NORTHWEST ENVIRONMENTAL DATA-NETWORK

WHITE PAPER

Best Practices for Reporting Location and Time Related Data

Version 3.3, Dec 12, 2007

Council Document 2007-21

Acknowledgements

A Spatial and Temporal Work Group of the Northwest Environmental Data-Network (NED) have developed these Best Practices.

NED operates under a 2004 Memorandum of Understanding, which supports collaborative action and joint activities with respect to improving the collection, management, and sharing of environmental data and information.

Participants in the Spatial and Temporal work group include Michael Beaty (US Bureau of Reclamation), Greg Robillard (State of the Salmon Consortium), Brendan Sylvander and Jeff Cowen (National Oceanographic and Atmospheric Administration - Fisheries), Bobbi Riggers and Doug Terra (Oregon Watershed Enhancement Board).

The primary authors are Joy Paulus (WA Office of the Interagency Committee) and Stewart Toshach (National Oceanographic and Atmospheric Administration - Fisheries).

Dick O'Connor (Washington Department of Fish and Wildlife), Stan Frazier (US Bureau of Land Management), Tom Pansky (Bonneville Power Administration), Curtis Cude (Oregon Department of Environmental Quality), Roberto Morganti (US Forest Service), Paul Ocker (US Army Corps of Engineers), Tom O'Neil (Northwest Habitat Institute), Kristen Swodoba (US Bureau of Reclamation), Mike Banach, Bruce Schmidt and Van Hare (StreamNet), David Graves and Denise Kelsey (Columbia River Intertribal Fisheries Commission), John Arterburn (Colville Confederated Tribes) and Rebekka Lindskoog (Summit Environmental Consulting Ltd.) all provided valuable reviews. Comments on the draft were solicited from the Pacific Northwest Aquatic Monitoring Partnership, the Pacific Northwest Regional Geographic Information Council and NED.

Much of the physical data structure outlined in this document is based on work conducted at the WA State Department of Ecology on the Environmental Information Management System initiative in early 2000.

Photographs provided by the Washington Office of the Interagency Committee's Grant Application System PRISM.

Introduction and Background

In the Pacific Northwest there are hundreds of research, monitoring and evaluation and environmental management projects creating substantial quantities of data. Most of this data has location and time related data elements that are often reported using different standards and formats.

There is a region-wide need, for multiple purposes, to be able to view and analyze these data at different landscape-scales. This need requires the creation of integrated data products (maps, tables, charts, statistical analyses) from multiple data sets. Unfortunately, because the data has been reported without common standards, the data integration task is time-consuming and expensive. And, because data conversion is needed, errors are introduced. In many instances the burden of data integration and error checking prevents data analysis.

Version History

Version 3.2 2006-11-14, replaced version 3.1 (May 2006). The significant change between these versions was to adopt a best practice for reporting date that is consistent with International Standards Organization standard 8601 standard notation.

This version, 3.3 2007-03-12, replaces version 3.2 2006-11-14. The change is to include instructions at page 8 about how to select the yyyy/mm/dd format for managing date information within cells or groups of cells when using Microsoft Excel:

Intended Users of These Guidelines

The guidelines have been prepared for two types of users:

1) Users who are not presently tracking environmental project data within a geographic information system (GIS) and who are managing their information within a database or spreadsheet. The guidelines are focused on the needs of these users.

2) Users who are already employing GIS systems to track monitoring and restoration projects. This group is strongly encouraged to track similar elements using established state and federal data and metadata (information about data) standards.

Example of more detailed federal standards can be found at:

- EPA (for detailed geolocational standards http://iaspub.epa.gov/edr/epastd$.startup
- FGDC (for metadata) http://www.fgdc.gov/standards/
- Water Information Coordination Program/Advisory Committee Water Resources (for Water monitoring) http://water.usgs.gov/wicp/acwi/

Nothing in these guidelines is intended to diminish existing authorities for information collection or reporting. For example, most Federal entities are already required to provide FGDC compliant metadata about spatial, temporal, and other data collection efforts.

These guidelines represent what is considered to be the minimum set of location and time information that should be considered for collection and reporting. This is not meant to limit your collecting additional information that may be pertinent to, and best determined by, the collecting organization.

For more information about GIS and other technical terms used in this guidance and what they mean, please look at:

- http://gis.esri.com/showcase/showcase.cfm
- http://support.esri.com/index.cfm?fa=knowledgebase.gis

Why Use Data Standards

A minimum set of mapping standards is necessary to ensure the successful implementation of a multi-agency approach to data collection. Consistent use of common reporting standards would have significant benefits to the region by:

- Reducing errors and improving data quality;
- Increased understanding of the information content;
- Leveraging existing technical advances and investments that have been made in spatial and temporal data collecting and viewing. In particular: Geographic Positioning Systems (GPS) for determining location (and time) and GIS for creating spatial products;
- Reducing the cost of analysis and increasing confidence in analytical products;
- Allowing easier and more widespread use of data collected across different programs and entities;
- Increasing data consistency; and
- Improving data maintenance over time.

The use of consistent minimum location and time data reporting standards are not a technical challenge: it is a policy choice. It requires action within agencies to support or require the use of consistent standards within relevant agency projects and programs.

