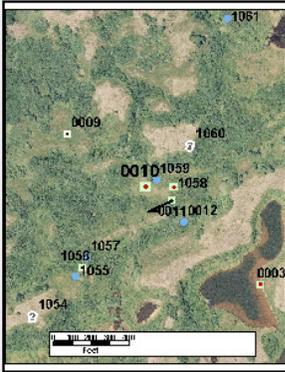
File Edit View Favorites Tools Help

Pebble Gold Copper Project: Jurisdictional Wetland Determination Photo Report

Plot Number: 3PP0010
Wetland Status: Y

[Export To Word](#)

Field Investigators:	Christopher Love (3PP) Steve Reidsma (3PP)	
USGS Quad:	ILID7	GPS: ILID7
Township:	03S	GPS: 3S
Range:	35W	GPS: 35W
Section:	33	GPS: 33
Watershed:	South Fork Koktuli GPS:	
Landform:	Swale	
Topography:	Concave	
Aspect:	118 degrees	Direction: E
Percent Slope:	4	
Elevation Range:	1152	



Hydrology & Soils

Depth to Saturated Soils (inches):	0
Depth to Free Water in Pit (inches):	1
Primary Hydrology Indicators:	None
Secondary Hydrology Indicators:	None
HGM Class:	Slope
Depth of Organic Material:	19
1987 Manual Hydric Soil Indicators:	None
Hydric Per 1987 Manual:	Yes
Hydric Per NRCS Field Taxonomy:	Yes
Soil Field Drainage Class:	PD

Soil Profile Picture



Field Taxonomy:

Dominant Plants by Stratum:

Tree: None **Shrub:** None **Herbaceous:** None

Percent of Dominant Species that are OBL, FACW, or FAC: 75%

Vegetation Picture 1



Vegetation Picture 2



FIGURE 19-18, Jurisdictional Wetland Determination Photo Report

Species Composition:

Trees:

Latin Name	Common Name	Stratum	Magee Stratum	Ind. 1995	Ind. 1988	Percent Cov.	Std. Dev.	Freq.	Avg. Height	Avg. DBH
Betula papyrifera (Trees)	Paper Birch (Trees)	T	TREE		FACU	3-30% (14.3% avg.)	14.01%	6	27.0'	5.0"
Picea glauca (Trees)	White Spruce (Trees)	T	TREE		FACU	3-20% (6.9% avg.)	4.64%	67	10.1"	2.2"
Picea mariana (Snags)	Black Spruce (Snags)	T	TREE		N/A	10-15% (11.7% avg.)	2.89%	4	"	"
Picea mariana (Trees)	Black Spruce (Trees)	T	TREE		FACW	5-5% (5.0% avg.)	0.00%	2	"	"
Picea sitchensis	Sitka Spruce	T	TREE		FACU	%	%	1	"	"
Populus balsamifera (Trees)	Cottonwood (Trees)	T	TREE		FACU	%	%	1	"	"

Shrubs:

