



**PEBBLE PROJECT  
ENVIRONMENTAL BASELINE DOCUMENT  
2004 through 2008**

**APPENDIX C.  
DATA MANAGEMENT AND GEOGRAPHIC  
INFORMATION SYSTEM**

PREPARED BY:

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## ACRONYMS AND ABBREVIATIONS

3PPI	Three Parameters Plus, Inc.
BBMP	Bristol Bay Management Plan
CAD	computer-aided drafting
CQM	comments and questions management
EDD	electronic data deliverables
ESRI	Environmental Systems Research Institute
GIS	geographic information system
HGM	hydrogeomorphic
HDR	HDR Alaska, Inc.
PDF	portable document format
RDI	Resource Data, Inc.
SHAW	The Shaw Group, Inc.
SHP	ESRI shapefile
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

## C. DATA MANAGEMENT AND GEOGRAPHIC INFORMATION SYSTEM

### C.1 Introduction

This report describes the data management and geographic information system (GIS) program currently in progress at Resource Data, Inc. (RDI) for the Pebble Project. The GIS and scientific data generated from the baseline studies are extensive and require careful management to support the characterization of the affected environment for the Pebble Project. Sound data management strategies ensure that the data are accurate, timely, and integrated into a multidisciplinary data repository.

Data management is automated to the extent possible to minimize errors that errors that might be caused by manual editing and analysis of scientific data.

### C.2 Program Objectives

The objectives of the GIS activities are as follows:

- Develop standards for spatial data, including datum, projection, and accuracy.
- Compile basemap data.
- Compile study data.
- Distribute data to all study consultants.
- Support the habitat-mapping team.

The objectives of website and data management activities are as follows:

- Establish standards for data format, content, and transfer.
- Support field operations through the development and maintenance of web-based software for data entry and document management.
- Support data analysis and reporting.
- Manage documents.
- Maintain the project website.

### C.3 Scope of Work

The scope of work for the data management program consists of GIS work, and website and data management.

GIS work includes managing mapping data submitted by the consultants during baseline studies, creating and loading basemap and Pebble-specific data, supplying GIS support for the wetlands study, and providing cartographic services to support the project. Resource Data provides GIS work on an on request basis from the consultants.

Website and data management tasks include building a central data repository for the project, providing web-based tools for entering and reporting on project data, and developing tools for uploading data into the project database. The website and database provide long-term storage and access to baseline data. Data management software is provided by Resource Data, Incorporated.

## **C.4 Technologies Used**

### **C.4.1 GIS Technology**

The Pebble GIS uses the following technologies:

- ArcGIS 9.3, used for all GIS related functionality, including map production and data creation.
- Vector data, stored as Environmental Systems Research Institute (ESRI) shapefiles.
- Raster imagery, stored as Geotiffs with ESRI pyramids.
- Data are distributed by means of portable hard drives or through the project website.
- 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.

### **C.4.2 Data Management Technology**

The Pebble Project website was developed using the following technologies:

- Oracle 9.2g.
- Microsoft Advanced Server 2003.
- Microsoft Internet Information Server.
- Microsoft C#.NET.
- Dell PowerEdge 2600 Xeon Server.

## **C.5 Program Description**

### **C.5.1 Geographic Information System**

The data management program included developing GIS standards, and building a GIS to support the Pebble Partnership and its contractors. The activities outlined in Sections C.5.1.1 through C.5.1.5 were completed by the end of 2008.

### **C.5.1.1 GIS Management**

Standards developed for managing the GIS data associated with the Pebble Project include 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 the Pebble Project is ESRI ArcGIS Version 9.3. This software ensures that all figures and maps produced for the project are compatible. As long as the resulting data are fully compatible with ESRI ArcGIS Version 9.3, individual consultants may use other data-creation software systems.

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 the GIS\_FINAL folder are stored in subfolders named by a three- or four-character abbreviation of the data originator's name.
- Inside of the data-originator subfolders, consultants create CATEGORY folders at their discretion, and then the data are submitted to RDI.
- Data are stored in the ESRI shapefile (SHP) format.
- All SHP names are limited to 13 characters and must contain the version number (e.g., hydro\_V02).

GIS data have metadata populated using the ESRI metadata tool set.

Standard map templates (ArcGIS map template files) for use by the project team are created in the following sizes:

- 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 maintains the master GIS data repository and coordinates all data transfers from RDI to project consultants by means of portable hard drives or other data media.

### **C.5.1.2 Basemap Data**

Basemap data were compiled for use by the project team. These data were converted from their native format for use in ArcGIS 9.3. Basemap data include the following:

- United States Geological Survey (USGS) 1:63,360 digital line graph (DLG) hydrography.
- 50-foot contours generated from USGS 1:63,360 digital elevation models (DEM).
- Hand-entered geographic labels and water-body labels from USGS digital raster graphs.
- 1:2400-scale orthophotography 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 for the inner mine area produced by Eagle/Kodiak Mapping.
- 1:4800-scale orthophotography for the outer mine area developed by Eagle/Kodiak Mapping.
- 1:4800-scale vector mapping for the outer mine area produced by Eagle/Kodiak Mapping.
- Township, range, and section information.
- National parks and preserve data.
- Native regional corporation boundaries.

#### **C.5.1.3 Environmental Data**

Various environmental data sets were converted into ArcGIS 9.3 for the Pebble Project. In some cases, data existed only 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 habitats for bears, birds, caribou, clams, crabs, fish, marine mammals, moose, and sheep.

#### **C.5.1.4 Data Acquisition for Wetlands Consultants**

Data sets for use by Three Parameters Plus, Inc. (3PPI), and other environmental consultants that existed only in paper form and required digitizing were converted into ESRI shapefile format. Data include the following:

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

#### **C.5.1.5 Ongoing Support for Wetlands Consultants**

Support for the 3PPI and HDR Alaska, Inc. (HDR) wetlands delineation process was provided through the following activities:

- Produced field maps and photo reports. Field maps were created on weather-resistant paper for use during the field seasons. Photo reports, including field data, were generated at the completion of each field season (through summer 2008) to be used in quality control.

- Wetlands data were scrubbed to remove slivers, close polygons, and maintain the integrity of the wetlands mapping.
- Digital photographs and location information were processed.
- Summary tables were developed that show, for the study area, the number of acres for each vegetation type and hydrogeomorphic (HGM) classification.

#### **C.5.1.6 Cartographic Services**

Cartographic services were provided to the consultants on the Pebble Project team on an as-needed basis (with approval from Pebble Partnership).