Acquiring Latitude and Longitude Coordinates for Your Projects, Sites and Features

All projects have some form of locational information. Locational information about a project may include the location of the **project** itself, the locations where actual **site** work for the project is completed and details of **features** at sites. Features are things carried out at sites, for example building a fence, sampling water quality, or counting fish. It is very important to identify what locations are being associated with each project, site or feature, using detailed latitude and longitude information.

For example: a salmon habitat restoration project is located on the Skagit River at the confluence with the Sauk River (the project location). At the confluence there are 3 separate places of work (site locations) where fence installations (feature location information) are being completed. If monitoring was also completed as a part of the project, there may also be records of monitoring site locations with feature level detail about each of those sites, for example, transect location information.

Each case may be different.

The following sources of coordinate information may help to make reporting information about your project area easier. This material is not intended to be a complete guide for working with GIS or GPS, but rather, a guide for building the needed attributes in a database so you can track project information at the simplest level.

Hardcopy Map Sources

- USGS quad sheets have lat/long coordinate grids along the side of the map.

Map Data From Your Computer

- National Geographic sells USGS quad data on CD/DVD's for individual states that can be loaded on your PC.

Free On-line Map Sources

There are on-line USGS maps that can be accessed on-line from different sources. For example:

- TopoZone http://www.topozone.com

- MapTech's http://www.maptech.com/
- Microsoft's http://terraserver.microsoft.com/

These sites allow you to search for your area of interest and then display the area selected. By holding your mouse over a point on the map it will display the lat/long coordinates of that point.

Web Mapping Services

For organizations that need access to frequent and accurate geocoding information there are services that can provide you with this sort of support. One example would be ArcWeb Services for Geocoding.

For a glossary on more information about spatial information go to:

- http://gis.esri.com/showcase/showcase.cfm
- http://support.esri.com/index.cfm?fa=knowledgebase.gis

Reporting Date and Time data for Your Projects, Sites and Features

The recommended best practice is consistent with the ISO 8601 standard notation.

Calendar date is reported as an eight digit sequence composed of numeric characters in the format YYYY-MM-DD where YYYY is the year in the Gregorian calendar, MM is the month of the year between 01 (January) and 12 (December), and DD is the day of the month between 01 and 31.

Time is reported according to the international standard notation of HH:MM:SS where HH is the complete number of hours that have passed since midnight, from 00 to 24, MM is the number of complete minutes that have passed since the start of the hour (00-59), and SS is the number of complete seconds since the start of the minute. If the hour value is 24, then the minute and second values must be zero.

If the date and the time are stored in the same data field then they should be separated by the Latin capital letter T, eg 19950123T235959.

For these Best Practices the time zone is assumed to be the local time unless there are further additions.

To indicate that a time is being reported in Universal time (UTC) it is necessary to append a Z eg 23:59:59Z. The Z stands for zero meridian. The strings +HH:MM or +HH can be used to indicate

when the local time zone is ahead of the UTC. Strings of –HH:MM or – HH can be used when the local time zone is behind UTC.

Note:

When using Microsoft Excel a user can select the yyyy/mm/dd format for managing date information within cells or groups of cells as follows:

Select Format/Cells/Date/Locale(Location)/English(Canada) e.g. 2001-03-14

Real World Examples of How Data Reporters Can Conform to These Guidelines

The spatial and temporal standards described in this document are for use in any *Observation Based Data* collection effort[1]. *Observation Based Data* are generated during an *activity* (e.g. fish and wildlife counting, habitat survey), performed by *participants* (e.g. Data Collector) where *observations* (recorded data) are collected about a subject (e.g. fish passage or bird inventory) following a *methodology* (screw trap method 2 or point counts) at a *location* during a *period* (2005 05-04 to 2005-05-08) and for a particular *purpose* (measuring smolt production or counting various birds in an area).

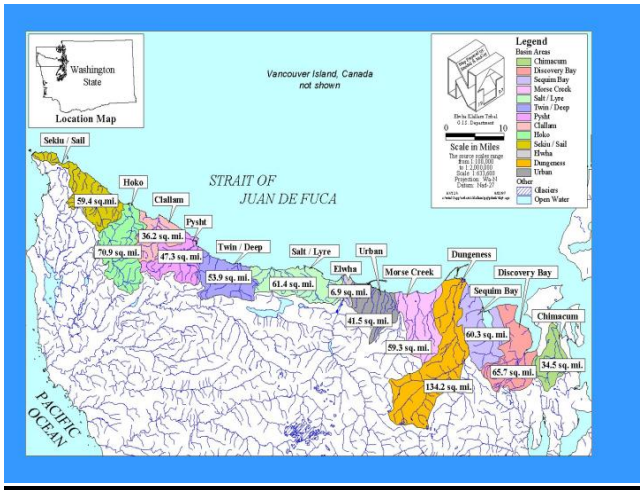
While data analysts usually want to know all of the *italicized* information above, this document is intended to provide minimum standards for reporting on the *location* and the *period* of an Observation Based Data collection effort.