Latin Name	Common Name	Stratum	Magee Stratum	Ind. 1995	Ind. 1988	Percent Cov.	Std. Dev.	Freq.	
Alnus sinuata (shrub)	Sitka Alder (shrub)	S	TS		FAC	3-85% (15.7% avg.)	18.91%	54	
Andromeda polifolia	Bog Rosemary	S	DS		OBL	3-35% (9.7% avg.)	8.10%	121	
Arctostaphylos alpina	Alpine Manzanita	S	DS		FACU*	3-15% (5.4% avg.)	3.63%	20	
Arctostaphylos alpina var rubra	Alpine Manzanita	S	DS		FAC*	%	%	1	
Artemisia tilessi	Sagebrush	S	DS		NL	3-3% (3.0% avg.)	0.00%	5	
Betula glandulosa	Tundra Dwarf Birch	S	SS		FAC	5-25% (11.7% avg.)	11.65%	5	
Betula nana	Swamp Birch	S	SS		FAC	3-50% (11.7% avg.)	7.94%	257	
Diapensia lapponica		S	DS		UPL*	NL	5-5% (5.0% avg.)	0.00%	1
Dryas drummondii	Yellow Mountain-Avens	S	DS		FACU	%	%	1	
Empetrum nigrum	Black Crowberry	S	DS		FAC	3-55% (13.1% avg.)	10.46%	192	
Kalmia polifolia	Pale Laurel	S	DS		FACW	4-15% (6.9% avg.)	3.97%	37	
Ledum decumbens	Narrow-Leaf Labrador-Tea	S	DS		FACW	3-60% (14.1% avg.)	11.45%	168	
Ledum groenlandicum	Greenland Labrador-Tea	S	DS		FACW	4-30% (11.9% avg.)	8.45%	12	
Linnaea borealis	Twinflower	S	DS		FACU	UPL	%	2	
Loiseleuria procumbens	Alpine Azalea	S	DS		NL	3-3% (3.0% avg.)	0.00%	9	
Myrica gale	Sweetgale	S	SS		OBL	3-75% (21.7% avg.)	15.43%	39	
Picea glauca (Saplings)	White Spruce (Saplings)	S	SAP		FACU	3-10% (5.5% avg.)	4.95%	20	
Potentilla fruticosa	Shrubby Cinquefoil	S	SS		FAC	3-40% (13.6% avg.)	11.33%	37	
Ribes sp.	Currant	S	SS			%	%	1	
Rosa acicularis	Prickly Rose	S	SS		FACU	%	%	2	
Rubus spectabilis	Salmon Berry	S	SS		FACU	%	%	1	
Salix alaxensis	Felt-Leaf Willow	S	TREE		FAC	3-80% (22.3% avg.)	23.09%	20	
Salix arbusculoides	Little-Tree Willow	S	TS		FACW	%	%	2	
Salix arctica	Arctic Willow	S	DS		FAC	3-40% (12.6% avg.)	13.09%	9	

FIGURE 19-19, Plant Community Report

Model: Model 3: Storm and Flood-Water Storage

Plot Number: JPP0001

HGM Type: 0 N/A

Date: 2/4/2005 1:04:00 PM

Variable	Condition	Weight	Value
Indicators Of Disfunction			
No Indicators of Disfunction found			
Indicators Of Function			
No Indicators of Function found			
Primary Variables			
No Primary Variables found			

Total Score	0
Model Range	0 - 0
Index Range	0.00 - 1.0
Functional Capacity Index	0.00

Neither a direct indicator of function nor a indicator of disfunction was present in the wetland being assessed. Therefore, the functions primary variables were used to obtain the final index.