### **C.5.2 Data Management**

A web-based data management application was created to support the Pebble Project environmental baseline team and ensure data security is protected. An integrated data management system is critical for ensuring data consistency and reliability. 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 login credentials. Types of functionality present in the system are summarized below.

#### **C.5.2.1 Meteorological Data**

From the home page of the Pebble Project website (Figure C-1) users can access the following data related to meteorology:

- Camera images at meteorological stations at the mine and Cook Inlet study areas.
- Current weather-station data updated regularly and are used to help plan helicopter flights to and from Iliamna.
- Maps of weather stations in the possible mine area and possible port area.
- Data for USGS stream-gage stations.
- A list of current enhancements for the different modules within the website.

#### **C.5.2.2 Document Repository**

The document repository provides a centralized storage location for project documents (Figure C-2). The repository stores electronic project-related documents including spreadsheets, images, portable document format (PDF) files, and map files. The repository also stores metadata such as title, author, keywords, and citations (Figure C-3). When a new version of a document is created, it can be uploaded to the repository and associated with the document to create an historical archive. Role-based security determines user permissions for adding, viewing, editing, and deleting files. Users can search for specific documents and document types. Files are stored in a folder structure, and users can expand or collapse these structures to see more or fewer subfolders and files.

### **C.5.2.3 Wetlands**

The wetlands page enables users to enter wetlands data and review existing data for plots of land in the wetlands study area. The data captured for each plot are: site location, vegetation, hydrology, soil profile and other soil information, determination on whether the plot is a wetland, and wetland functional capacity assessments. In addition, the wetlands page includes a number of wetland-specific reports and digital photographs of each wetland plot.

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

- Site Location—information relating to the location of an individual field plot including a site-location map (Figure C-4).
- Vegetation—information relating to the vegetation located at a field plot (Figure C-5).
- CRP-AK06—information relating to bryophyte vegetation located at a field plot (Figure C-6). (Bryophytes are land plants that have tissues and enclosed reproductive systems, but which lack vascular tissue that circulates liquids. They do not have flowers or seeds but instead reproduce with spores).
- MORPH-AK06—information relating to plant morphological adaptations observed at a field plot (Figure C-7).
- HYD-87—information relating to the hydrology present at a field plot (Figure C-8).
- HYD-AK06—information relating to wetlands indicators at a field plot (Figure C-9).
- Soil Profile—information relating to the soil profile at a field plot (Figure C-10).
- Other Soil—additional information on the soil present at a field plot (Figure C-11).
- Determination—final information on whether the field plot is a wetland; also allows for storage of multiple digital photographs of the field plot and surrounding area (Figure C-12).
- Assessment—if the wetland is designated as a wetland on the Determination tab, the Assessment tab will appear; allows users to describe the wetland by selecting choices under a predefined list of wetland variables (e.g., hydrology, landscape, vegetation; Figure C-13).

### **C.5.2.4 Links**

Links are provided to relevant web-based resources for associations, publications, governmental, and regional agencies.

### **C.5.2.5 Field Forms**

Field forms were developed to capture information collected during or related to field studies (Figure C-14). Data captured in these forms will be exportable to Microsoft Excel for future analysis.

At the request of the Field Data Manager, user access to the field forms was restricted in September 2008 to ensure security and integrity of the data.

### **C.5.2.6 Analytical Data**

The analytical data application includes three features: data loader, data extractor, and data changer.

#### ***Data Loader***

The data loader, which can be configured by the user, checks incoming data for a variety of problems such as duplicate sample numbers, blank cells within a column, and previously loaded samples. Access to the data loader is strictly controlled to ensure security and integrity of the data—only those people approved by the Pebble Partnership have authority to load data. The primary use of the data loader has been to upload laboratory results and meteorological data. The data loader is composed of the following functionalities (Figure C-15):

- New Data Loader—allows users to create a new data loader for the system. The data loader controls the EDD (electronic data deliverables), which specifies the format of the columns to be added to the database.
- Edit Data Loader—allows users to edit an existing data loader (Figure C-16).
- Delete Data Loader—removes a data loader from the system.
- View Loader History—allows users to search through a log of all data loaded to the system (Figure C-17).
- Load Data—allows users to load analytical data to the system in the format specified in the EDD.
- Batch Removal—allows users to remove data that have been loaded to the system previously.

#### ***Data Extractor***

The data extractor is used to query the database and to save the result sets to Microsoft Excel files. It is highly configurable and includes the following features:

- Report creation based on multiple data types (e.g., analytical chemistry and field water quality).
- Mandatory fields that must accompany each result set (e.g., the validation flag and units must accompany all result sets for analytical chemistry).
- Option to include or remove fields from result sets (with the exception of mandatory fields).
- Ability to filter result sets using logical (Boolean) operators.

Environmental consultants for Pebble Project were instructed in the use of the data extractor to support their report writing.

#### ***Data Changer***

The data changer is used in controlled situations to change the data—only the Field Data Manager can use this tool. The data changer enables authorized users to run existing reports and to edit the chemistry data and the analyte criteria data. These data can be used for review, performing calculations, or creating customized reports. The data changer also allows authorized users to use existing Data Extractor Reports as a basis for editing data within the Data Changer.

## C.6 References

Magee, Dennis W., and Garrett G. Hollands. 1998. A Rapid Procedure for Assessing Wetland Functional Capacity Based on Hydrogeomorphic (HGM) Classification. Bedford, NH: Normandeau Associates.

## C.7 Glossary

Functionality—a particular set of functions or capabilities associated with computer software.

Hydrogeomorphic—a wetlands classification system.

Metadata—data about other data; used in describing the data and putting them into context.

Receipt (in the CQM system)—a document from government agencies containing agency comments. A receipt is broken down into individual comments in the CQM system, and responses are developed or positions are assigned for each comment.