There are many different types of participants involved in data collection and reporting with different levels of technical support. Examples are provided below for two types of *participants*:

- Data collectors with limited data or GIS resources
- Data collectors with expanded data or GIS resources (or large organization) data collectors.

Data collectors with limited data resources would typically be working on smaller scale projects, often without support from an enterprise level information system.

Data collectors with expanded resources would typically be working within an organization that has enterprise level GIS support. Most participants working for a government scientific program enjoy the support of a GIS department or staff with an established data management system.



[1] Draft Fish Monitoring Protocols Workshop -Data Management Work Group -Welches, OR, May 2005

Example 1: Collector with Limited Data Resources

The participant collects water quality data in a stream environment and determines the sampling location from a paper map. The time of sampling is reported as HH:MM:SS from a personal watch that is not synchronized. Later, in the office, the user logs onto a map web service (e.g. http://www.maptech.com/ or http://www.topozone.com) to identify the sampling latitude and longitude (in decimal degrees) from the map web service.
The participant would report, at the least, a brief description of the location method (along with other needed metadata[2]): e.g. "I marked the location on a 1:100,000 typographical map in the field and then used the http://www.maptech.com/ or http://www.topozone.com or http://terraserver.microsoft.com/ Web service to get a lat/long in decimal degrees. Time of sampling was reported from a personal unsynchronized watch".

Example 2: Collector with Limited Data Resources

The collector is validating the planting of an area of riparian planting. While the site can be located, survey stakes cannot be located to delineate the work site. The collector walks to the estimated center location (centroid) of the tree-planting project and measures the location using a hand-held GPS. Later, in the office, the collector reports the data by keying the location information from the GPS into a spreadsheet and makes a description of the spatial and temporal data method used as a part of the needed metadata record: e.g. "I walked to the approximate center of the planting and estimated the location with a "Garmin E-Trex" GPS using an unknown methodology. The datum used was NAD83 (North American Datum 1983). I could not locate survey stakes."

Example 3: Collector With Expanded Data Resources

The participant collects water quality data in a stream environment from multiple sites and observes and reports the sampling locations in decimal degrees, the date (YYYY-MM-DD), and the time of sampling (HH:MM:SS), into a PDA with an integrated "Garmin 18" GPS unit. The time is taken from the GPS. When reporting the data, on return to the lab, the GPS data is downloaded from the users PDA to a corporate database and a description of the spatial and temporal methods used is attached along with other metadata, including a reference to the datum used (NAD83) and the use of automatic loading of spatial and temporal data from the Garmin GPS 18 unit.

[2] Other needed metadata could include:

1. Description of what the dataset is, who collected, created, or processed the data, and the dates these were completed.
2. Any access/use constraints associated with the data—is it sensitive, copyright, etc.
3. A descriptive title or naming convention for the dataset.
4. Originator of the data-who? When it was published.
5. A point of contact for the data. Name, organization, contact phone number, address or email.
6. Any processing that was done from the data from it's original state-who, when, what, where and how.
7. What is the data quality? Is it complete, logical, consistent? What is the accuracy or precision of the data?

Example 4: Collector With Expanded Data Resources

The participant is validating the planting of an area of riparian planting. While the site can be located, survey stakes cannot be located to delineate the work site. The collector describes a polygon (shape file) for the boundary of the planting by walking the boundary of the planting and using a hand held GPS to enter waypoints at changes of direction along the boundary. In the office the data is downloaded from the GPS into the corporate database.

When reporting the data, a description of spatial and temporal methods used and other needed metadata, should be attached to the data: For example: "The area of planting was located by walking the perimeter of the planting using a hand-held Garmin Map 60 GPS, reporting way points at boundary direction changes. The datum was NAD83 (North American Datum 1983). In the office the data was downloaded into the database."

How to Understand and Use the "Multi-Level" Guidelines

These guidelines, for reporting location (spatial) and time (temporal) related data, were designed with flexibility in mind. Since some projects are simpler than others, the **"Multi-Level"** structure allows project managers to track projects and location information at the needed level of detail. See Table 1 for descriptions of Level 1, Level 2, and Level 3.

Simple projects can typically be tracked using **Level 1,** which provides managers and end users with just enough general information, such as project name, sponsor, and project type, along with a general physical description of the project's location and its time duration. An example of this sort of project could be an environmental education project that associated with a scientific program where locational data is not collected.

But, as we know, certain projects can become complex, especially when they entail specific sampling or other activities. In these instances, a project can cover a large area with discrete places where information is tracked and collected, for example, a project to replace culverts at multiple sites. In this case you could track project information at **Level 1** and **Level 2, which provides for more detailed collection**.

In some cases, tracking information at **Level 2** may not be sufficient. During some projects, multiple sites could be visited many times with the sampling of detailed environmental data at each of the sites in addition to the location and time data. Project Sites where water chemistry and a stream's morphology are collected along different reach segments is an example of when **Level 3** information would be needed. With this complexity you would need to be tracking project information at all three levels.

This "*leveled*" (or multi-tiered) structure for tracking project location and duration was created for this reason. To allow the reporting of information on simple to complex projects as the need arises while still being able to connect the project, site, and feature information.

As you go through these levels, you expose more levels of detail related to your project collection and reporting efforts. This is one of the primary benefits of this leveled reporting approach.

