DRAFT

Guidance on

Water Quality, Contaminants, and Aquatic Biology

Vital Signs Monitoring Under the Natural Resource Challenge

Long-Term Water Quality Monitoring Program

PART E

Draft Guidance on Data Reporting

and Archiving in STORET

(Work in Progress)
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(Send Suggestions to Dean_Tucker@NPS.GOV)

By

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INTRODUCTION

"Always do the right thing. This will gratify some people and astonish the rest."
Mark Twain

Tucker's Corollary
"But how will they remember that you did the right thing?"

The preceding sections of this document provide guidance on how Vital Signs Networks can "do the right thing" in designing and implementing long-term water quality monitoring programs. This section is intended to help posterity remember that your Network did the right thing by ensuring the results of your monitoring efforts are appropriately reported and archived. Only by implementing an appropriate data management program can we be sure to both preserve and amplify the investment of public resources that have been expended on water quality Vital Signs monitoring.

Data management is not as glamorous as planning or designing a water quality monitoring program. Nor is data management as fun as venturing afield to collect the samples or make measurements and observations. As a result, data management is often relegated to one of the last steps in the water quality monitoring process. But without adequate data management, an otherwise successfully designed and implemented water quality monitoring program could founder. If the results of the monitoring program are not readily available in easily accessible (popular) formats or not properly documented with adequate metadata, the entire effort could be considered for naught. Data management sets the stage for data analysis and interpretation, which, in turn, provides feedback to the monitoring effort. Consequently, data management should be considered an integral part of a water quality monitoring program.

The art and science of data management is well documented. For a sampling of prominent data management-related texts, refer to the bibliography maintained by the Data Management Association at http://www.dama.org/Bibliography.htm. For an NPS perspective on data management, check out the Servicewide Inventory and Monitoring Program's Draft Data Management Protocol at http://www.nature.nps.gov/im/dmproto/joe40001.htm. Rather than focusing on the basics of data management, the purpose of this document is simply to articulate the draft guidance for data reporting and archiving in support of the NPS Vital Signs Water Quality Monitoring Program.

BACKGROUND

Vital Signs Monitoring Networks will be collecting a wide variety of physical, chemical, biological, and other data in support of monitoring impaired, pristine, and other high-priority waters. The Implementation Plan for the Water Quality Monitoring Component of the National Park Service Vital Signs Monitoring Program states that all water quality data collected by Vital Signs Monitoring Networks will be funneled through the NPS Water Resources Division into the

Environmental Protection Agency's (EPA) modernized STORET (STOrage and RETrieval) database where the data will be available to parks, Regions, and the public on the Internet at http://www.epa.gov/storet.

STORET is the EPA's oldest and largest data system. The Legacy Data Center (LDC) portion of STORET is billed as the world's largest repository of ambient water quality data. The LDC contains water quality data collected from all 50 states, tribal lands, U.S. Territories, and Canada over the past 30 or more years. These data were collected by Federal, State, and other governmental entities prior to 1999 and entered into the old mainframe version of STORET. These data were migrated to a read-only Oracle database in the STORET National Data Warehouse. The NPS Water Resources Division was an active contributor to old STORET entering more than 2.5 million observations collected from 1900 to 1998 from 17,477 monitoring stations in or near 191 national park units.

More germane to the Vital Signs Monitoring Networks, however, is the new or modernized STORET (Ver. 2). Modernized STORET adopts a distributed database model that relies on government agencies and other entities to operate local copies of STORET and Oracle. Periodically these local STORET implementations replicate their entire database on the web-accessible STORET National Data Warehouse. Modernized STORET is a full-featured database that allows users to enter nearly any type of environmental monitoring data and thoroughly document the results of monitoring with complete metadata. All data in modernized STORET must include the required metadata. Data collected through 1998 and entered into the mainframe version of STORET can be migrated to modernized STORET provided the responsible organization includes all the new metadata required by modernized STORET. The NPS Water Resources Division is in the process of migrating the 2.5 million observations entered into old STORET to modernized STORET.

Why STORET?

The NPS has elected to use STORET as its Servicewide archive for water quality data for several reasons:

- States are responsible for promulgating and enforcing water quality standards under the Clean Water Act (http://www4.law.cornell.edu/uscode/33/ch26.html and http://www.ncseonline.org/NLE/CRSreports/water/h2o-32.cfm) with oversight by the EPA. This includes ensuring water quality standards are met in national park units. STORET is the water quality database employed by many states and the EPA. The ready accessibility of NPS data in STORET increases the probability that our data will be used by states in determining compliance with water quality standards (including impairment status, outstanding national or state resource waters designation, etc.), developing Total Maximum Daily Loads, and for other regulatory, enforcement, or assessment activities.

- STORET is a robust, full-featured, relational database that the EPA spends millions of dollars developing and supporting every year. In fact, the annual EPA budget for developing and supporting STORET exceeds the amount of money the NPS plans (assuming full-funding) to expend annually on collecting water quality data under the Water Quality Vital Signs Monitoring Program. Developing a database with similar capabilities in-house would be a waste of tax dollars. The scant NPS resources are better spent actually collecting the data.

- Although developed and supported by the EPA, STORET will be the NPS' Servicewide water quality archive. The NPS' STORET database will physically reside on an Oracle server at the NPS Natural Resource Program Center in Fort Collins, Colorado.

- The public can search, examine, and retrieve NPS-entered and other data from the STORET National Data Warehouse on the Internet. The STORET National Data Warehouse will contain a complete backup copy of the NPS's STORET database.

- The enhanced metadata recommendations of the Interagency Task Force on Monitoring Water Quality (http://water.usgs.gov/wicp/itfm.html) and its successor, the National Water Quality Monitoring Council (http://water.usgs.gov/wicp/acwi/monitoring), are fully supported by modernized STORET. This allows water quality monitoring programs to thoroughly document the content, quality, condition, and other characteristics of data to allow users to ascertain the quality and appropriateness of the data for other applications.

- The Natural Resources Management Guideline (NPS-77) states that the NPS should provide water quality monitoring data to STORET as the national water quality repository (http://www1.nature.nps.gov/rm77/freshwater/WaterResources.htm).

- The NPS made a substantial investment in STORET, entering over 2.5 million observations at 17,477 stations for 191 parks.

DRAFT PROPOSED VITAL SIGNS DATA REPORTING

All Vital Signs Monitoring Networks should submit their water quality monitoring results to the Water Resources Division on at least an annual basis for upload into the NPS' STORET database. If desired, Networks can provide their data more frequently. At minimum, the results provided must include the recommended water quality data elements developed by the Methods and Data Comparability Board of the National Water Quality Monitoring Council (NWQMC) (http://wi.water.usgs.gov/methods/tools/wqde/index.htm). These data elements document the "**W**ho, **W**hat, **W**here, **W**hen, **W**hy, and **H**ow" of the monitoring effort. Networks can record/provide additional metadata as desired; but the NWQMC data elements should be considered the key pieces of metadata that must be provided for every result as applicable.

The water quality data element categories (the 5Ws and the big H) will be discussed in general terms below followed by more specifics about how these data should be transmitted to WRD for upload to STORET.

Who:

This is the contact information, including formal name, organizational name, mailing address, phone number, and e-mail address for: (1) the data owner; (2) the sampling entity; and (3) the lab that analyzed the sample. Basically, this information allows anyone to contact the sample collector, lab analyzer, and whoever is ultimately responsible for the data. As the sampling entity and lab analyzer will likely change overtime, it is important that these data get tagged/stored with each sample that is collected.

What:

This is the characteristic, analyte, parameter, or generically the "thing" that was measured, observed, or sampled while monitoring. This would include the core parameters (i.e. conductivity, dissolved oxygen, pH, and temperature) and any other parameters. Providing this information also entails specifying the analyte name; filtered fraction (total, dissolved, suspended, etc.); sample medium (water, sediment, biological, air, etc.); sample identification number; field or lab measured; measurement units (mg/l, °C, µg/l, etc.); detection and quantification limits; Chemical Abstracts Service Registry Number (for chemicals); and Biological Systematic Name and ITIS Taxonomic Serial Number (for biological data). Details about composite, replicate, and QC samples are also specified here.