## FIGURES



FIGURE C-1  
Types of Data Accessible from Pebble Project Website Home Page

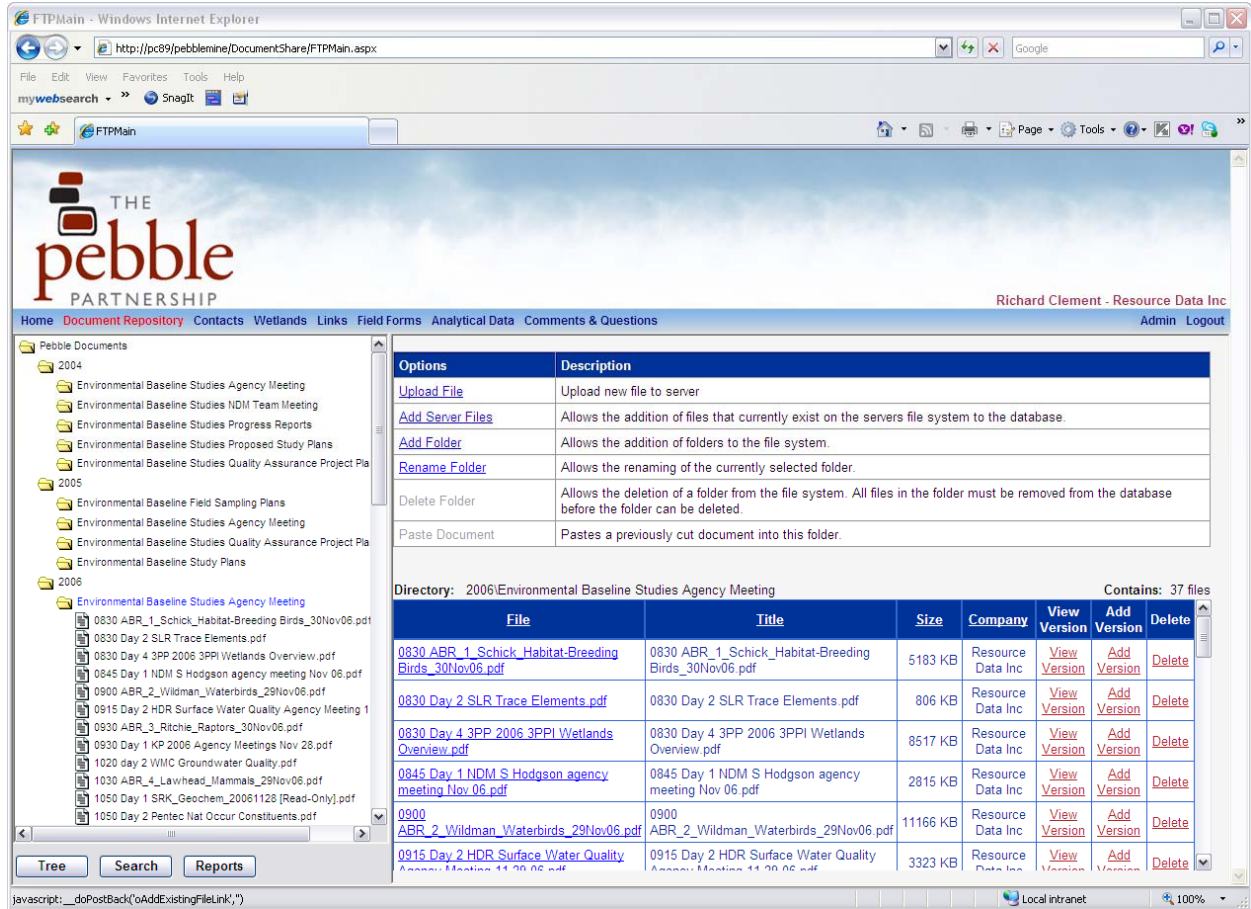


FIGURE C-2  
Document Repository, Example Files List

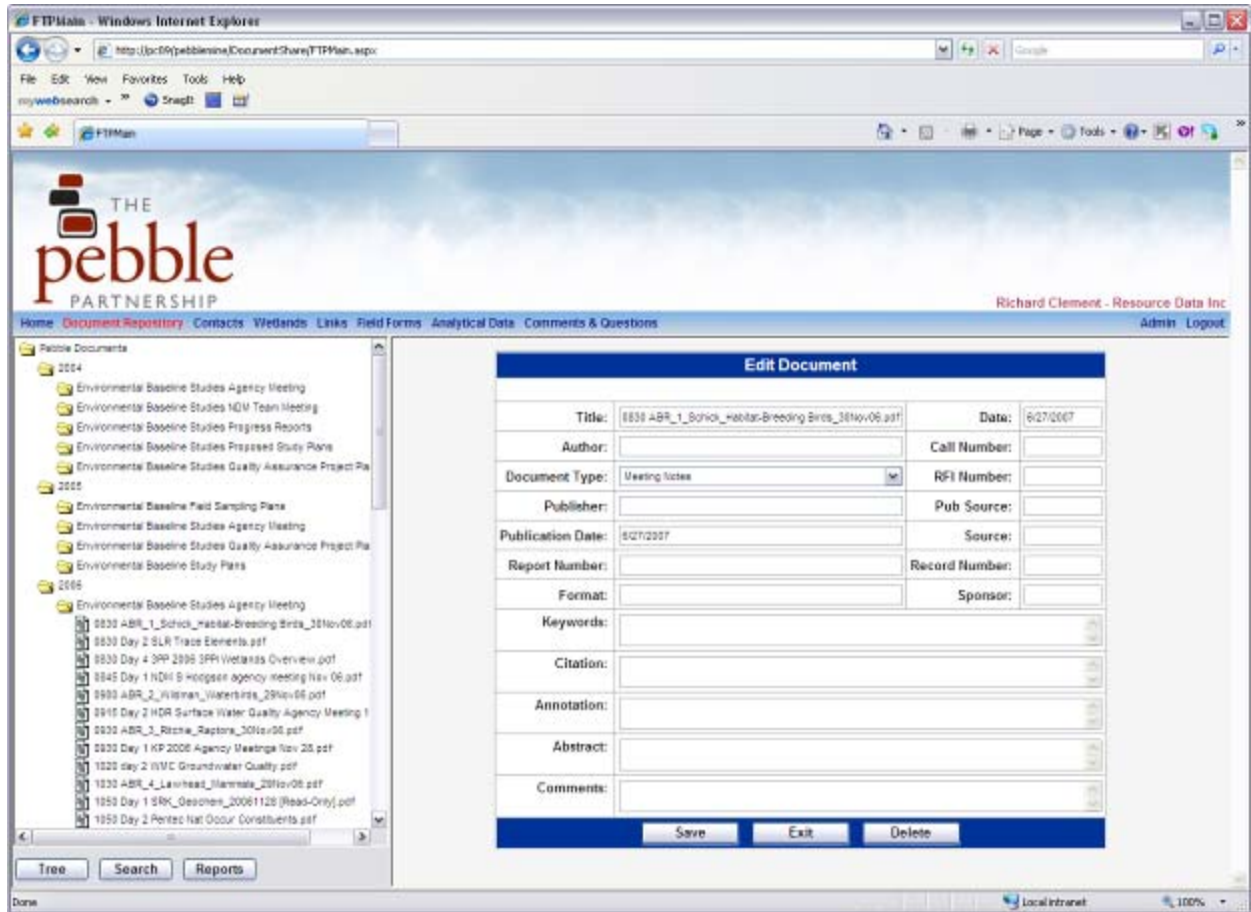


FIGURE C-3  
Document Repository, Example Metadata Form



WetlandsFormInputMain - Windows Internet Explorer  
 http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx?r=JDWETLANDS

**Routine Wetland Determination**  
 Last Saved: Plot Type @ 4:17:32 PM  
 Show Menu:  Plot: 3PP0001 QC Status: Data Entry Not Complete  
 Find Plot: 3PP Go Type: JD Status:

Site Location: Vegetation | CRYP-AK06 | MORPH-AK06 | HYD-87 | HYD-AK06 | Soil Profile | Other Soil | Determination | Save Plot | Main Menu

Yellow highlighting indicates a species of interest. If the species is rare, the rare species form may be access by clicking on the link in the 'rare' column.