Using the Location and Time Element Tables

The standards are designed to support consistent reporting of data that is collected. For example, the standards do not require programs or projects to collect the time of water quality sampling to the nearest second. But if data is being collected to the nearest second, then the data should be consistently reported at that time interval. The data tables are provided as a guideline. The physical attribute examples or format may not meet your organizations rules but as long as you document what physical attributes and formats you are using you meet the intent of the standards. In order to compare information across organizations it is important that you follow the predefined meaning of each element, it its definition and associated codes.

The following tables are broken down into their separate, essential elements **as a guide for information managers**. To attain consistency across regional organizations, the actual element (logical) names and name definitions should be adopted "as is" along with the code tables listed under "*Element Code, Code Range, or Description*". But, the elements' physical names (the names used in the database, e.g. PRJ_ID) themselves are only provided as guidance. Your own agency physical data naming conventions may need to be followed.

The more consistency you use in implementing these standards, the better we'll all be able to link information together. Note, as you define your naming standards you will also need to define the business rules for how you will represent project, site, and feature location: For example, if you wish to characterize a watershed with a single point you could define that point as the centroid for the watershed. Similarly, if you are defining a single point for a fence you could define that point as the mid-point of the fence. Whatever method you use must be described as a part of the metadata record.

The tables do not require the user to provide elevation related data. This data can be generated if the user needs it and therefore it is not essential to report it separately. If your organization wants to report elevation data, the type of information can be found in Table 5.

Table 1: Project Level Summary Table (Levels 1-3)

This provides the user with an overview of the "multi-level" data approach, associated definitions, and data elements. It also provides an outline of the types of other project information that you might want to consider collecting. The **bolded** headings represent the location and time information that we suggest should be added to existing and new project tracking systems.

Table 2: Location and Time Data Elements Associated with Projects (Level 1)

This provides detailed information about the types of location and time information that should be associated with all general projects. It also provides information on the following data elements – the name, its definition, an example of a database name, the associated codes to track the information properly, along with examples. The **bolded** headings represent the location and time information that we suggest should be added to existing and new project tracking systems.

Table 3: Location and Time Data Elements Associated with Project Sites (Level 2)

This provides the user with an overview of how you would implement the location and time information in a more complex project, such as projects where you are tracking specific and/or numerous locations or where the project's sites exist over time. Not all projects will need this level of detail or the data may not be available for reporting. Following this format would enable the reporting of more detailed information concerning actual activities that are being performed in the field.

The Table also provides information regarding the project site and its associated location and time elements. You will also find examples of database attributes and their associated code tables. The **bolded** headings represent the minimum spatial and temporal elements that should be added to existing and new project tracking systems.

Table 4: Location and Time Data Elements Associated with Project Site Features (Level 3)

Provides the user with an overview of how you would implement the location and time information in a more complex project which requires the project manager to track specifically measured features in the field at a given project site. Again, not all projects may need to be tracked at this level of detail. The table outlines the spatial and temporal elements of site features. You will find examples of database attributes and their associated code tables and examples of how this would be applied in the field. The **bolded** headings represent the minimum spatial and temporal elements that should be added to existing and new project tracking systems.

Table 5: Optional Elevation Data Elements Associated with Projects, Sites, or Features

Table 5 provides the user with an option of reporting elevations for Projects, Sites, or Features.

Table 6: Examples of
Location and Time Data Reporting for Different Types of Data Collection Efforts

Provides the user with examples of how features can be reported at different levels of spatial and temporal detail, depending on whether or not the data is from an "independent" or "corporate" data collector.

Table 1: **Project Level Summary Overview Table**

	Level Definition	Minimum Location (Spatial) and Other Common Data Elements	Minimum Time (Temporal) Data Elements
Level 1	*Project Definition:* *A project is an administrative unit of work that's defined by an organization or entity.* *PROJECT* = one project present per grant/activity/etc	Project Guideline **Project ID (unique system identifier, Primary Key)** Project Name (user defined name) Project Type **Project Location Description – text field** (physical place where project collection/measurement/observation occurred) **Project Location** (Longitude/Latitude in decimal degrees. The minimum reporting standard is a single point **Datum** (horizontal reference model) **Project Location Collection Method** (GPS, Digital Elevation Model, map derived, etc.)	Project Guideline **Project Start Date** (date the project started) E.g. 1998-01-23 **Project End Date** (date the project ended) E.g. 2005-05-31
Level 2	*Site Definition* *The location where project work is done.* *SITE* = one or many sites may be contained in a project	Site Guideline **Project ID (Secondary Key)** **Site ID (unique system identifier, primary key)** Site Name (user defined name) Site Type **Site Location Description** (physical place where collection/measurement/observation occurred) **Site Location** (Longitude/Latitude in decimal degrees) The minimum reporting standard is a single point. **Datum** (horizontal reference model) **Site Location Collection Method** (GPS, DEM, map derived, etc.)	Site Guideline **Site Start Date** (date the site collection, measurement, observation started) E.g. 1998-01-23 **Site End Date** (date the site collection, measurement, observation ended) E.g. 2005-05-31
Level 3	*Feature Definition:* *The location of things or activities at sites* *FEATURE* = one or many features may be present at a site	Feature Guideline **Project ID (Secondary Key)** **Site ID (Secondary Key)** **Feature ID (unique system identifier, primary key)** Feature Type (fence, transect, planting area, etc.) **Feature Location Description** (physical place where collection/measurement/observation occurred) **Feature Location** (Longitude/Latitude in decimal degrees) The minimum reporting standard is	Feature Guideline **Feature Start Date** (date the collection, measurement, observation started at this site) E.g. 1998-01/23 **Feature End Date** (date