Where:

This is the location where the measurement/observation occurred or the sample was collected. The location identification should include the name of the water body (Use the Geographic Names Information System: http://geonames.usgs.gov/gnishome.html as appropriate.); sampling location type (eg. river, canal, spring, estuary, etc.); latitude and longitude coordinates; datum, source, source scale, and accuracy for latitude and longitude coordinates; location elevation; datum, source, source scale, and units for elevation; water depth (to the bottom at the station and at which the sample was collected); and depth units.

When:

This element documents when a particular measurement or observation was made or sample collected. It includes the start date and time and, optionally, end date and time. This element also includes the date and, optionally, time the lab analyzed the sample.

Why:

In a general sense, this data element should include a basic statement of the purpose of the monitoring effort. More specifically, this element attempts to document why a particular sample was collected (e.g. reconnaissance/occurrence survey, trend analysis, permit compliance, pollution event, etc.). This concept can be extended to the station level to include why a particular station was included in the sample design.

How:

This is the capstone of the metadata – documenting collection, gear configurations, preservation/treatment, and analysis of each sample and the protocol and equipment employed to make measurements and observations. Ideally, this information is contained in an approved Quality Assurance Project Plan (QAPP) or sampling plan. Otherwise, the data collectors and lab that analyzed the samples must be queried regarding the detailed protocol used to collect, preserve/treat, transport, and analyze samples and make measurements and observations.

TECHNICAL DETAILS

The primary mechanisms that will be employed to enter Vital Signs Monitoring Network water quality data into STORET are a series of input screens (forms/templates), developed as part of the Natural Resource Database Templates (http://www.nature.nps.gov/im/apps/template), and the STORET Interface Module (SIM Ver. 2). The input screens (called NPSTORET), developed by the NPS WRD, will allow Vital Signs Monitoring Networks to enter data about their projects, stations, metadata, and results. NPSTORET will run under Access 2002 or higher.

SIM is a data entry and validation tool that was designed by Gold Systems, Inc. to load large volumes of data into the STORET database, bypassing tedious data entry screens and STORET's own built-in batch input system. SIM is a series of Oracle forms that interact with a group of specially designed Oracle tables called the SIM database. These specially designed data tables reside in the same Oracle instance as STORET and interface directly with the STORET database.

SIM can read delimited text files generated by Microsoft Access, Excel, or any other application. SIM validates the input against the STORET database, identifying any errors in the incoming data. The fields of data that are supported in the current version of the NPSTORET are identified below. NPSTORET includes only a subset of the fields supported by SIM (which includes only a subset of the fields supported by STORET). In developing NPSTORET, the intent was to include only the most common/germane fields with the first release. Other fields can and will be supported at a later date.

Project, station, and metadata information are only entered once (unless a new project is started, new stations are added, or procedures change). Before SIM can be used to import delimited text files, however, the receiving copy of STORET must have been appropriately configured with metadata about the characteristics measured or observed; sample collection and creation; gear/equipment configurations; sample preservation, transport, and storage; lab sample preparation

and analytical procedures; and other information. This information is entered in the metadata template of NPSTORET.

What follows below is an introduction to the four main templates of NPSTORET: Projects (Why, Who); Stations (Where); Metadata (How); and Results (What, When).

Project Information:

This is one component of the "Why" part of the metadata. Why was the effort undertaken? All monitoring results collected at stations are assigned to projects. Vital Signs Monitoring Networks may wish to establish multiple projects in STORET or they may lump everything into one project, depending on what makes the most sense for organizing stations and monitoring. For Project ID, enter your four-character Vital Signs Network alpha-code followed by WQ to indicate that it is a water quality project and then a sequence number (e.g. the first project in the Northern Colorado Plateau Network would be NOCOWQ01). Most of the information entered about the Project on the Main and Additional Info tabs should be readily available in network planning documents. You can paste in relevant information directly from a QAPP, monitoring plan, or other document. Additionally, the entire document can be stored as an Adobe Acrobat PDF file in the database (Documents screen) to permanently associate important reference material directly with the data. Other references (entered in the Metadata template) can be associated with the project on the Citations tab.

Below are screen captures showing the Project Template for a park-based Level I Survey.

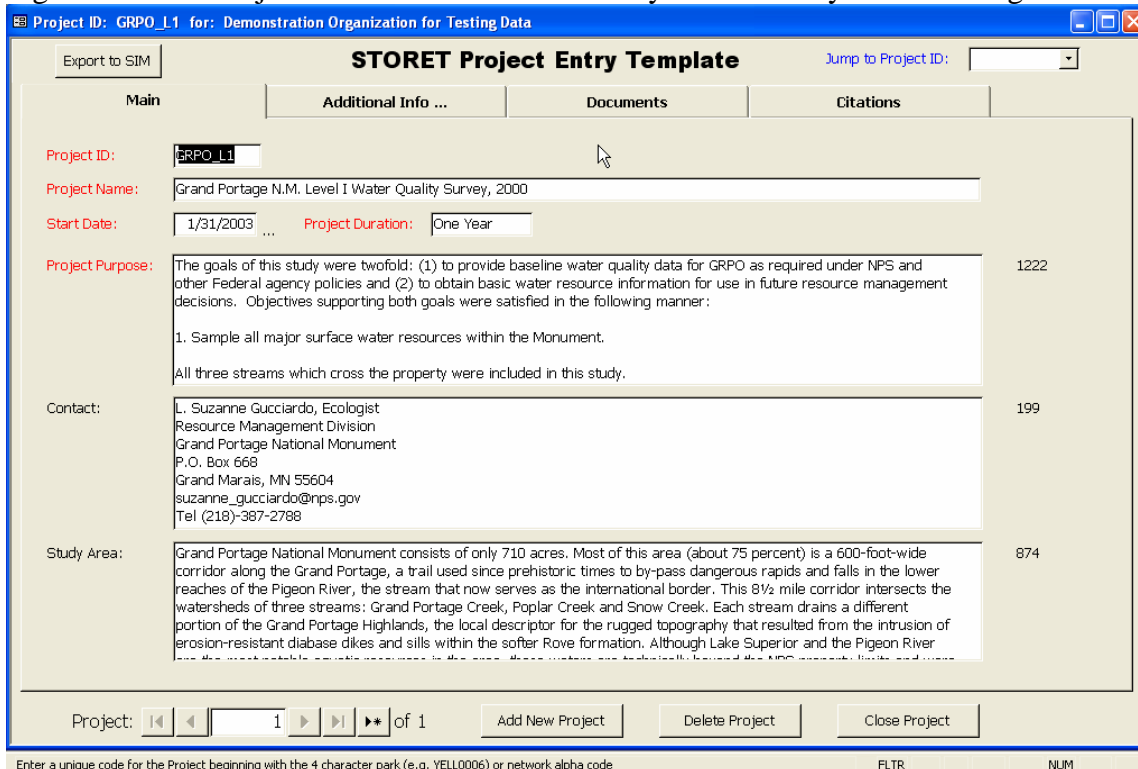Figure 1. Main Project Screen for a Level I Survey conducted by Grand Portage NM

Figure 2. Additional Project Info Screen

Figure 3. Project-Related Documents Screen

Figure 4. Link Citations to the Project Screen

Table 1. Project Attributes

Project Attributes	Description	Required in STORET	Allowed Values	Field Definition
Project ID	A unique and user defined code for the Project	Yes		8
Project Name	A unique and user defined name for the Project	Yes		60
Start Date	Date on which the Project began (MM-DD-YYYY)	Yes		MM-DD-YYYY
Duration	Planned duration of the Project (i.e. 2 years, ongoing)	Yes		15
Purpose	Description of the Project	Yes		4000
Contact	Contact Information for the Project	No		4000
Study Area	Description of the Project study area	No		4000
Design and Sampling Summary	Brief design and sampling summary	No		4000
Quality Assurance Project Plan Summary	Brief quality assurance Project plan summary	No		4000
Measurement Quality Objectives	Measurement quality objectives	No		4000
Project-Related Documents	Attach full QAPP, plan, etc. as PDF file	No		
File Name	File Name	No		255
Document Date	Date of document	No		MM-DD-YYYY
Description	Brief description of document	No		4000
Citation	Document citation	No		n/a
Link Citations to the Project	Other citations linked to the Project	No	Entered previously in STORET for Organization	n/a