Acronym	Latin Name	Common Name	Stratum	Ind. Status	% Cover	Dom.	Height	Tree DBH	Magee Stratum	Animal Food	Subs. Food	Delete	Rare
STEM	Stachys emersonii	Emersonnulis hedgenettle	H	FACW	10	Y			SH			<input type="checkbox"/>	<a href="#">Y</a>
CAAT	Carex atherodes	Slough sedge	H	OBL	5	Y			SH	Y		<input type="checkbox"/>	<a href="#">Y</a>
												<input type="checkbox"/>	<a href="#">↑</a>
												<input type="checkbox"/>	<a href="#">↑</a>
												<input type="checkbox"/>	<a href="#">↑</a>
												<input type="checkbox"/>	<a href="#">↑</a>

% of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **97** Calculated: 100% Calculate Species Removed by Extrapolation: 5 Add Rows Delete Species Modify Species

VEGETATION REMARKS  
 Fri Jun 27 09:36:10 2008

MISC. VEGETATION DATA  
 Project Veg Type: Field BBMP Veg Type: Viereck Code: ABR Hab Code: Field JD Wet Code: W Field ENWI Code: FRI JUN 27 09:37:34 Field EROS Veg. Type: Subarctic Lowland Sedge Bog Meadow Eros GIS: Open low shrub ericaceous/conifer woodland/mesic bog/ericaceous shrub tundra Trace =< (%): 81 Method: Fri Jun 27 09:37 Proportion of Animal Food Plants (Calculated): 5 Proportion of Subsistence Food Plants (Calculated): 0

INDICATOR 1: PREVALENCE INDEX (AK2006)

Total % Cover of (A)	Multiplied by (B)	Prevalence Index = B/A =
OBL Species: 79	x 1 = 16	Calculated: 1.67
FACW Species: 92	x 2 = 59	
FAC Species: 71	x 3 = 88	
FACU Species: 28	x 4 = 44	
UPL Species: 27	x 5 = 11	
Column Totals: 50	54	

HYDROPHYTIC VEGETATION INDICATORS  
 2006 1987  
 Prevalence Index - Indicator 1: Wetland Cryptograms - Indicator 2:

Plot 1 of 13193 << previous 1 next >> Go To Next Tab

FIGURE C-5  
 Jurisdictional Wetlands Input Form Example, Vegetation Tab

WetlandsFormInputMain - Windows Internet Explorer  
 http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx?r=JDWETLANDS

File Edit View Favorites Tools Help  
 mywebsearch SnagIt

WetlandsFormInputMain

**Routine Wetland Determination**  
 Last Saved: Plot Type @ 4:17:32 PM

Show Menu:  Plot: 3PP0001 QC Status: Data Entry Not Complete  
 Find Plot: 3PP Go Type: JD Status:

Site Location Vegetation **CRYP-AK06** MORPH-AK06 HYD-87 HYD-AK06 Soil Profile Other Soil Determination Save Plot Main Menu

Bryophyte Type	% Cover Quad 1	% Cover Quad 2	% Cover Quad 3	Avg Quads 1 - 3	Calc Avg Quads 1 - 3
Aulacomnium palustre	90	98	15	17	67.67
Blepharostoma trichophyllum	85	93	25	20	67.67
Calliergon stramineum	76	39	49	43	54.67
Calypogeia sphagnicola	77	57	83	55	72.33
Drepanocladus sp.	24	84	91	69	66.33
Meesia triquetra	81	48	93	11	74
Meesia uliginosa	37	98	78	4	71
Mylia anomala	0	8	69	69	25.67
Pohlia prolifera	47	79	0	99	42
Polytrichum strictum	79	19	88	91	62
Sphagnum angustifolium	75	40	83	70	66
Sphagnum fuscum	38	77	28	23	47.67
Sphagnum papillosum	32	62	78	92	57.33
Sphagnum russowii	67	97	4	66	56
Sphagnum squarrosum	89	39	84	81	70.67
Sphagnum warnstorfi	65	71	60	62	65.33
Tomentypnum nitens	93	20	5	53	39.33
<b>A. SubTotal (Wetland Bryophytes Above)</b>	<b>6</b>	<b>11</b>	<b>11</b>	<b>31</b>	<b>1005.67</b>
Other Moss	77	52	68	27	65.67
Other Liverwort	21	3	96	91	40
Other Hornwort	5	65	80	14	50
<b>B. SubTotal (Other Bryophytes Above)</b>	<b>1</b>	<b>92</b>	<b>28</b>	<b>50</b>	<b>155.67</b>
<b>C. TOTAL ALL BRYOPHYTES (A + B)</b>	<b>99</b>	<b>8</b>	<b>89</b>	<b>31</b>	<b>1161.34</b>
<b>D. Avg. Total &gt; 50% of Total Cover? (A/C)</b>					Yes

Within Interior or South-central Alaska? Yes (from GIS)  
 Within Black Spruce Forest mapping unit? No  
 Wetland Cryptogams - indicator 2

Plot 1 of 13193 << previous 1 next >> Go To Next Tab

Done Local intranet 100%

FIGURE C-6  
 Jurisdictional Wetlands Input Form Example, CRYP-AK06 Tab

WetlandsFormInputMain - Windows Internet Explorer  
 http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx?r=JDWETLANDS

**Routine Wetland Determination**  
 Last Saved: Plot Type @ 4:17:32 PM  
 Show Menu:  Plot: 3PP0001 QC Status: Data Entry Not Complete  
 Find Plot: 3PP Go Type: JD Status:

Site Location | Vegetation | CRYP-AK06 | **MORPH-AK06** | HYD-87 | HYD-AK06 | Soil Profile | Other Soil | Determination | Save Plot | Main Menu

Adapted FACU Species	% Cov Stunted	% Cov Multiple Trunks	% Cov Rotten Core	% Cov Altered Growth Form	% Cov Other	Other Adaptation Description	Total % Cov Adaptations	Total % Cov	>50% Adapted?	PHOTOS
----------------------	---------------	-----------------------	-------------------	---------------------------	-------------	------------------------------	-------------------------	-------------	---------------	--------

Enter FACU Species on the [Vegetation Tab](#).