	a single point. **Datum** (horizontal reference model) **Feature Location Collection Method** (GPS, DEM, map derived, etc.)	the collection, measurement, observation ended at this site) E.g. 2005-05-31 **Feature Start Time** (time the collection, measurement, observation started - using a 24hr clock at local time) (HH;mm;ss) E.g. 16:43:22 **Feature End Time** (time the collection, measurement, observation ended - using a 24hr clock at local time) (HH;MM;SS) E.g. 17:52:31

Notes on Table 1:

- **Highlighted** elements are further described in Tables 2, 3, and 4
- Other data elements could be added if needed. For example, some users may want to include a comment field to document any pertinent information about a record that could not be conveyed in other fields, while other users might want to include routed hydrography data.

***Table 2*: General Location and Time Data Elements Associated with Projects**

Level 1 **General Project Information** **(This information should be reported unless it is not applicable)**			
Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code, Code Range and Examples**
Project Identifier	A project is a unit of work defined by an organization or entity. A project may include one or more sites or one or more types and number of activities. Unique system identifier	PRJ_ID	Examples Skagit River Habitat Restoration Project Okanogan Water Quality Sampling Project Oregon North Coast Nearshore Monitoring Project Deschutes River Flow Monitoring Project
Project Location Description	Term that best describes the field location in relation to the surrounding environment.	PRJ_LOC_DESC	Text field Examples: Okanogan watershed ESA Region SW ¼ of Section 36 of Township 29 Range 01
Project Location Latitude Coordinate	Distance north or south of the equator. Decimal equivalent to the degrees-minutes-seconds latitude value.	PRJ_LOC_LAT_COORD	Float, 2 places, 6 decimals; (4 decimals minimum) E.g. Range for WA: 45.000000- 49.999999
Project Location Longitude Coordinate	Distance east or west of the Central Meridian (Greenwich, England). Decimal equivalent to the degrees-minutes-seconds longitude value	PRJ_LOC_LONG_COORD	Float, 3 places, 6 Decimals, will accommodate signed values (4 decimals minimum); E.g. Range for WA: -116.000000 – -125.999999
Project Horizontal Datum	Model used to match the horizontal position of features on the ground to coordinates and locations on a map. NOTE - When taking GPS measurements, it is very important to record your datum!	PRJ_HORZ_DAT	01 - N. American Datum 1927 (NAD27- used on many USGS quad maps or NOAA charts); 02 - N. American Datum 1983 (NAD83 or 91 Adj. – based on Earth and satellite observations, similar to WGS84 but specific to North America.); 03 - High Accuracy Reference Network (HARN – similar to NAD83, but more accurate per GPS observations);

			04 - World Geodetic System of 1984 (WGS84 – world datum, based on Earth and satellite observations); 99 - unknown.
Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code, Code Range and Examples**
Project Location Collection Method	Technique used to collect the horizontal coordinates of a Location.	PRJ_LOC_COLL_MTH	1 - Address Matching - Block Face; 2 - Address Matching - House Number; 3 - Address Matching - Street Centerline; 4 - Address Matching - Unknown; 5 - Aerial Photography - Rectified; 6 - Aerial Photography - Unknown; 7 - Aerial Photography - Unrectified; 8 - Cadastral Survey (conventional land survey); 9 - Census Block 1990 Centroid; 10 - Census Block Group 1990 Centroid; 11 - Conversion from STR; 12 - Digital or manual raw photo extraction; 13 - Digitized off CTR screen/digital data; 14 - Digitized - paper map; 15 - GPS carrier phase (employs the satellite Code's carrier signal to improve accuracy); 16 - GPS code phase (measurements based on pseudo random code broadcast by satellite); 17 - GPS kinematics (tracking location while moving using carrier phase); 18 - GPS (Unknown); 19 - Hand measured - paper map (interpolation); 20 - LORAN-C; 21 - Orthophotography - digital; 22 - Orthophotography - paper; 23 - Satellite Imagery - Landsat MSS (Multi-Spectral Scanning); 24 - Satellite Imagery - Landsat TM (Thematic Mapper); 25 - Satellite Imagery - Other; 26 - Satellite Imagery - SPOT Panchromatic; 27 - Satellite Imagery - SPOT Multi Spectral; 28 - Zip Code Centroid; 29 - GPS (Code/Differential);

			30 - Estimated Value; 31 - GIS Interpretation Centroid of polygon; 32 - GIS Interpretation Centroid of transect; 33 - GPS Beginning of Transect; 34 - GPS End of Transect; 35 - GPS Center of Project; 36 - Web based internet mapping system; 99 - unknown
Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code, Code Range and Examples**
Project Start Date	The date that the project activity commenced.	PRJ_STR_DT	Date, YYYY-MM-DD format. (Only if applicable) E.g.2003-03-12 03/12/2003. Use a date of 1800-01-01 to indicate that the Start Date is not specified or is unknown.
Project End Date	The date that the project activity ended.	PRJ_END_DT	Date, YYYY-MM-DD format. (Only if applicable) E.g. 2004-03-12. Use a date of 1800-01-01 to indicate that the End Date is not specified or is unknown.