Station Information:

Station information concerns the location of where samples were collected or observations/measurements were made. Station information comprises the bulk of the "Where" part of the metadata. Once a project has been established in STORET, stations can be assigned to it. STORET supports a large variety of descriptive fields of data to document information about the location of each monitoring site. NPSTORET supports a subset of these fields as displayed in the figures below. For Station ID, enter your four-character Vital Signs Network Code followed by an underscore, the park alpha-code followed by an underscore and then a 5-character or less code for the specific location (e.g. a station located at the Yampa River crossing of Dinosaur National Monument's eastern boundary could be NOCO_DINO_YRBDY, NOCO_DINO_00001, or anything else that is logical and/or consistent with the network's desired naming convention).

Below are screen captures showing the Station Tempate.

Figure 5. Main Station Screen

Figure 6. Station Pictures Screen
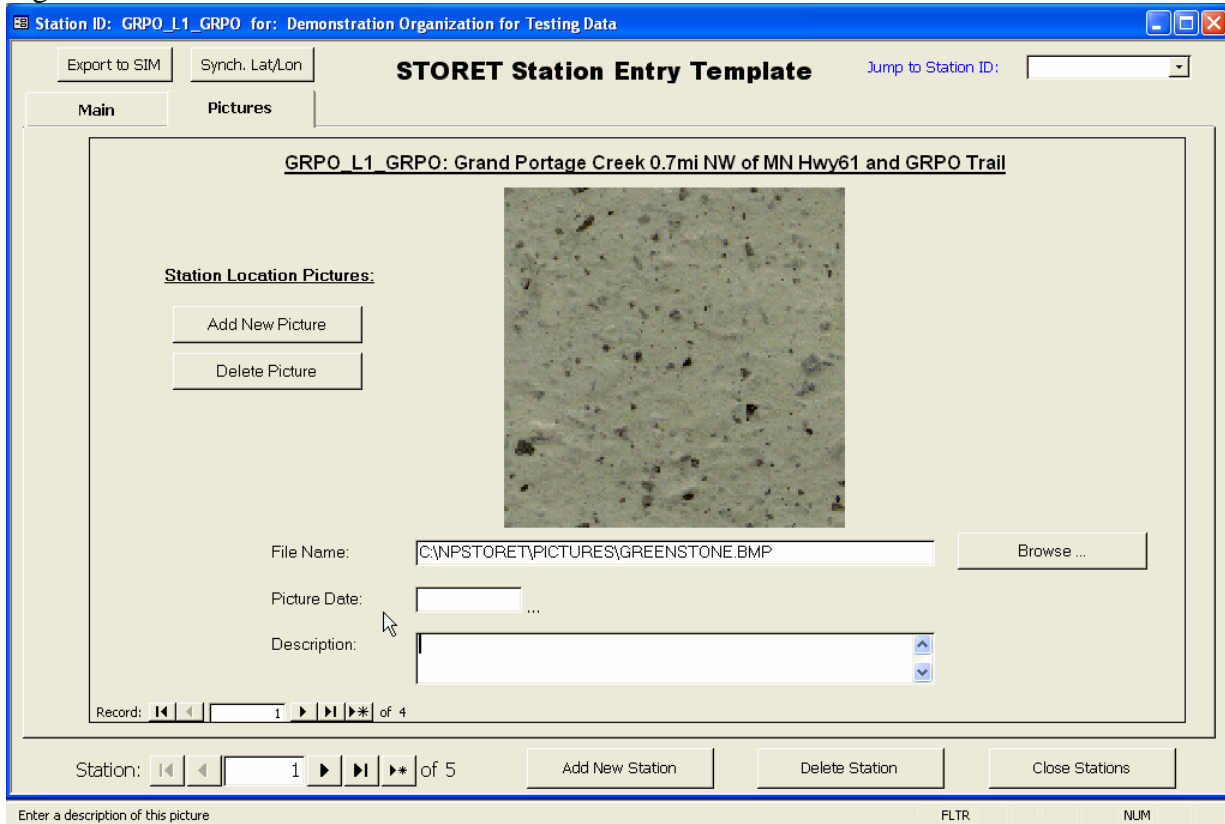
Table 2. Station Attributes

Station Attributes	Description	Required in STORET	Allowed Values	Field Definition
Station ID	A unique and user defined code for the Station	Yes		15
Name	A unique and user defined name for the Station	No		60
Primary Type	The Station's primary classification	Yes	Canal Cave CERCLA Superfnd Site Channelized stream Combined sewer Estuary Facility Gallery Great Lake Lake Land Land Runoff Landfill Mine/mine discharge Ocean Reservoir River/stream Riverine Impoundment	n/a

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Station Attributes	Description	Required in STORET	Allowed Values	Field Definition
			Spring Storm Sewer Waste Pit Waste Sewer Well Wetland Constructed Wetland	

Secondary Type	The Station's secondary type classification. Required if Primary Type = Canal, Facility, or Wetland	Conditional	If Primary Type = Canal
			    Drainage
			    Irrigation
			    Transport
			If Primary Type = Facility
			    Industrial
			    Municipal Sewage (POTW)
			    Municipal Water Supply (PWS)
			    Other/combined
			    Privately Owned non-industrial
			If Primary Type = Wetland
			    Estuarine, emergent
			    Estuarine, forested
			    Estuarine, scrub-shrub
			    Lacustrine, emergent
			    Palustrine, emergent
			    Palustrine, forested
			    Palustrine, moss-lichen
			    Palustrine, shrub-scrub
			    Riverine, emergent
				n/a

Latitude Degrees	Latitude degrees reported as DD if latitude is degrees, minutes, and seconds; otherwise decimal degrees	Yes		Number
Latitude Minutes	Latitude minutes reported as MM if latitude is degrees, minutes, and seconds	Conditional		Number
Latitude Seconds	Latitude seconds reported as SS.SSSS if latitude is degrees, minutes, and seconds	Conditional		Number
Latitude Direction	Latitude direction. Defaults to N if not supplied	No	"N" or "S"	n/a
Longitude Degrees	Longitude degrees reported as DDD if longitude is degrees, minutes, and seconds; otherwise decimal degrees	Yes		Number
Longitude Minutes	Longitude minutes reported as MM if longitude is degrees, minutes, and seconds	Conditional		Number
Longitude Seconds	Longitude seconds reported as SS.SSSS if longitude is degrees, minutes, and seconds	Conditional		Number
Longitude Direction	Longitude direction. Defaults to W if not supplied	No	"W" or "E"	n/a
Geopositioning Method	Method used to determine station's latitude and longitude	Yes	A1 Address Matching - House Number A2 Address Matching - Block Face A3 Address Matching - Street Centerline A4 Address Matching - Nearest Intersection A5 Address Matching - Primary Name A6 Address Matching – Digitized AU Address Matching - Unknown C1 Census Block - 1990 - Centroid C2 Census Block/Group - 1990 - Centroid C3 Census Block Tract - 1990 – Centroid CO Census - Other CU Census - Unknown G1 GPS Carrier/Geodetic G2 GPS-Code/Geodetic G3 GPS-Kinematic GO GPS-Other GU GPS-Unknown I1 Interpolation - Map I2 Interpolation - Photo I3 Interpolation - Satellite IO Interpolation - Other	n/a