INDICATOR 3: PREVALENCE INDEX (MORPHOLOGICAL ADAPTATIONS)

Total % Cover of (A)	Multiplied by (B)	Prevalence Index = B/A = 76
OBL Species: 65	x 1 = 92	
FACW Species: 95	x 2 = 26	
FAC Species: 85	x 3 = 11	
FACU Species: 11	x 4 = 22	
UPL Species: 3	x 5 = 36	
Column Totals: 61	18	

COMMENTS  
 Thu Jul 24 11:47:11 2008

Morphological Adaptations - Indicator 3  Yes

Plot 1 of 13193    << previous 1 next >>    Go To Next Tab

Done    Local intranet    100%

FIGURE C-7  
 Jurisdictional Wetlands Input Form Example, MORPH-AK06 Tab

WetlandsFormInputMain - Windows Internet Explorer  
 http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx?r=JDWETLANDS

**Routine Wetland Determination**  
 Last Saved: Plot Type @ 4:17:32 PM

Plot: 3PP0001 QC Status: Data Entry Not Complete  
 Find Plot: 3PP Go Type: JD Status:

Site Location | Vegetation | CRYP-AK06 | MORPH-AK06 | **HYD-87** | HYD-AK06 | Soil Profile | Other Soil | Determination | Save Plot | Main Menu

Recorded Data (Describe in Remarks):  
 Stream, Lake or Tide Gauge  
 Aerial Photographs (Years: 1, 14, 73)  
 Other  
 No Recorded Data Available

Waterbody Type: Ocean  
 Stream Width: 63  
 Water pH: 64 Data Src: Extrap Fr: Go  
 Specific Conductance (SPER): 76 Data Src: Measured Extrap Fr: Go

FIELD OBSERVATIONS (INCHES):  
 Surface Water Present? Depth of Surface Water: 99  
 Water Table Present? No Depth to Free Water: 68  
 Depth to Ice in Pit: 70  
 Impeding Layer? Depth to Impeding Layer: 86  
 Impeding Layer Type: 43  
 Saturated Soil Present? Yes Depth to Saturated Soil: 44

Hydrology Comments:  
 Thu Jul 24 12:39:44 2008

WETLAND HYDROLOGY INDICATORS

Primary Indicators:  
 Relic Inundated  
 Relic Saturated  
 Slight Water Marks  
 Drift Lines  
 Relic Sediment Deposits  
 Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):  
 Yes Oxidized Root Channels in Upper 12"  
 Water-Stained Leaves  
 Yes Local Soil Survey Data  
 Marginal FAC- Neutral Test  
 Yes Calculated FAC-Neutral Test  
 No Other (Explain in Comments)

Aspect (degrees): 73 (direction): East  
 Percent Slope: 32 %  
 Elevation (ft): 99  
 Landform: Mound  
 Macro-Topography: Hummocky (large)  
 Micro-Topography: Flat to Slightly Concave  
 HGM Class: Depressional  
 ABR Physiography: 57  
 ABR MacroSurface: 82  
 ABR MicroSurface: 79

Wetland Hydrology Present (1987 Manual)? Yes

Plot 1 of 13193 << previous 1 next >> Go To Next Tab

Done Local intranet 100%

FIGURE C-8  
 Jurisdictional Wetlands Input Form Example, HYD-87 Tab

The screenshot shows a web browser window titled 'WetlandsFormInputMain - Windows Internet Explorer'. The address bar shows the URL: `http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx?r=JDWETLANDS`. The page title is 'Routine Wetland Determination'. Below the title, there is a 'Last Saved' timestamp: 'Plot Type @ 4:17:32 PM'. The 'Find Plot' field contains '3PP' and the 'Go' button is visible. The 'Plot' field contains '3PP0001', 'QC Status' is 'Data Entry Not Complete', 'Type' is 'JD', and 'Status' is empty. The 'Save Plot' and 'Main Menu' buttons are also present.

The main content area is divided into several tabs: 'Site Location', 'Vegetation', 'CRYP-AK06', 'MORPH-AK06', 'HYD-87', 'HYD-AK06' (selected), 'Soil Profile', 'Other Soil', and 'Determination'. The 'Determination' tab is active, showing the following sections:

- PRIMARY INDICATORS:** A grid of dropdown menus for indicators A1 through B5.
 

Surface Water (A1)	Yes	Surface Soil Cracks (B6)	Yes
High Water Table (A2)	No	Inundation Visible on Aerial Imagery (B7)	Yes
Saturation (A3)	Relic	Sparsely Vegetated Concave Surface (B8)	No
Water Marks (B1)	Slight	Hydrogen Sulfide Odor (C1)	Yes
Sediment Deposits (B2)	Relic	Dry-Season Water Table (C2)	No
Drift Deposits (B3)		Other (Explain in Comments)	Relic
Mat or Crust of Algae or Mari (B4)	No		
Iron Deposits (B5)	Yes		
- SECONDARY INDICATORS:** A grid of dropdown menus for indicators B9 through D5.
 

Water-stained Leaves (B9)	
Drainage Patterns (B10)	
Oxidized Rhizospheres on Living Roots (C3)	Yes
Presence of Reduced Iron (C4)	Yes
Salt Deposits (C5)	No
Stunted or Stressed Plants (D1)	Yes
Geomorphic Position	Marginal
Shallow Aquitard (D3)	Marginal
Microtopographic Relief (D4)	Yes
FAC-Neutral Test (D5)	Marginal
Calculated FAC-Neutral Test	Yes
- FIELD OBSERVATIONS (INCHES):** A grid of input fields for measurements.
 

Surface Water Present?		Depth of Surface Water:	99
Water Table Present?	No	Depth to Free Water	68
		Depth to Ice in Pit:	70
Impeding Layer?		Depth to Impeding Layer:	86
Impeding Layer Type	43		
Saturated Soil Present?	Yes	Depth to Saturated Soil:	44
- Additional Fields:**
  - 'Are climate/hydrologic conditions on the site typical for this time of year?' with a dropdown set to 'Unsure'.
  - 'Climate Comments:' with a text area containing 'Thu Jul 24 11:42:48 2008'.
  - 'Hydrology Comments:' with a text area containing 'Thu Jul 24 11:42:48 2008'.
  - 'Wetland Hydrology Present (AK2006)?' with a dropdown menu.