FIGURE 19-20, Wetlands Functional Assessment Report

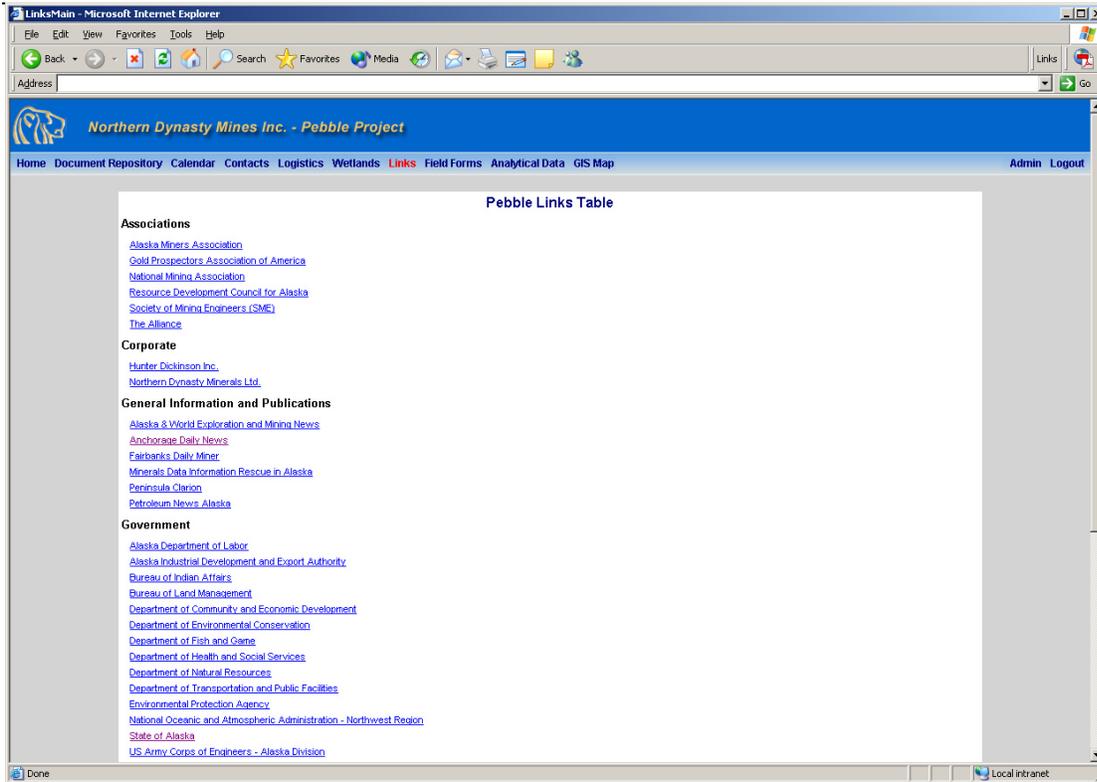


FIGURE 19-21, Pebble Links Table