Station Attributes	Description	Required in STORET	Allowed Values	Field Definition
			IU Interpolation-Unknown LI Loran C P1 Public Land Survey-Quartering P2 Public Land Survey-Footing UN Unknown Z1 ZIP Code-Centroid OT Other	
Geopositioning Datum	Datum used to determine station's latitude and longitude	Yes	NAD27 North American Datum of 1927 NAD83 North American Datum of 1983 OTHER Other UNKWN Unknown WGS72 World Geodetic System of 1972 WGS84 World Geodetic System of 1984 GUAM Guam Datum of 1963 AMSMA American Samoa Datum WAKE Wake-Eniwetok Datum of 1960 ASTRO Midway Astro Datum of 1961 JHNSN Johnson Island Datum of 1961 SPAUL St. Paul Island Datum SGEOR St. George Island Datum SLAWR St. Lawrence Island Datum OLDHI Old Hawaiian Island Datum PR Puerto Rican Datum	n/a
Scale	Map scale used. Required when Geopositioning Method is "Interpolation-Map"	Conditional		20
Elevation	Station's elevation (XXXX.XXXX)	No		Number
Elevation Units	Elevation's unit of measure	Conditional	"ft" or "m"	n/a
Elevation Method	Method used to determine Elevation Required if Elevation is given	Conditional	MA Map Interpolation Analog MD Map Interpolation Digital AM Absolute Mode GPS CS Conventional Survey DM Differential Mode GPS SP Conversion from State Plane System UT Conversion from Univ. Trans. Merc. PL Public Land Survey AZ Algorithm Zip Code Centroid PI Photo Interpretation RT Radio Triangulation	n/a
Elevation Datum	Datum used to determine Elevation Required if Elevation is given	Conditional	NAVD88 North American Vertical Datum 1988 NGVD29 National Geodetic Vertical Datum 1929 WGS84 World Geodetic System of 1984 SEALV Elevation from Mean Sea Level LTD Local Tidal Datum UNKWN Unknown OTHER Other	n/a
County	Name of station's primary county Must be in capitol letters	Yes	STORET Pick List (includes 3,305 named counties)	n/a
State	Two-character postal abbreviation of primary state	Yes	STORET Pick List (includes 112 states, territories, provinces)	n/a
HUC	Station's 8-digit USGS subbasin/catalog unit ID	No	STORET Pick List (includes 2,285 8-digit subbasins/catalog units)	n/a
NRCS ID	NRCS watershed ID for Station 12 digit, 6th level ID - 1st 8 digits are the 4th level HUC	No		12
Water Depth	Typical water depth at station (not sample depth)	No		Number
Depth Units	Depth units	Conditional	"m", "ft", "cm", "in", "km", "mi"	n/a
Station Description	Anything you might want to say about the station	No		4000
Travel Directions	How to travel to the station	No		2000
Ocean Name	Ocean name Required if Primary Type = Ocean	Conditional	"Atlantic Ocean", "Pacific Ocean", "Arctic Ocean", "Gulf of Mexico", "Caribbean Sea"	n/a

Station Attributes	Description	Required in STORET	Allowed Values	Field Definition
Shore Relation	Where is the station relative to the shore	Conditional	"Near Shore" or "Far Shore"	n/a
Primary Estuary	Name of the primary Estuary Required if Primary Type = Estuary	Conditional	STORET Pick List (includes 1,047 named primary estuaries)	n/a
Secondary Estuary	Name of the secondary Estuary	Conditional	STORET Pick List (includes 898 named secondary estuaries)	n/a
Great Lake	Great Lake name Required if Primary Type = Great Lake	Conditional	"Lake Superior", "Lake Huron", "Lake Erie", "Lake Michigan", "Lake Ontario"	n/a
Station Pictures	Include digital picture of the station	No		
File Name	Name of the digital picture file	No		255
Picture Date	Date digital picture file was taken	No		MM-DD-YYYY
Description	Description of digital picture	No		4000

Metadata:

Metadata (which typically answers the question of "How" something was done) is the most critical improvement to modernized STORET. At a time when states are increasingly passing "Credible Data" statutes and ignoring improperly documented data, it behooves the NPS to ensure that metadata about sample collection, preservation, transport, and storage; lab preparation and analytical methodology; quantification and detection limits; and other metadata that help users judge the usefulness of data are stored with the data. In short, poorly documented data are a waste of money and effort.

STORET allows users to document the entire monitoring procedure, from field data collection to final result generation. In fact, before any results can be entered into the system, STORET must be prepped with the appropriate metadata documenting the field sampling/measurement procedure; gear configurations; sample preservation, transport, and handling; field/lab analytical procedure; lab sample preparation; complete detail about the characteristics measured; laboratory information; staff and their roles; and any literature citations pertinent to the monitoring effort. This metadata, which should exist in your network's QAPP or monitoring plan, only needs to be entered once, prior to entering results. Below are the primary metadata screens for documenting these aspects of the monitoring process in a STORET compatible format.

Figure 7. Metadata Template - Field Sampling/Collection Procedures

Table 3. Field Sampling/Collection Procedure Attributes

Field Collection Procedure and Gear	Description	Required in STORET	Allowed Values	Field Definition
Field Collection Procedure ID	Code for sample collection procedure	Yes		10
Field Collection Procedure Name	Name of sample collection procedure	Yes		60
Field Gear Category	Broad category of field gear used in procedure to extract sample	No	Water Sampler Benthic Corer Benthic Dredge Benthic Grab Trap/Substrate Diatometer Net/Horizontal Tow Net/Vertical Tow Net/Non-Tow Electroshock Miscellaneous/Other	n/a
Field Procedure Description	Description of the field sampling procedure	No		4000
Field Procedure Citation	Literature citation documenting the field procedure	No	Entered previously in STORET for Organization	n/a

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Figure 8. Metadata Template - Gear Configurations

Table 4. Gear Configuration Attributes

Gear Configuration	Description	Required in STORET	Allowed Values	Field Definition
Gear Type Category	Broad category of field gear used in procedure to extract sample	Yes	Water Sampler Benthic Corer Benthic Dredge Benthic Grab Trap/Substrate Diatometer Net/Horizontal Tow Net/Vertical Tow Net/Non-Tow Electroshock Miscellaneous/Other	n/a
Gear Name	Name of specific gear used	Yes	STORET Pick List (includes 168 specific kinds of field gear)	n/a
Gear ID	Code for gear configuration	Yes		10
Configuration Name	Name of gear configuration	Yes		30
Specification	Description/specification of the gear configuration	No		2000

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Figure 9. Metadata Template - Preservation, Transport, and Storage Procedures

Table 5. Preservation, Transport, and Storage Procedure Attributes

Preservation, Transport, and Storage	Description	Required in STORET	Allowed Values	Field Definition
Preservation, Transport, and Storage ID	Code for handling procedure	Yes		10
Preservation, Transport, and Storage Name	Name for handling procedure	Yes		60
Sample Container Type	Type of container	No	Aluminum Dish Aluminum Foil Wrap BOD Bottle Carboy Container Cubitainer Galvanized Steel Container Glass Bottle Glass Media Bottle Glass Petri Dish Glass Tube Glass Vial Glass Vial w/ Septa HDPE Bottle HDPE Vial Nalgene Bottle Nalgene Vial Plastic Bottle Plastic Bag Plastic Dilution Bottle Plastic Syringe Polycarbonate Media Bottle	n/a

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Preservation, Transport, and Storage	Description	Required in STORET	Allowed Values	Field Definition
			Polyethylene Bottle Polyethylene Container Polyethylene Vial Polypropylene Bottle Polypropylene Container Polypropylene Vial Polystyrene Container Polystyrene Petri Dish Stainless Steel Container Teflon Bottle Teflon Vial	
Container Size	Container size	No		Number
Size Units	Container size units	Conditional	"gal", "qt", "pt", "oz", "l", "ml"	n/a
Container Color	Container color	No	Amber Clear Green Black Translucnt Opaque	n/a
Temperature Preservation	How was the sample temperature preserved	No	None Wet Ice (4 deg C) Dry Ice (-78.5 deg C) Refrigerated (4 deg C) Frozen (0 deg C) Frozen (-20 deg C) Frozen (-50 deg C) Freeze Dried	n/a
Handling Description	Other relevant sample handling information	No		2000