At the bottom of the form, there is a 'Plot 1 of 13193' indicator, navigation buttons '<< previous', '1', and 'next >>', and a 'Go To Next Tab' button. The browser status bar shows 'Done', 'Local intranet', and '100%' zoom.

FIGURE C-9  
Jurisdictional Wetlands Input Form Example, HYD-AK06 Tab

WetlandsFormInputMain - Windows Internet Explorer  
 http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx?r=JDWETLANDS

**Routine Wetland Determination**  
 Last Saved: Plot Type @ 4:17:32 PM

Show Menu:  Plot: 3PP0001 QC Status: Data Entry Not Complete  
 Find Plot: 3PP Go Type: JD Status:

Site Location | Vegetation | CRYP-AK06 | MORPH-AK06 | HYD-87 | HYD-AK06 | **Soil Profile** | Other Soil | Determination | Save Plot | Main Menu

SOIL PROFILE:  
 Mapping Unit Code: IA9 Field Taxonomy: Typic Cryorthents  
 Soil Survey: Exploratory Soil Survey of Alaska Andisol Taxonomy:  
 Field Drainage Class: Moderately Well Drained Edition of Keys Used?  
 (Series and Phase): Typic Cryandpts, very gravely, hilly to steep association.

Soil Profile Description: Colors Moist Unless Otherwise Noted

U/L Depth (in)	Name	Matrix Color - (%)	Feature Type	Feature Color	Feature %	Feature Loc	Abundance	Size	Contrast	Coarse Frags - (%)	Modifier	Texture	Structure	Roots	pH	Fe+	Mv
0 / 2	O																
Order: 0																	
Delete																	
2 / 6	A	7.5YR 3/3	100							G	20		WSBK	FF	5.5		
Order: 1																	
Delete																	
6 / 8	B	10YR 3/4	100							G	20	CSAL	WSBK	FF	5.5		
Order: 2																	
Delete																	
8 / 18	C	10YR 4/3	100							CB	40	CSAL	WSBK		5.5		
Order: 3																	
Delete																	
Very course soil, loamy texture																	
Order: 4																	
Delete																	

Plot 1 of 13193 << previous 1 next >> Go To Next Tab

FIGURE C-10  
 Jurisdictional Wetlands Input Form Example, Soil Profile Tab

WetlandsFormInputMain - Windows Internet Explorer  
 http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx?r=JDWETLANDS

**Routine Wetland Determination**  
 Last Saved: Plot Type @ 4:17:32 PM

Show Menu:  Plot: 3PP0001 QC Status: Data Entry Not Complete  
 Find Plot: 3PP Go Type: JD Status:

Site Location | Vegetation | CRYP-AK06 | MORPH-AK06 | HYD-87 | HYD-AK06 | Soil Profile | **Other Soil** | Determination | Save Plot | Main Menu

COE 1987 MANUAL HYDRIC SOIL INDICATORS:

Hydric Per 1987 COE Manual? **Yes**

Yes Histosol (16+'' Saturated) Yes Gleyed or Low-Chroma Colors  
 Yes Histic Epipedon (8-16'' Saturated) Yes High Organic Content Surface Layer Sandy Soils  
 Marginal Sulfidic Odor Organic Streaking in Sandy Soils  
 Marginal Aquic Moisture Regime (Obsolete per USACE HQ) No Listed on Local Hydric Soils List  
 Marginal Reducing Conditions Yes Listed on National Hydric Soils List

OTHER SOIL REMARKS:  
 Depth of Organic Mat (inches) 21  
 Depth to Permafrost (inches) 74  
 Major Rooting Zone (inches) 60  
 Soil Temperature 27 C  
 Soil Temperature Depth (inches) 60  
 Cryoturbated No Thixotropic

NRCS-NTCHS:  
 Hydric Per NRCS-NTCHS Indicators **Unsure** 10 Add Rows

2007	2006	2005	Ref	2004	Ref	1987	Delete
							Delete
							Delete
							Delete
							Delete
							Delete

2006 Indicators Listed Above that start with a number are not recognized by the NTCHS but are found in the Interim Alaska Regional Supplement.

Profile Comments:  
 Thu Jul 24 11:45:51 2008

Hydric Soils Present? 1987 2006  
 No

ABR SOIL DATA  
 ABR Soil Drainage: 45  
 ABR Soil Moist: 14

Plot 1 of 13193 << previous 1 next >> Go To Next Tab

Local intranet 100%

FIGURE C-11  
 Jurisdictional Wetlands Input Form Example, Other Soil Tab

WetlandsFormInputMain - Windows Internet Explorer  
 http://pc89/pebblemine/Wetlands/WetlandsFormInputMain.aspx

**Routine Wetland Determination**  
 Last Saved: [ ] Show Menu: [ ] Plot: 3PP0001 QC Status: Data Entry Complete  
 Find Plot: 3PP Go Type: JD Status: N

Site Location: **Vegetation** | CRYP-AK06 | MORPH-AK06 | HYD-87 | HYD-AK06 | Soil Profile | Other Soil | **Determination** | Save Plot | Main Menu

Mark QC Complete [ ] 1987 2006

Hydrophytic Vegetation Present? No (50) [ ] [ ]  
 Wetland Hydrology Present? No [ ] [ ]  
 Hydric Soils Present? No [ ] No [ ]  
 Plot Meets Wetland Criteria? N [ ] [ ]

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

Plot Photographs Are: Digital [ ] APS Roll #: [ ]  
 File: [ ] Browse... Add Image  
 Click the image below for a larger view and for other options.  
 Photo Path: Photos\Wetlands\3PP\_040629\_03\3PP-4\F0004438.JPG

Remarks:  
 Photos from this area combined under this location. Lots of camera testing done here.

Wildlife Observations: [ ]  
 Engineering Concerns: Flat [ ]

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"/>

Photo Path: @040627012952N5952086W155182908 6/26/2004 17:34  
 << Prev 1 of 6 Next >>  
 Photo Type: Vegetation [ ] Photo Bearing: S [ ]

Plot 2 of 19989 << previous 1 next >> Mark As QC Complete Go To Next Tab  
 This will not save the plot.