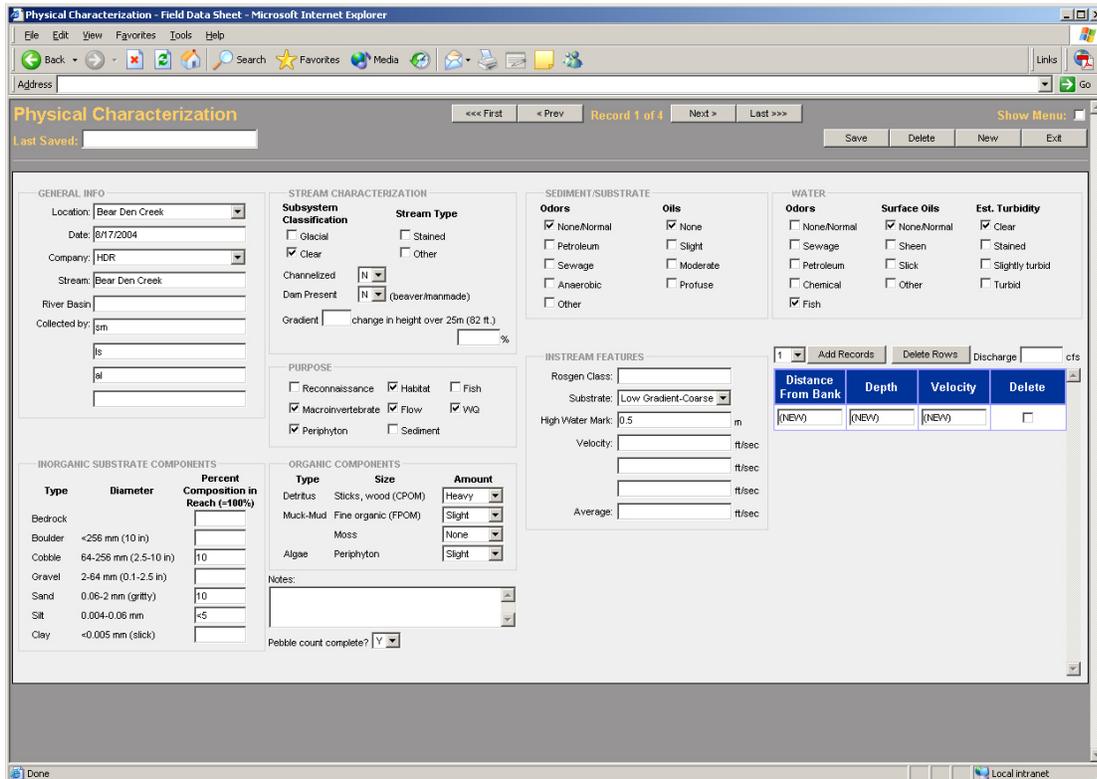


FIGURE 19-22, Field Form Example, Physical Characterization

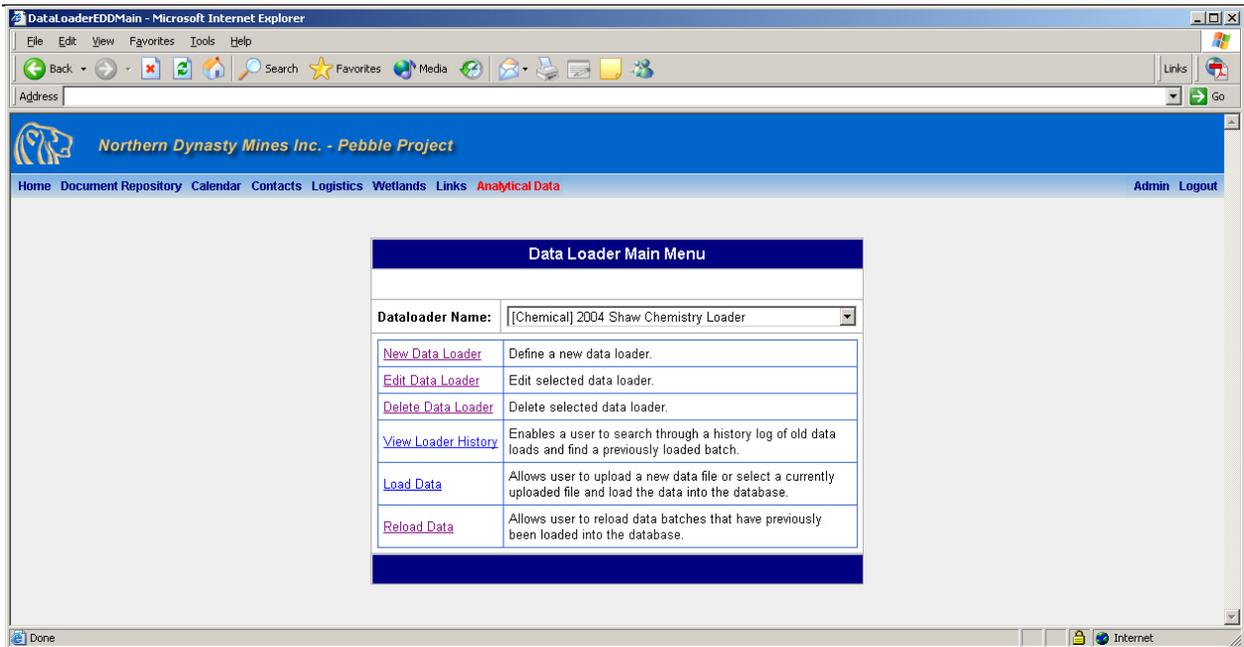