Notes:

Other data elements could be added if needed. For example, some users may want to include a comment field to document any pertinent information about a record that could not be conveyed in other fields, while other users might want to include routed hydrography data.

Table 3: **Location and Time Data Elements Associated with Tracking Project Sites**

Level 2 **The Following Site Elements Are Nested Under Projects** **(This detail may not be necessary for all reporting purposes)**			
Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code, Code Range or Examples**
Project Site Identifier	The place where site activities that are associated with a project occur or the area where the work is done. Each site will pertain to just one project but there can be more than one site for any given project. Location of the site or activities where work is conducted - on the ground activities Unique system identifier	PRJ_SITE_ID	*This needs to be defined based on the type of project site work that is being done, E.g.* *Skagit River Habitat Restoration Sites- 2 stream reaches* *Okanogan Water Quality Sampling Site – 4 monitoring sites in study* *Oregon North Coast Nearshore Monitoring Sites- 3 coastal reaches in project* *Deschutes Flow Monitoring Sites – 2 gauging stations in project*
Project Site Location Description	Term that best describes the site location in relation to the surrounding environment. Information that describes the place a Location exists.	PRJ_SITE_LOC_DESC	Text field E.g. 200 yards north of the cattle crossing on Laumann Road, north of the intersection with Heidi Road
Project Site Location Latitude Coordinate	Distance north or south of the equator. Decimal equivalent to the degrees-minutes-seconds latitude value.	PRJ_SITE_LOC_LAT_COORD	Float, 2 places, 6 decimals; (4 decimals minimum) E.g. Range for WA: 45.000000-49.999999
Project Site Location Longitude Coordinate	Distance east or west of the Central Meridian (Greenwich, England). Decimal equivalent to the degrees-minutes-seconds longitude value.	PRJ_SITE_LOC_LONG_COORD	Float, 3 places, 6 decimals, (4 Decimals minimum); will accommodate signed values; E.g. Range for WA: -116.000000 – -125.999999

Project Site Horizontal Datum	Model used to match the horizontal Position of features on the ground to coordinates and locations on a map. NOTE - When taking GPS measurements, it is very important to record your datum!	PRJ_SITE_HORZ_DAT	01 - N. American Datum 1927 (NAD27- used on many USGS quad maps or NOAA charts); 02 - N. American Datum 1983 (NAD83 or 91 Adj. – based on Earth and satellite observations, similar to WGS84 but specific to North America.); 03 - High Accuracy Reference Network (HARN – similar to NAD83, but more accurate per GPS observations); 04 - World Geodetic System of 1984 (WGS84 – world datum, based on Earth and satellite observations); 99 - unknown.
Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code, Code Range or Examples**
Project Site Location Spatial Data Collection Method	Technique used to collect the horizontal coordinates of a site location.	PRJ_SITE_LOC_COLL_MTH	1 - Address Matching - Block Face; 2 - Address Matching - House Number; 3 - Address Matching - Street Centerline; 4 - Address Matching - Unknown; 5 - Aerial Photography - Rectified; 6 - Aerial Photography - Unknown; 7 - Aerial Photography - Unrectified; 8 - Cadastral Survey (conventional land survey); 9 - Census Block 1990 Centroid; 10 - Census Block Group 1990 Centroid; 11 - Conversion from STR; 12 - Digital or manual raw photo extraction; 13 - Digitized off CTR screen/digitial data; 14 - Digitized - paper map; 15 - GPS carrier phase (employs the satellite code's carrier signal to improve accuracy); 16 - GPS code phase (measurements based on pseudo random code broadcast by satellite); 17 - GPS kinematics (tracking location while moving using carrier phase); 18 - GPS (Unknown); 19 - Hand measured - paper map (interpolation); 20 - LORAN-C; 21 - Orthophotography - digital; 22 - Orthophotography - paper; 23 - Satellite Imagery - Landsat MSS (Multi-Spectral

			Scanning); 24 - Satellite Imagery - Landsat TM (Thematic Mapper); 25 - Satellite Imagery - Other; 26 - Satellite Imagery - SPOT Panchromatic; 27 - Satellite Imagery - SPOT Multi Spectral; 28 - Zip Code Centroid; 29 - GPS (Code/Differential); 30 – Estimated Value; 31 - GIS Interpretation Centroid of polygon; 32 - GIS Interpretation Centroid of transect; 33 - GPS Beginning of Transect; 34 - GPS End of Transect; 35 - GPS Center of Project; 36 - Web based internet mapping system; 99 - unknown
Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code or Code Range or Examples**
Project Site Start Date	The date that the site activity (sample collection, field measurement, field observation) commenced. If a site activity is essentially instantaneous, a Site End Date is often not specified.	PRJ_SITE_STR_DT	Date, YYYY-MM-DD format. (Only if applicable) E.g. 2003-03-12. Use a date of 1800-01-01 to indicate that the Start Date is not specified or is unknown.
Project Site End Date	The date that the site activity (sample collection, field measurement, field observation) ended. If a field activity is essentially instantaneous, a Site End Date is often not specified.	PRJ_SITE_END_DT	Date, YYYY-MM-DD format. (Only if applicable) E.g. 2004-03-12. Use a date of 1800-01-01 to indicate that the End Date is not specified or is unknown.