Done Local intranet 100%

FIGURE C-12  
 Jurisdictional Wetlands Input Form Example, Determination Tab

WetlandsFormInputMain - Microsoft Internet Explorer

Address: https://www.pebbleproject.com/pebblemine/Wetlands/WetlandsFormInputMain.aspx

**Routine Wetland Determination**

Plot: 3PP0001 QC Status: Data Entry Complete

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

Site Location | Vegetation | CRYP-AK06 | MORPH-AK06 | HYD-87 | **HYD-AK06** | Soil Profile | Other Soil | Determination | **Assessment** | Save Plot | Show Model | Main Menu

Plot 1 of 6606

Mark As QC Complete Go To Next Tab

---

**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 Juxtaposition:**

- Connected up & 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: Fibric
- Histosol: Hemic
- Histosol: Sapric

**HYDROLOGIC VARIABLES CONT.**

**Wetland Water Regime:**

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

**Surface Water Level Fluctuation:**

- 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
- Fluvaquent soils
- Sediment observed on substrate

**Basin Topographic Gradient:**

Stream Gradient: ( )

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

**Degree of Outlet Restriction:**

- Restricted outflow
- Unrestricted outflow
- No outlet

**Inlet/Outlet Class:**

- No inlet/no outlet
- No inlet/intermittent outlet
- No inlet/perennial outlet
- Intermittent inlet/no outlet
- Intermittent inlet/intermittent outlet
- Intermittent inlet/perennial outlet
- Perennial inlet/no outlet
- Perennial inlet/intermittent outlet
- Perennial inlet/perennial outlet
- Undetermined inlet/perennial outlet

**Water pH:** ( )

- Acid (<5.5)
- Circumneutral (5.5-7.4)

**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
- Emergent Non-persistent
- Aquatic bed
- Herbaceous
- Wet Moss/Lichen

**Number of Types:** ( )

- 5 or more types
- 3 - 4 types
- 1 - 2 types
- No Vegetation

**Type Distribution:**

- Even distribution
- Moderately even distribution
- Highly uneven distribution
- No Vegetation

**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)
- No Vegetation

**Plant Species Diversity:**

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

FIGURE C-13  
Jurisdictional Wetlands Input Form Example, Assessment Tab

Physical Characterization - Field Data Sheet - Windows Internet Explorer  
 http://pc09/pebblemine/FieldForms/FieldFormsMain.aspx

Physical Characterization - Field Data Sheet

Physical Characterization Record 1 of 73

Last Saved: 6/1/2004 12:00:00 AM

Save Delete New Exit

**GENERAL INFO**

Location: SK100G  
 Date: 6/1/2004  
 Company: HDR  
 Collected by: SM/LS/JH

**STREAM CHARACTERIZATION**

**Subsystem Classification**  
 Glacial  
 Clear

**Stream Type**  
 Stained  
 Other

Channelized: N  
 Dam Present: N (beaver/manmade)  
 Gradient: change in height over 25m (82 ft.) 1%

**WATER**

**Odors**  
 None/Normal  
 Sewage  
 Petroleum  
 Chemical  
 Fish

**Surface Oils**  
 None/Normal  
 Sheen  
 Slick  
 Other

**Est. Turbidity**  
 Clear  
 Stained  
 Slightly turbid  
 Turbid

**INORGANIC SUBSTRATE COMPONENTS**

Type	Diameter	Percent Composition in Reach (=100%)
Bedrock	<256 mm (10 in)	
Cobble	64-256 mm (2.5-10 in)	10
Gravel	2-64 mm (0.1-2.5 in)	
Sand	0.06-2 mm (gritty)	20
Silt	0.004-0.06 mm	50
Clay	<0.005 mm (slick)	

**PURPOSE**  
 Reconnaissance  
 Macroinvertebrate  
 Periphyton  
 Habitat  
 Flow  
 Sediment  
 Fish  
 WQ

**ORGANIC COMPONENTS**

Type	Size	Amount
Detritus	Sticks, wood (CPOM)	
Muck-Mud	Fine organic (FPOM)	80%
	Moss	
Algae	Periphyton	

Notes:  
 Some aquatic plants = 20%  
 Pebble count complete? Y

**SEDIMENT/SUBSTRATE**

**Odors**  
 None/Normal  
 Petroleum  
 Sewage  
 Anaerobic  
 Other

**Oils**  
 None  
 Slight  
 Moderate  
 Profuse

**INSTREAM FEATURES**

Rosgen Class:  
 Substrate: Low Gradient-Fine  
 High Water Mark: 2 m  
 Velocity: ft/sec  
 Average: ft/sec