FIGURE 19-23, Data Loader Menu

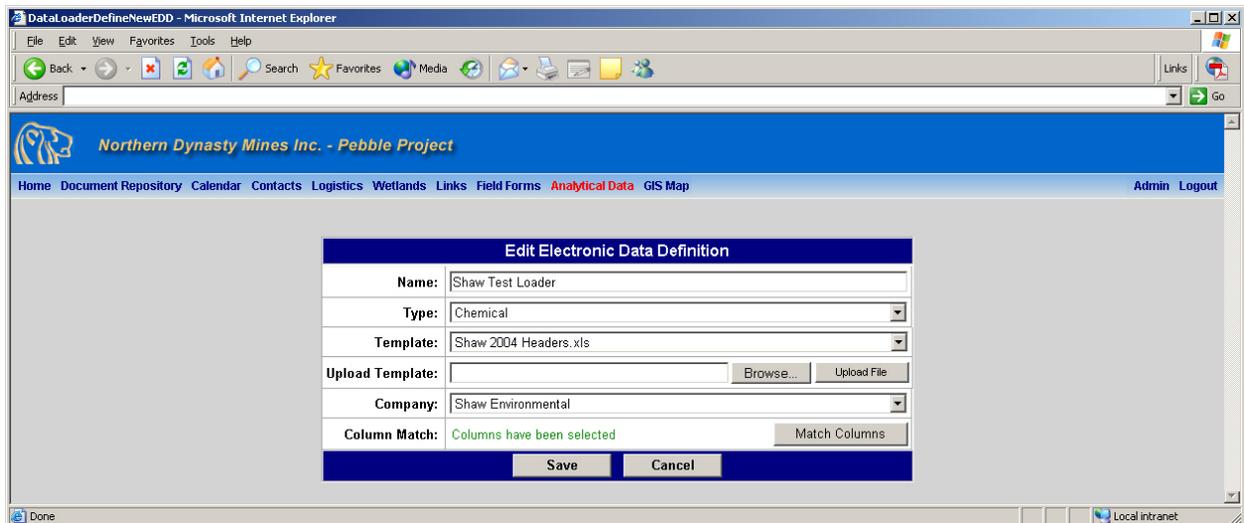


FIGURE 19-24, Editing or Defining Data Definition