***Table 4*: Location and Time Data Elements Associated with a Complex Project Tracking Specific Site Features**

Level 3 **The Following Elements are Nested under Project Sites** **(This detail may not be necessary for all reporting purposes)**			
Logical Name	**Definition**	**Element Name (For Example Only)**	**Element Code, Code Range, or Examples**
Site Feature Identifier	The structure, form, or appearance of what is being tracked, measured or observed at any given project site. Within any give project site there may be various features represented as single points, linear features or aerial extents. Unique system identifier	SITE_FEA_ID	*This needs to be defined based on the type of scientific/field information that is being collected* *Example Code Tables:* *Transect measurement point* *Fence* *Wells* *Fish hatchery raceway* *Reach segments* *Examples of Site Features:* *Water sampling well locations* *Individual gauging station location* *Location of addition to spawning gravel*
Site Feature Location Description	Term that best describes the feature location in relation to the surrounding environment. Information that describes the place a Location exists.	SITE_FEA_LOC_DESC	Text field, E.g. 200 yards north of the cattle crossing on Laumann Road, north of the intersection with Heidi Road
Site Feature Location Latitude Coordinate	Distance north or south of the equator. Decimal equivalent to the degrees-minutes-seconds latitude value of a	SITE_FEA_LOC_LAT_COORD	Float, 2 places, 6 decimals; (4 decimals minimum) E.g. Range for WA: 45.000000-49.999999
Site Feature Location Longitude Coordinate	Distance east or west of the Central Meridian (Greenwich, England). Decimal equivalent to the degrees-minutes-seconds longitude value.	SITE_FEA_LOC_LONG_COORD	Float, 3 places, 6 decimals, (4 Decimals minimum); will accommodate signed values; E.g. Range for WA: -116.000000 – -125.999999

Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code, Code Range or Examples**
Site Feature Horizontal Datum	Model used to match the horizontal position of features on the ground to coordinates and locations on a map. NOTE - When taking GPS measurements, it is very important to record your datum!	SITE_FEA_HORZ_DAT	01 - N. American Datum 1927 (NAD27- used on many USGS quad maps or NOAA charts); 02 - N. American Datum 1983 (NAD83 or 91 Adj. – based on Earth and satellite observations, similar to WGS84 but specific to North America.); 03 - High Accuracy Reference Network (HARN – similar to NAD83, but more accurate per GPS observations); 04 - World Geodetic System of 1984 (WGS84 – world datum, based on Earth and satellite observations); 99 - unknown.
Site Feature Location Collection Method	Technique used to collect the horizontal coordinates of a feature location.	SITE_FEA_LOC_COLL_MTH	1 - Address Matching - Block Face; 2 - Address Matching - House Number; 3 - Address Matching - Street Centerline; 4 - Address Matching - Unknown; 5 - Aerial Photography - Rectified; 6 - Aerial Photography - Unknown; 7 - Aerial Photography - Unrectified; 8 - Cadastral Survey (conventional land survey); 9 - Census Block 1990 Centroid; 10 - Census Block Group 1990 Centroid; 11 - Conversion from STR; 12 - Digital or manual raw photo extraction; 13 - Digitized off CTR screen/digital data; 14 - Digitized - paper map; 15 - GPS carrier phase (employs the satellite code's carrier signal to improve accuracy); 16 - GPS code phase (measurements based on pseudo random code broadcast by satellite); 17 - GPS kinematics (tracking location while moving using carrier phase); 18 - GPS (Unknown); 19 - Hand measured - paper map (interpolation); 20 - LORAN-C;

			21 - Orthophotography - digital; 22 - Orthophotography - paper; 23 - Satellite Imagery - Landsat MSS (Multi-Spectral Scanning); 24 - Satellite Imagery - Landsat TM (Thematic Mapper); 25 - Satellite Imagery - Other; 26 - Satellite Imagery - SPOT Panchromatic; 27 - Satellite Imagery - SPOT Multi Spectral; 28 - Zip Code Centroid; 29 - GPS (Code/Differential); 31 - GIS Interpretation Centroid of polygon; 32 - GIS Interpretation Centroid of transect; 33 - GPS Beginning of Transect; 34 - GPS End of Transect; 35 - GPS Center of Project; 36 - Web based internet mapping system; 99 - unknown
Logical Name	**Element Definition**	**Physical Name (For Example Only)**	**Element Code. Code Range, or Examples**
Site Feature Activity Frequency	The frequency of time at the location for treatments or collecting information	SITE_FEA_FREQ	Continuous, Hourly Daily Weekly Bi-weekly Monthly Quarterly Biannually Annually Decadal Alternating Time Frame (Rotating Panel)
Site Feature Start Date	The date that the feature activity (sample collection, field measurement, field observation) commenced. If a Feature activity is essentially instantaneous, a Feature End Date is often not specified.	SITE_FEA_STR_DT	Date, YYYY-MM-DD format. (Only if applicable) E.g. 2003-03-12. Use a date of 1800-01-01 to indicate that the Start Date is not specified or is unknown.