Figure 10. Metadata Template - Field/Lab Analytical Procedures

Table 6. Field/Lab Analytical Procedure and Equipment Attributes

Analytical Procedure/Equipment	Description	Required in STORET	Allowed Values	Field Definition
Procedure ID	Code for analytical procedure	Yes		15
Procedure Name	Name for analytical procedure	Yes		120
Procedure Citation	Literature citation for the analytical procedure	Yes	Entered previously in STORET for Organization	n/a
Equipment Type Category	Broad category of analytical equipment used	No	Acoustic Velocity Autoanalyzer Chromatography Conductivity Electrochemical Microscope Particle Counter Physical/Handling Probe Spectroscopy Test Kit Titration Visual Inspection None	n/a
Specific Analytical Equipment	Specific type of analytical equipment used	Conditional	STORET Pick List (includes 186 specific kinds of equipment)	n/a
Procedure Description	Description providing additional information about the procedure and/or equipment	No		4000
Comparable National Procedure	Assign a comparable national procedure to your procedure	No	STORET Pick List (includes 2,917 national procedures)	n/a

Figure 11. Metadata Template - Lab Sample Preparation Procedures

Table 7. Lab Sample Preparation Procedure Attributes

Lab Sample Preparation Procedure	Description	Required in STORET	Allowed Values	Field Definition
Preparation ID	Code for lab sample preparation procedure	Yes		15
Preparation Name	Name for lab sample preparation procedure	Yes		120
Preparation Citation	Literature citation for the lab sample preparation procedure	Yes	Entered previously in STORET for Organization	n/a
Preparation Description	Broad category of analytical equipment used	No		4000

Figure 12. Metadata Template – Define Your Characteristics (Under-Development)
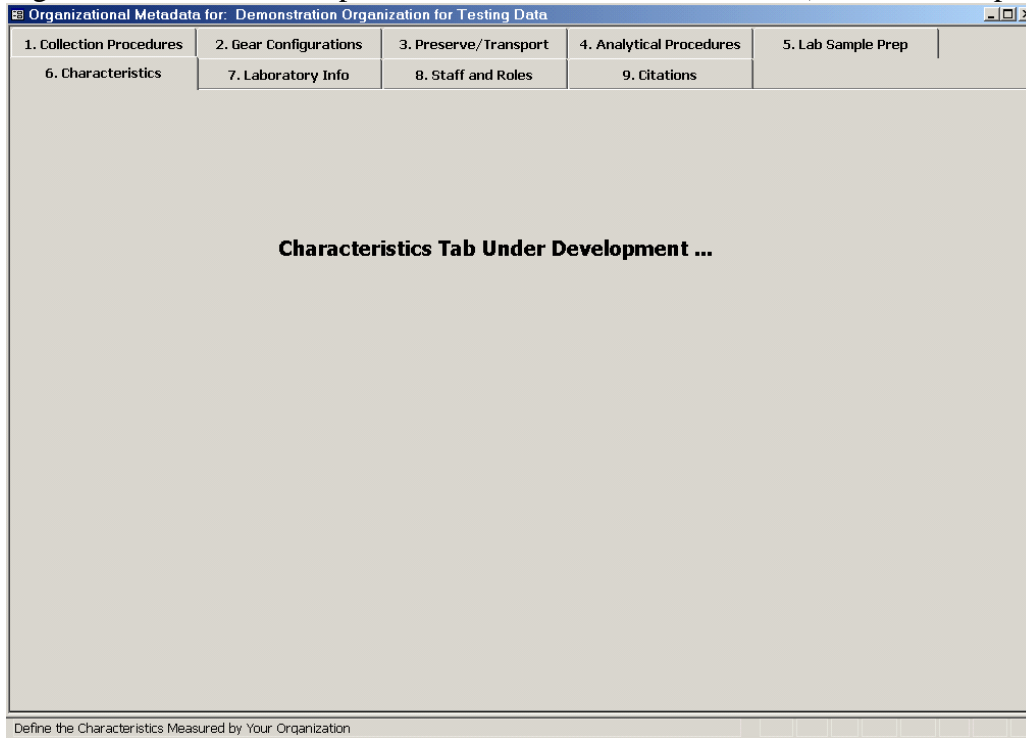
Table 8. Characteristic Attributes

Characteristic	Description	Required in STORET	Allowed Values	Field Definition
Characteristic Name	Name of what was sampled, measured, or observed	Yes	STORET Pick List (includes 323,212 characteristics)	n/a
Brief Name	Brief name for the characteristic	Yes		20
Sample Fraction	Sample portion analyzed	Conditional	Total Dissolved Suspended Settleable Non-settleable Filterable Non-filterable Volatile Non-volatile Acid Soluble Vapor Supernate Fixed Total Recovrble Comb Available Total Residual Free Available Pot. Dissolved	n/a
Lab/Field	Was the characteristic measured/observed in the field or lab	Yes	"Field", "Lab"	n/a
Medium	Medium where characteristic was measured	Yes	Water Biological Sediment Air	n/a

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Characteristic	Description	Required in STORET	Allowed Values	Field Definition
			Soil Other	
Units	Unit of measure	Yes	STORET Pick List (includes 255 units of measure)	n/a
Value Type	Type of value recorded Defaults to "Actual"	Yes	"Actual", "Calculated", "Estimated"	n/a
Statistic Type	Statistic or calculation type of the reported result value	No	Maximum Mean Median Minimum Mode MPN Standard Deviation 5 pctl 10 pctl 15 pctl 20 pctl 25 pctl 75 pctl 80 pctl 85 pctl 90 pctl 95 pctl	n/a
Duration	Period of time over which measurement was made	No	24 Hours 96 Hours 1 Day 2 Day 3 Day 4 Day 5 Day 6 Day 7 Day 8 Day 9 Day 10 Day 11 Day 12 Day 13 Day 14 Day 15 Day 16 Day 17 Day 18 Day 19 Day 20 Day 21 Day 22 Day 23 Day 24 Day 25 Day 26 Day 27 Day 28 Day 29 Day 30 Day 60 Day 90 Day 120 Day 6 Month 1 Year	n/a
Weight Basis	Form or portion of the sample associated with the result	No	"Wet", "Dry", "Ash-free Dry"	n/a
Temperature Basis	Temperature at which sample was maintained for analysis	No	05 Deg C 10 Deg C 15 Deg C 20 Deg C	n/a

Characteristic	Description	Required in STORET	Allowed Values	Field Definition
			25 Deg C	
Particle Size Basis	Sediment size class	No		40
Lower Range	Lowest expected value (values below this pop up a warning message)	No		n/a
Upper Range	Highest expected value (values above this pop up a warning message)	No		n/a
Detection Limit	Least amount that can be detected by method/procedure	No		12
Quantification Low	Lowest amount that can be detected by method/procedure	No		12
Quantification High	Highest amount that can be detected by method/procedure	No		12
Detection Limit Description	Further describe the detection or quantification limits	No		254

Figure 13. Metadata Template - Laboratory Info

Table 9. Laboratory Info Attributes

Laboratory Information	Description	Required in STORET	Allowed Values	Field Definition
Lab ID	Code for the lab	Yes		8
Lab Name	Name of the lab	Yes		60
Location Address	Physical address of the lab	No		
Location Address Type	Type of physical address	Conditional	Located at Mailing Shipping	n/a
Address1	First line of physical address	No		40
Address2	Second line of physical address	No		40
Address3	Third line of physical address	No		40
City, State, Zip	City, State, and Zip Code	No		40
Electronic Address	Electronic address of the lab	No		
Electronic Address Type	Type of electronic address	Conditional	Phone Fax Internet Commercial network Other	n/a
Electronic Address	Actual electronic address	Conditional		60
Comment	Comment/description of electronic address	No		40