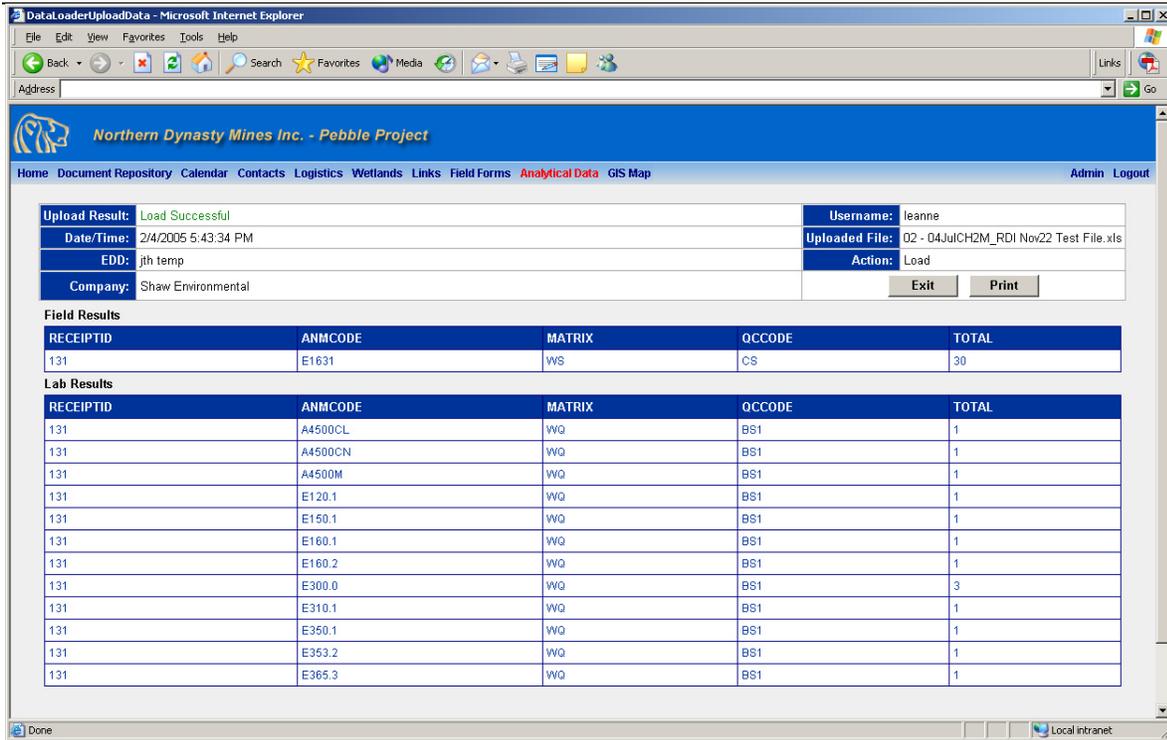


FIGURE 19-25, Data Loader History

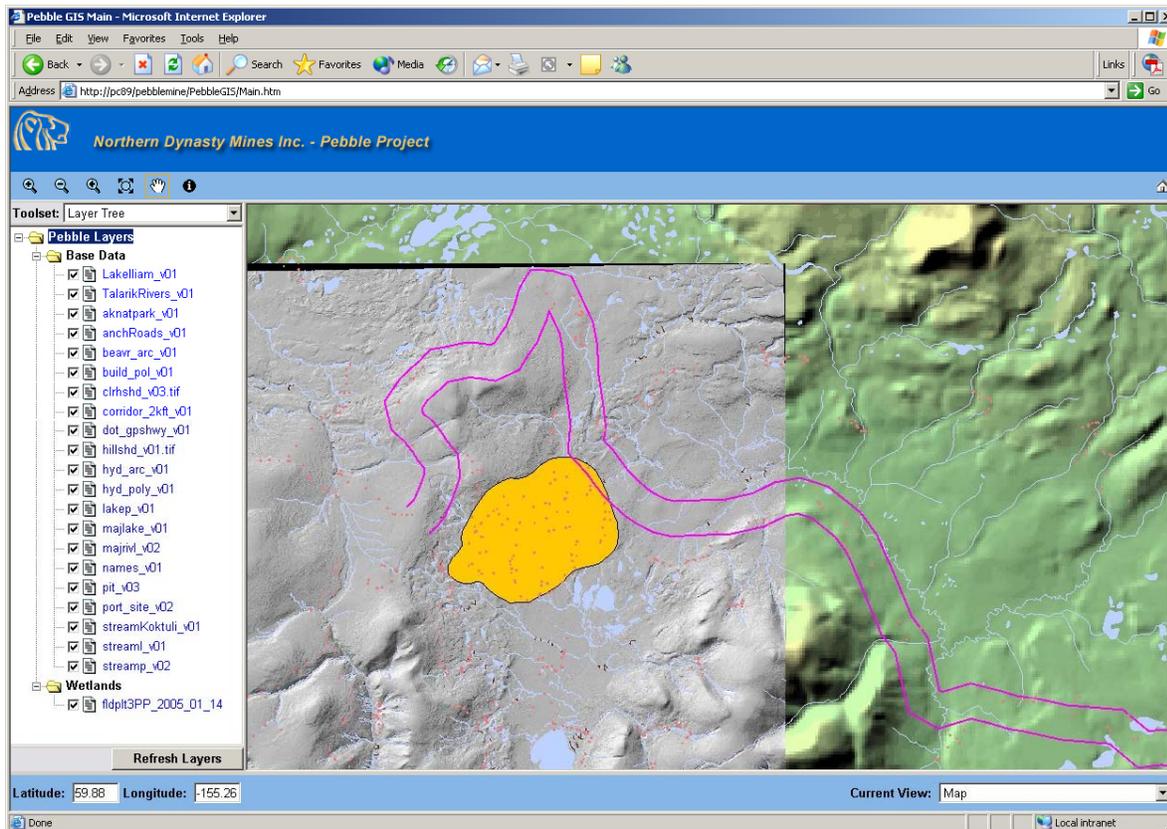


FIGURE 19-26, GIS Map