Site Feature End Date	The date that the feature activity (sample collection, field measurement, field observation) ended. If a feature activity is essentially instantaneous, a Feature End Date is often not specified.	SITE_FEA_END_DT	Date, YYYY-MM-DD format. E.g.2004-03-12. Use a date of 1800-01-01 to indicate that the End Date is not specified or is unknown.
Site Feature Start Time	The time that the feature activity began, for example the time of sampling	SITE_FEA_STR_TM	**Feature Start Time** (time the collection, measurement, observation started -using a 24hr clock at local time) (HH:MM:SS) e.g. 16:43:22
Site Feature End time	The time that the feature activity ended, for example the end of sampling	SITE_FEA_END_TM	**Feature End Time** (time the collection, measurement, observation ended -using a 24hr clock at local time) (HH:MM:SS) e.g. 17:52:31 (Only if applicable)

Table 5: **Optional Elevation Data Associated with Projects, Sites or a Feature**

Logical Name	Element Definition	Physical Name (For Example Only)	Element Code, Code Range, or Examples
Elevation	The measure of the elevation of the project site above a reference datum.	PRJ_SITE_VERT	Float, will accommodate signed values
Elevation Units	The unit of measurement used to describe the elevation value.	PRJ_SITE_VERT_UNIT	Text field; example Meters Feet
Elevation Datum	The code for the reference datum used to determine the vertical measure	PRJ_SITE_VERT_DAT	Navd88 Ngvd29 Mean Sea-Level Local Tidal Datum Other
Elevation Collection Method	The technique used to establish the elevation or depth of the sampling site	PRJ_SITE_VERT_COLL_MTH	GPS Carrier Phase Static Relative Position GPS Carrier Phase Kinematic Relative Position GPS Code (Pseudo Range) Differential GPS Code (Pseudo Range) Precise Position GPS Code (Pseudo Range) Standard Position (Sa Off) GPS Code (Pseudo Range) Standard Position (Sa On) Other Altimetry Precise Leveling-Bench Mark Leveling-Non Bench Mark Control Points Trigonometric Leveling Photogrammetric Topographic Map Interpolation

Table 6: **Examples of Location and Time Reporting for Different Types of Features (Data Elements describing the features themselves are not included in this Table)**

Feature Name	**Examples of location/time reporting detail from data collectors** with limited data or GIS resources	**Examples of location/time reporting detail from *corporate* data collectors** with expanded data or GIS resources
Install Fish Screen	Location of screen: (Lat/Long dec degree). Date of install: YYYY-MM-DD	Location of screen: (Lat/Long dec degree) Date of install: YYYY-MM-DD
Stream Bank Stabilization	Start and end point of stabilization: (Lat/Long dec degree) Date of stabilization: YYYY-MM-DD	Polygon of stabilization area: (Lat/Long dec degree) Date of stabilization: YYYY-MM-DD
Riparian Area Treated	Start and end point (Lat/Long dec degree) Date of treatment: YYYY-MM-DD	Polygon of area treated: (Lat/Long dec degree) Date of treatment: YYYY-MM-DD
Road Obliteration Project	Start and end point (Lat/Long dec degree) Length of treatment (miles) Date of obliteration: YYYY-MM-DD	Line detail of road treatment: (Lat/Long dec degree) Date of obliteration: YYYY-MM-DD
Sediment Control Basin	Centroid of basin: (Lat/Long dec degree). Date of sediment control: YYYY-MM-DD	Polygon of basin: (Lat/Long dec degree) Date of sediment control: YYYY-MM-DD
Wetland Creation Project	Centroid of area created: (Lat/Long dec degree) Date of wetland creation: YYYY-MM-DD	Polygon of area created: (Lat/Long dec degree) Date of wetland creation: YYYY-MM-DD
Invasive Species Treatment	Centroid of treatment area: (Lat/Long dec degree) Date of treatment: YYYY-MM-DD	Polygon of treatment area (Lat/Long dec degree) Date of treatment: YYYY-MM-DD
Hatchery Fry/Smolt Release	Location of point of release (Lat/Long dec degree) Date of release: YYYY-MM-DD Time of release HH:MM:SS	Location of point of release: (Lat/Long dec degree) Date of release: YYYY-MM-DD, Time of release: HH:MM:SS
Sampling Site	Location: (Lat/Long dec degree) Date of sample: YYYY-MM-DD Time of Sample: HH:MM:SS	Location: (Lat/Long dec degree) Date of sample: YYYY-MM-DD, Time of Sample: HH:MM:SS
Livestock Exclusion Fencing	Start and end point: (Lat/Long dec degree)	Line detail: (Lat/Long dec degree)