FIGURE C-14  
 Field Form Example, Physical Characterization

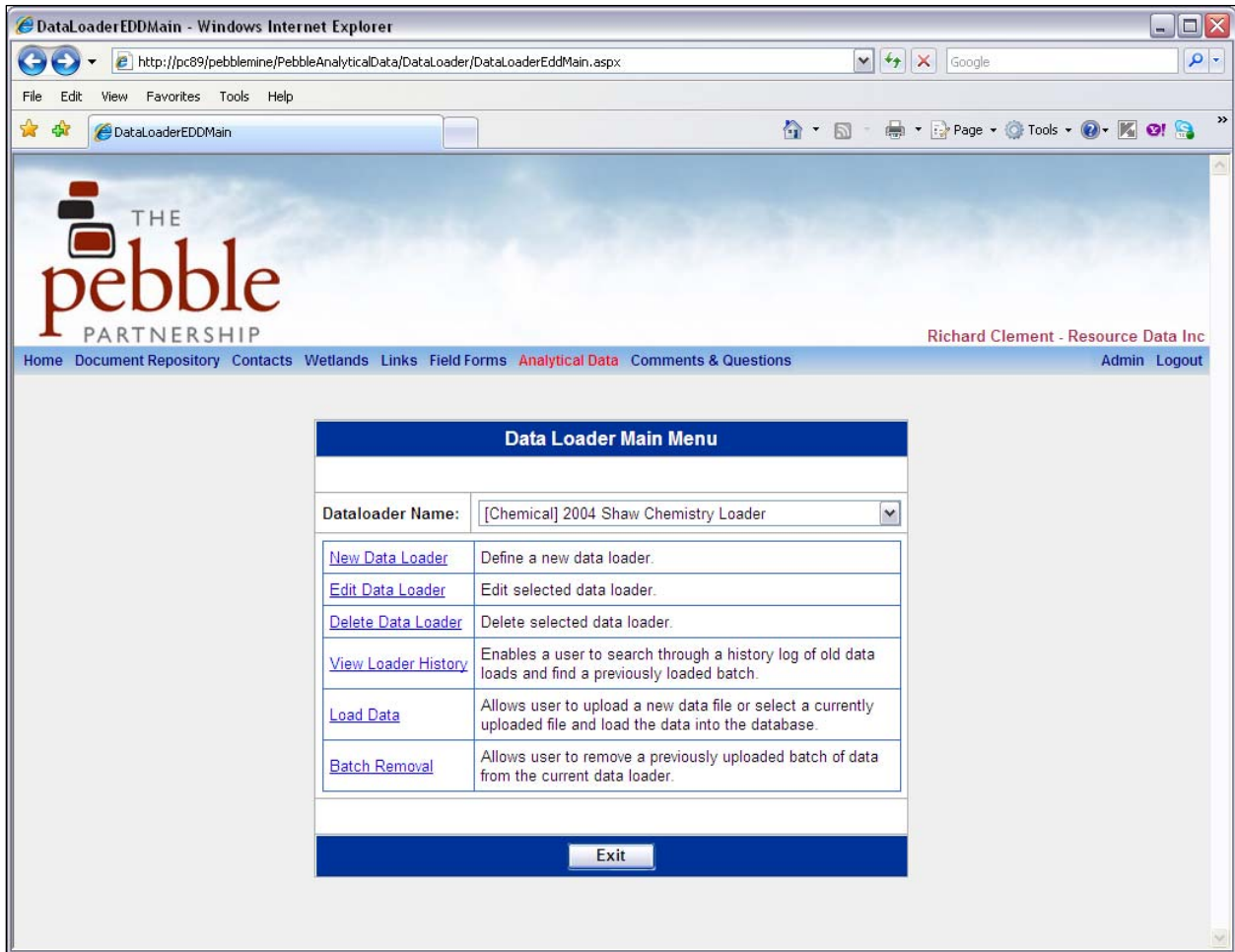


FIGURE C-15  
Data Loader, Main Menu

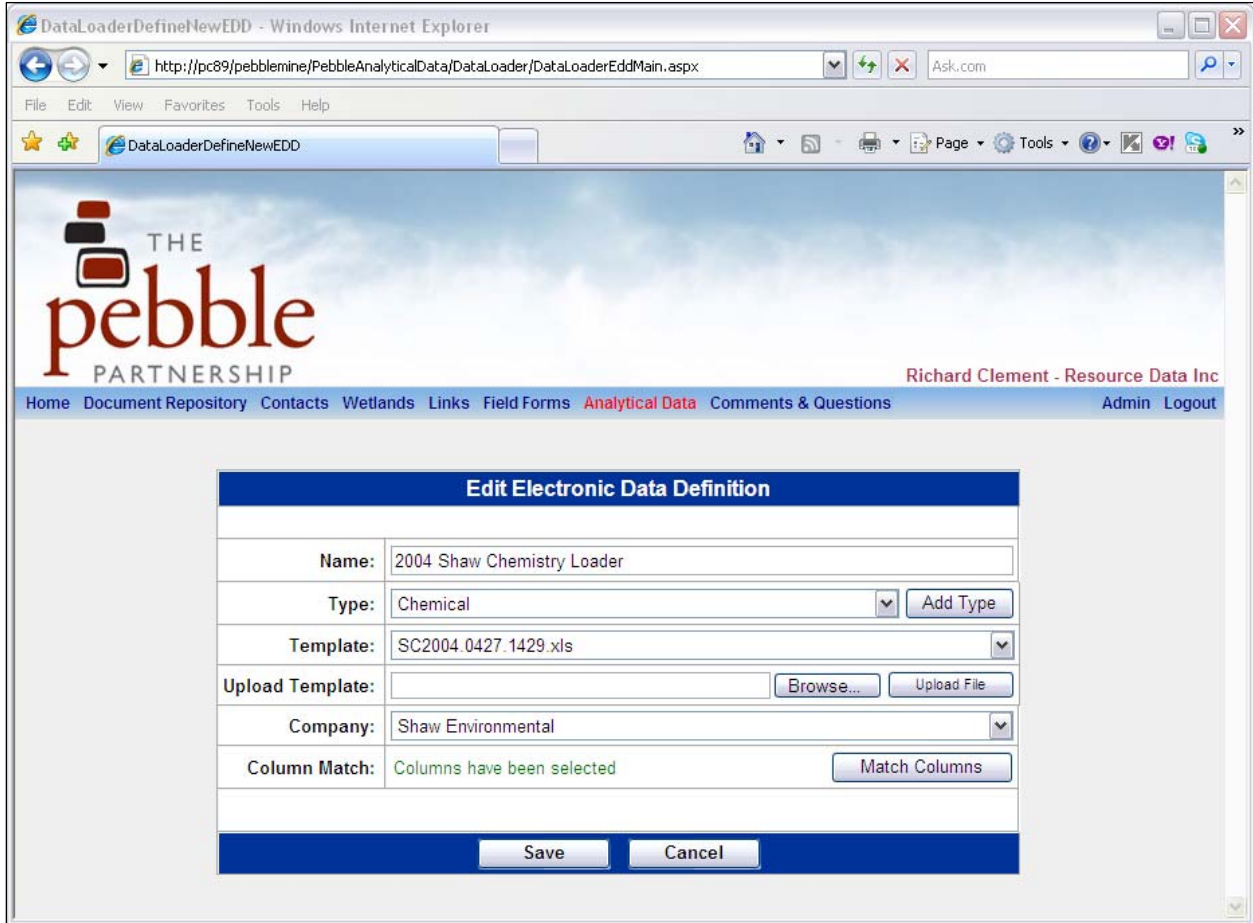


FIGURE C-16  
Example Edit Data Definition Screen

**Data Extraction History for Richard Clement** [Export to Excel](#)

Username	Type	Table Name	Run Date (Desc)	Options
RICHARDC	Chain of Custody	EDFREQ_ANALYSES Table	7/2/2008 1:22:42 PM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chain of Custody	EDFREQ_ANALYSES Table	7/2/2008 1:22:19 PM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chain of Custody	EDFCUSTODY Table	7/2/2008 12:58:49 PM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chain of Custody	EDFCUSTODY Table	7/1/2008 5:07:22 PM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chemistry	All Chemistry Data	6/5/2008 3:54:04 PM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chemistry	All Chemistry Data	6/5/2008 3:52:52 PM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chemistry	All Chemistry Data	3/18/2008 6:49:00 AM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chemistry	All Chemistry Data	3/18/2008 6:37:58 AM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Chemistry	All Chemistry Data	1/2/2008 10:04:48 AM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>
RICHARDC	Metstabon	All Metstation Data	12/3/2007 1:39:40 PM	<a href="#">View Report</a> <a href="#">Re-Run Report</a> <a href="#">View SQL</a>

1 2 3

[Exit](#)

FIGURE C-17  
Example Data Loader History