Figure 15. Metadata Template - Organizational Staff and Their Roles

Table 10. Organizational Staff and Their Roles Attributes

Organizational Staff and Their Roles	Description	Required in STORET	Allowed Values	Field Definition
First Name	First name	Yes		30
Last Name	Last name	Yes		40
Log In ID	Log In ID created in NPSTORET	No		8
Active Status	Button to indicate if person is still active in the organization	No		n/a
Roles	Select one or more roles for this person in the organization	No	Biochemist Biologist Chemist Data Administrator Department Manager Deputy Director Director Engineer Geologist Hydrologist Limnologist Meteorologist Quality Assurance Officer Senior Scientist Staff Scientist Staff/Contract Staff/Employee Staff/Volunteer STORET Primary Contact Taxonomist Technician	n/a

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Organizational Staff and Their Roles	Description	Required in STORET	Allowed Values	Field Definition
			305B Coordinator	
Electronic Address	Electronic address of the staff member	No		
Electronic Address Type	Type of electronic address	Conditional	Phone Fax Internet Commercial network Other	n/a
Electronic Address	Actual electronic address	Conditional		60
Comment	Comment/description of electronic address	No		40

Figure 16. Metadata Template - Organizational Citations

Table 11. Organizational Citation Attributes

Organizational Citation	Description	Required in STORET	Allowed Values	Field Definition
Publication Title	Title of the publication being cited	Yes		1999
Author Names	Name(s) of the author(s)	Yes		120
Publisher Name	Name of the publisher	Yes		120
Publication Year or Date	Publication year or date of publication	Yes		18
Volume and Page Number	Volume and page number	Yes		20
Organization Reference ID	Reference ID for publication from the citation's owner	No		20
Comments	Additional information about the citation	No		254

Other Metadata

A wide variety of other metadata is supported by STORET. Please consult with your STORET contact if you require storage of metadata other than what is displayed here and supported in NPSTORET. NPS WRD staff will QA/QC and then enter each networks' monitoring metadata in the NPS' copy of STORET prior to uploading the results to the STORET National Data Warehouse (http://www.epa.gov/storet/dw_home.html).

Result Information:

Result information contains the results of sample analyses or measurements/observations made while conducting activities at stations during trips in support of projects. This is a combination of the 'What', 'When', and 'How' parts of metadata. The NPSTORET template to house result information is still under development. The result file supported by SIM (Table 12) includes redundant information on sample collection procedures, analytical methodology, detection limits, and other metadata that describe the process ('How'). These will generally be entered on the Metadata template (described above) and linked to characteristics. Consequently, when you choose to enter data for a particular characteristic on the Result template, the metadata associated with that characteristic will automatically be linked to the result.

Discussion of some of the fields in the result file helps illuminate the depth of the STORET database. Every result in STORET is assigned to a Station ID and every Station ID must be assigned to a Project ID. Both of these IDs and their accompanying tables were discussed above. The Trip ID is a QC construct in new STORET. A trip occurs, for example, when a data collector leaves the office and collects samples and/or makes measurements/observations at the six stations included in the park's monitoring network and then returns to the office. It is included as a way to attach QC data (Trip Blank, Reagent Blank, Equipment Blank, Pre-preservative Blank, Post-preservative Blank, Reference Sample) to all the samples collected during the trip. You can enter your own Trip ID or SIM can automatically generate one. You can also name your trip and provide a variety of other trip details in STORET as shown in Figure 17. Note, however, that all fields shown on these screens are not currently supported by SIM.

Figure 17. Entering Trips and Assigning QC Information in STORET

Since you can visit stations multiple times during a trip, STORET allows you to assign Station Visit IDs. You can enter your own Station Visit or let SIM automatically generate one. You also provide a start/end date and time as well as comments about the visit or station condition as depicted in Figure 18.

Figure 18. Entering Station Visit Information in STORET

While visiting stations on trips, data collectors conduct activities – collecting samples, making a suite of measurements or observations, or generating trip QC information. To uniquely identify each activity, an Activity ID must be assigned. The Activity Type (Sample, Field Msr/Obs, Trip QC), Medium (Water, Biological, Sediment, Soil, Air, Other), and Category must also be entered. The date/time the activity began and ended are also entered as well as any comments about the activity as shown in Figure 19.

Figure 19. Entering Activity Information in STORET

You can also enter a variety of information about the activity depth including actual depth, relative depth, upper and lower depths, and depth zone (Figure 20).

Figure 20. Entering Activity Depth Information in STORET

Results are recorded for 'characteristics'. Characteristics are the parameters, analytes, constituents, or, generically, what is being observed or measured in the field or analyzed for in a sample. Every row in the result file will contain all the information described above as well as the characteristic name, result value, value type (actual, calculated, estimated), result status (final or preliminary), and result comment as shown in Figure 21. Depending on the characteristic and activity, you can also record precision, confidence level, statistic type, duration basis, temperature basis, Lab ID, analysis date/time, and Batch ID.

Figure 21. Entering Result Information in STORET

All these screens from the STORET Oracle Application will be winnowed down to a Results template in NPSTORET that Vital Signs Monitoring Networks will use to enter results in a STORET compatible format. Table 12 below provides a list of the SIM supported STORET fields that will be incorporated into the Results template. Please note that not all of these fields will be populated on the Results template. Many will be entered on the Metadata template and linked with the result.

Table 12. SIM Supported Attributes for Physical/Chemical (Regular) and Biological Results

Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
Trip ID	User defined Trip ID that either (a) exists in STORET, (b) is to be added to STORET by SIM, or (3) is to be generated by SIM. If the user selects (c), this field is left blank and SIM is instructed to create a trip/day, a trip/month, or a trip/year. This is a QA construct.	Yes		15	Both
Trip Start Date	The date when Trip began. Required if passing in a new Trip.	Conditional		MM-DD-YYYY	Both
Trip Stop Date	The date when Trip ended	No		MM-DD-YYYY	Both
Trip Name	Name of Trip	No		60	Both
Station ID	Valid STORET Station ID	Yes	Entered previously in STORET	n/a	Both
Point Type	The absolute location point type where the activity took place	Yes	*POINT OF RECORD SAMPLING BOUNDARY END OF PIPE WELL HEAD TRANSECT ORIGIN GRID ORIGIN	n/a	Both
Sequence Number	Sequence position among a group of points (1-9999)	Conditional		Number	Both
Well or Pipe ID	Well or Pipe ID	Conditional		n/a	Both
Additional Location Information	Additional information about the actual sample location	No		254	Both
Station Visit Number	Unique alphanumeric code for station and trip	Yes		3	Both
Station Visit Arrival Date	Date station visit commenced Defaults to Trip Start Date	No		MM-DD-YYYY	Both
Visit Comments	Notes about the station visit	No		4000	Both
Project ID	Valid STORET Project ID	Yes	Entered previously in STORET	n/a	Both
Activity ID	Unique alphanumeric code for each activity (a sample or a suite of field measurements)	Yes		12	Both
Medium	The medium where the activity occurred	Yes	Water Biological Sediment Air Soil Other	n/a	Both
Activity Type	Primary classification of the activity	Yes	Sample Field Msr/Obs Trip QC	n/a	Both
Activity Category	Activity's secondary classification	Yes	If Type=Sample Routine Sample Integrated Time Series Integrated Flow Proportioned Integrated Horizontal Profile Integrated Vertical Profile		Both

Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
			Composit w/o Parents Field Replicate Field Spike If Type=Field Msr/Obs Routine Msr/Obs Replicate Msr/Obs If Type=Trip QC Trip Blank Reagent Blank Equipment Blank Pre-preservative Blank Post-preservative Blank Reference Sample		
QC Indicator	Flag to indicate whether activity is a QC sample	Yes	"Y" or "N"	n/a	Both
Sample Matrix	Further define the sample medium	No	STORET Pick List (includes 56 matrices)	n/a	Both
Chain of Custody ID	ID for a record kept elsewhere that tracks a sample's chain of custody	No		30	Both
Replicate Number	User assigned number to differentiate activities of the same type	Conditional		Number	Both
Total Sample Weight	Total weight of sample	No		Number	Both
Total Sample Weight Units	Units of total weight of sample	Conditional	"lb", "oz", "gm", "mg"		Both
Activity Start Date	Date activity began	Y		MM-DD-YYYY	Both
Activity Start Time	Time activity began Required if SIM instruction is set to create station visits based on date and time	Conditional		HH:MM:SS	Both
Activity Start Time Zone	Time zone for start time Required if activity start time given	Conditional	AST ADT EST EDT CST CDT MST MDT PST PDT GMT AK HI GU	n/a	Both
Activity End Date	Date activity ended	No		MM-DD-YYYY	Both
Activity End Time	Time activity ended	No		HH:MM:SS	Both
Activity End Time Zone	Time zone for end time Required if activity end time given	Conditional	AST ADT EST EDT CST CDT MST MDT PST PDT GMT AK HI GU	n/a	Both
Depth to Activity	Depth at which activity occurred	No		Number	Both
Depth to Activity Units	Units for activity depth	Conditional	"ft", "m"	n/a	Both
Relative Depth	Relative depth at which activity occurred	No	Surface Midwater Near Bottom	n/a	Both

Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
			Bottom Subbottom		
Depth Measured From	Reference from which depth are measured	No		30	Both
Lower Depth	Lower depth in range at which activity occurred. Required if upper depth is given.	Conditional		8	Both
Upper Depth	Upper depth in range at which activity occurred. Required if lower depth is given.	Conditional		8	Both
Upper/Lower Depth Units	Units for depth range. Required if upper and lower depths are given	Conditional	"ft", "m"	n/a	Both
Depth Zone Type	Depth zone in which activity occurred	No	Epilimnion Mesolimnion Hypolimnion Epibenthic Mesobenthic Hypobenthic	n/a	Both
Thermocline	Activity's relationship to thermocline	No	"Above", "Below", "In"	n/a	Both
Halocline	Activity's relationship to halocline	No	"Above", "Below", "In"	n/a	Both
Pycnocline	Activity's relationship to pycnocline	No	"Above", "Below", "In"	n/a	Both
Personnel	Personnel responsible for activity	No	Previously entered in STORET	n/a	Both
Activity Comments	Comments about the activity	No		254	Both
Sample Collection Procedure ID	Valid Sample Collection Procedure ID. Required only if Activity Type=Sample	Conditional	Previously entered in STORET	n/a	Both
Gear ID	STORET code for gear used to collect sample. Required if Sample Collection Procedure has an associated Gear Type	Conditional	STORET Pick List (Includes 168 specific kinds of field gear)	n/a	Both
Gear Configuration ID	Valid STORET Gear Configuration ID	No	Entered previously in STORET	n/a	Both
Gear Deployment Comments	Additional comments about the gear was deployed	No		1999	Both
Sample Preservation Transport and Storage ID	Valid Sample, Preservation, Transport, and Storage ID	No	Entered previously in STORET	n/a	Both
Sample Transport and Storage Comments	Additional comments about sample preservation, transport, and storage	No		1999	Both
Field Set ID	Alphanumeric code that uniquely identifies a field set (grouping of activities) during a station visit	Conditional		10	Both
Field Set Name	Name given to the field set	Conditional		30	Both
Detection Condition	Detection condition of the result	Conditional	Detected and Quantified Not Detected Detected not Quantified Not Reported Present above Quantification Limit Present below Quantification Limit	n/a	Both
Characteristic Group ID	Valid STORET Characteristic Group ID	Conditional	Entered previously in STORET	n/a	Both
Characteristic Row ID	Valid STORET Row ID within selected Characteristic Group. Required if Characteristic Group ID has been selected.	Conditional		n/a	Both
Characteristic Name	Valid STORET Characteristic Name. Either Characteristic Name or Characteristic Group ID must be chosen.	Conditional	STORET Pick List (includes 323,212 characteristics)	n/a	Both
Result Value	Value of analysis or measurement. Allowed values depend on the characteristic. Some characteristics require a choice from a standard pick list; otherwise a numeric value	Conditional	<value> *Non-detect *Present <QL *Present >QL *Present	n/a	Both

Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
	or one of the codes.		<STORET Pick List>		
Result Value Units	Result value units of measure	Conditional	STORET Pick List (includes 255 units of measure)	n/a	Both
Result Status	QA status of the result Defaults to "F" for Final if not provided	No	F Final P Preliminary	n/a	Both
Sample Fraction	Sample portion analyzed	Conditional	Total Dissolved Suspended Settleable Non-settleable Filterable Non-filterable Volatile Non-volatile Acid Soluble Vapor Supernate Fixed Total Recovrble Comb Available Total Residual Free Available Pot. Dissolved	n/a	Both
Statistic Type	Statistic or calculation type of the reported result value	No	Maximum Mean Median Minimum Mode MPN Standard Deviation 5 pctl 10 pctl 15 pctl 20 pctl 25 pctl 75 pctl 80 pctl 85 pctl 90 pctl 95 pctl	n/a	Both
Value Type	Type of value recorded Defaults to "Actual"	Yes	"Actual", "Calculated", "Estimated"	n/a	Both
Precision	Numeric precision of result	No		8	Both
Confidence Level	Confidence level of result	No		8	Both
Bias	Deviation of measured from true value	No		12	Both
CL Corrected for Bias	Has the confidence level been corrected for bias	No	"Y", "N"	n/a	Both
Duration Basis	Period of time over which measurement was made	No	24 Hours 96 Hours 1 Day 2 Day 3 Day 4 Day 5 Day 6 Day 7 Day 8 Day 9 Day 10 Day 11 Day 12 Day 13 Day 14 Day	n/a	Both

Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
			15 Day 16 Day 17 Day 18 Day 19 Day 20 Day 21 Day 22 Day 23 Day 24 Day 25 Day 26 Day 27 Day 28 Day 29 Day 30 Day 60 Day 90 Day 120 Day 6 Month 1 Year		
Temperature Basis	Temperature at which sample was maintained for analysis	No	05 Deg C 10 Deg C 15 Deg C 20 Deg C 25 Deg	n/a	Both
Weight Basis	Form or portion of the sample associated with the result	No	"Wet", "Dry", "Ash-free Dry"	n/a	Both
Result Comment	Comments about the result	No		4000	Both
Laboratory ID	Valid STORET Lab ID at which sample was analyzed	No	Entered previously in STORET	n/a	Both
Field/Lab Procedure	Valid STORET ID for the analytical procedure used to obtain result. Required for most characteristics.	Conditional	Entered previously in STORET	n/a	Both
Field/Lab Procedure Source	Name of analytical procedure owner	No	Entered previously in STORET	n/a	Both
Laboratory Certified	Indication if Lab is certified for characteristic and lab procedure at time of analysis	No	"Y", "N"	n/a	Both
Laboratory Batch ID	Identification code for laboratory analysis batch	No		10	Both
Analysis Date	Date sample analyzed by lab	No		MM-DD-YYYY	Both
Analysis Time	Time sample analyzed by lab	No		HH:MM:SS	Both
Analysis Time Zone	Time zone for sample analysis Required if Analysis Time entered	Conditional	AST ADT EST EDT CST CDT MST MDT PST PDT GMT AK HI GU	n/a	Both
Lab Sample Prep Procedure	Valid STORET ID for sample preparation procedure that was used by the lab	No	Entered previously in STORET	n/a	Both
Lab Sample Prep Procedure Source	Name of lab sample prep procedure owner	No	Entered previously in STORET	n/a	Both
Quantification Low	Lowest amount that can be detected by method/procedure	No		12	Both
Quantification High	Highest amount that can be detected by method/procedure	No		12	Both

Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
Detection Limit	Least amount that can be detected by method/procedure	No		12	Both
Detection Limit Unit	Unit of measure of the detection or quantification limit	Conditional	STORET Pick List (includes 255 units of measure)	n/a	Both
Detection Limit Comment	Further describe the detection or quantification limits	No		254	Both
Intent	What is the biological sample's intent	Yes	Individual Tissue Taxon Abundance	n/a	Bio
Parent Sample ID	Parent sample/activity ID	Conditional	Entered previously in STORET or in the current data file	n/a	Bio
Community	Biological community from which sample was taken. Required when Intent=Taxon Abundance	Conditional	Aquatic Vegetation Terrestrial Vegetation Corals Benthic Macroinvertebrates Mammals Birds Reptiles Amphibians Fungi Bacteria/Virus Periphyton Phytoplankton/Zooplankton Ichthyoplankton Fish/Nekton	n/a	Bio
Bio Part	Portion of the organism on which the analysis was done. Required when Intent=Tissue	Conditional	STORET Pick List (includes 81 bio parts)	n/a	Bio
Subject Taxon	Which organism comprises the sample. Required when Intent=Tissue or Individual	Conditional	STORET Pick List (includes 320,444 taxa from ITIS)	n/a	Bio
Subject Taxon Species Number	Used with a valid genus or higher to indicate a unique species that has been observed but not taxonomically identified	Conditional	sp.1 sp.2 sp.3 sp.4 sp.5 sp.6 sp.7 sp.8 sp.9	n/a	Bio
Distance Fished	Distance covered while fishing	No		Number	Bio
Distance Fished Units	Units of distance covered	Conditional	"ft", "m", "mi", "km", "nmi"	n/a	Bio
Fished Duration	Length of time fishing	No		Number	Bio
Fished Duration Units	Units of length of time	Conditional	"minutes", "hours"	n/a	Bio
Trap or Net Sampling Duration	Length of time using a trap or net	No		Number	Bio
Trap or Net Duration Units	Units of length of time	Conditional	"minutes", "hours", "days"	n/a	Bio
Relative Current Direction	Direction of water movement relative to heading of the trap/net	No	0-359	Number	Bio
Relative Wind Direction	Direction of wind relative to heading of the trap/net	No	0-359	Number	Bio
Orientation to Current	Orientation of the equipment with respect to the current	No	Down Current Into Current Cross Current	n/a	Bio
Trap or Net Comments	Further detail about the trap or net operation	No		254	Bio
Bio Results Group ID	ID that uniquely identifies the bio results group among other groups for the same sample. Required when Intent=Taxon Abundance	Conditional		8	Bio
Bio Results Type	Identify the biological grouping type. Required when Intent=Taxon Abundance	Conditional	Multi-Taxon Population Census Single Taxon Frequency Classes Single Taxon Group Summary Single Taxon Individuals	n/a	Bio

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Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
Bio Results Group Description	Additional information about the biological results group	No		1999	Bio
Total Number in Group	Total number of individuals in the biological sample	Conditional		Number	Bio
Bio Group Count Type	How the total number in the group was counted	Conditional	"Actual", "Estimate", "Calculated"	n/a	Bio
Frequency Analysis Type	Identify whether single taxon frequency classes are defined by physical (length, weight) or biological (sex, life stage) measures	Conditional	P Physical Measures B Biological Condition	n/a	Bio
Primary Class Descriptor	First class descriptor for biological condition for single taxon frequency classes	Conditional	"Sex", "Life Stage"	n/a	Bio
Secondary Class Descriptor	Second class descriptor for biological condition for single taxon frequency classes	No	"Sex", "Life Stage"	n/a	Bio
Primary Class Value	Value of the primary class descriptor	Conditional	STORET Pick List (includes 4 sexes and 31 life stages)	n/a	Bio
Secondary Class Value	Value of the secondary class descriptor	No	STORET Pick List (includes 4 sexes and 31 life stages)	n/a	Bio
Common Class Descriptor	The single taxon frequency physical classification (eg. Height, length, weight)	Conditional	STORET Pick List (includes 32 physical characteristics)	n/a	Bio
Common Class Descriptor Units	Units of the common class descriptor	Conditional	STORET Pick List (includes 255 units of measure)	n/a	Bio
Sex	Sex of all organisms in bio result group when the Group Type is Single Taxon Frequency Classes based on Physical measures	No	Female Hermaphrod. Indeterm. Male	n/a	Bio
Life Stage	Life stage of all organisms in bio result group when the Group Type is Single Taxon Frequency Classes based on Physical measures	No	Adult Budded Egg Exfoliate First Form First Instar Flowering Foliate Fruited Gravid Imwcap Juvenile Larva Larva exuvia Late Instar Mid Instar Naiad Non-Gravid Nymph. Post Larva Pupa Pupal Exuvia Roe Present Second Form Seed Seedling Spent Subadult Subimago Y.O.Y. Yolk Larva	n/a	Bio
Frequency Class Count	Number of individuals in the Frequency Class	Conditional		Number	Bio
Lower Class Bound	Lower value of the frequency class	Conditional		Number	Bio

Result Attributes	Description	Required in STORET	Allowed Values	Field Definition	Regular, Bio, or Both
Upper Class Bound	Upper value of the frequency class	Conditional		Number	Bio
Number of Individuals in Group	Number of individuals in the group	Conditional		Number	Bio
Individual Number	Number of the individual in the group	Conditional		Number	Bio
Characteristic Species Number	Used with a valid genus or higher to indicate a unique species that has been observed but not taxonomically identified	No	sp.1 sp.2 sp.3 sp.4 sp.5 sp.6 sp.7 sp.8 sp.9	n/a	Bio
Cell Form	Type of cell	No	Flagellates Coccoids Filaments Diatom Haptophytes	n/a	Bio
Cell Shape	Shape of cell	No	Sphere Teardrop Oval Box Rectangular Box Rod Ovoid Lunate Cylindrical Fusiform Arcuate	n/a	Bio
Habit	A characteristic form, aspect, or mode of a plant or animal	No	Burrow Sprawl Cling Swim Climb Skater Uniden Unk Other	n/a	Bio
Voltinism	The duration required to complete a life cycle/generation	No	Semivoltine Facultative Semivoltine Univoltine Facultative Multivoltine Multivoltine	n/a	Bio
Taxon Pollution Tolerance	Numeric estimate of the ability of the organism to live in a polluted habitat (1=intolerant, 10=very tolerant)	No		4	Bio
Trophic Level	Where in the food chain the organism normally subsists	No		4	Bio
Functional Feeding Group	How the organism obtains food (eg. scraper, shredder, parasite, etc.)	No		6	Bio

REFERENCES:

STORET Web Site: http://www.epa.gov/storet.

STORET National Data Warehouse: http://www.epa.gov/storet/dw_home.html

STORET Legacy Database: http://www.epa.gov/storpubl/legacy/gateway.htm

STORET FTP Site: ftp://ftp.epa.gov/storet.

National STORET Alliance: ftp://ftp.epa.gov/storet/alliance.

Water Quality Data Elements: http://wi.water.usgs.gov/methods/tools/wqde/index.htm.

Interagency Task Force on Monitoring Water Quality: http://water.usgs.gov/wicp/itfm.html.

National Water Quality Monitoring Council: http://water.usgs.gov/wicp/acwi/monitoring.

Data Management Association: http://www.dama.org/Bibliography.htm.

I&M Draft Data Management Protocol: http://www.nature.nps.gov/im/dmproto/joe40001.htm.

Clean Water Act: http://www4.law.cornell.edu/uscode/33/ch26.html and
http://www.ncseonline.org/NLE/CRSreports/water/h2o-32.cfm.

Natural Resources Management Guideline (NPS-77):
http://www1.nature.nps.gov/rm77/freshwater/WaterResources.htm.

Geographic Names Information System: http://geonames.usgs.gov/gnishome.html.

Natural Resource Database Template: http://www.nature.nps.gov/im/apps/template.