

**SURFACE WATER REQUIREMENTS – KIDS GIS**



**Mission**

Provide an intuitive environmental geospatial portal for kids of all ages, based on open source software, open exchange formats and industry standard data models.



GIS Professionals from around the state of Oregon have come together to provide a productive and harmonious learning environment for kids. Based on industry tools and industry standard geospatial data structures, KIDS GIS has been carefully designed to help develop interests in math, physics, science and graphic arts. We hope to provide an intuitive application that will promote communication, collaboration and healthy team building skills in kids worldwide.

Taking special measures to embrace open source, public domain software and open, nonproprietary data structures, our hope as professionals is to provide an enduring program to educate and enable future generations. Important measures of the programs success include an intuitive and fun interface, ability to load with any operating system (PC, Mac, Sun, Open Source , etc.) and prolific use.

The objective is to provide an enduring program to educate and enable future generations. If successful, core components will support fundamental environmental needs well beyond needs considered in the initial design.

## **1. INTRODUCTION**

### **1.1 Purpose**

The purpose of this document is to clarify requirements for the Kids GIS's Open Source Environmental Portal, which will be designed by a team of GIS Professionals under the guidance of the academia, environmental scientists and private companies.

From a high-level overview of business functions to detailed entity descriptions and business processes, this document provides a road map for developers and project managers. The purpose of this document is to define application requirements, detail the application design, and essentially lay out a comprehensive set of plans prior to application coding. To use an architectural analogy, these are the house plans that must be completed before construction begins.

### **1.2 Intended Audience**

This document is intended for stakeholders and application development teams (internal and external), i.e., to serve as a contract of understanding between the two.

### **1.3 Project Phases**

Phases deployed over five years.

Phase one consists of establishing a skeletal link node structure capable of supporting events, networks, symbology and long transactions at the feature level. Feature types include 3d points, strings and polygons. Import functionality supports preformatted SHP, DBF and LandXML files. User teams have exclusive access to features in their own project. *(Future phases will support job management between projects.)* (Year one)

Users can view (read only)

- ◆ Ortho Photography

Users create and edit:

Linear Water Features (shore and flow line)

- ◆ Canal and channel and roadside ditch
- ◆ Pond
- ◆ Slough
- ◆ Swale
- ◆ Stream

- ◆ River

#### Nodal water Features

- ◆ Hydro Junction
- ◆ Shore Junction

#### Point Event Water Feature

- ◆ Dam
- ◆ Bridge
- ◆ Monitoring Point
- ◆ Water Withdraw
- ◆ Water Discharge
- ◆ Animal and Plant Species

#### Linear and Polygonal Event Water Feature

- ◆ Animal and Plant Species
- ◆ Habitat
- ◆ Debris and garbage

In phase two, work on job management functionality continues while two new parallel tracks begin. Track one addresses Kids learning games and track two develops grid and watershed support. (Year two and three)

#### Track One: Points based Kids learning games

- ◆ Basic mapping skills and k-3 math
- ◆ Species recognition
- ◆ Field operation (data acquisition sampling techniques, etc.)
- ◆ Skills in preservation and restoration
- ◆ How to perform chemical analysis
- ◆ Tutoring (distant learning for kids and parents)
- ◆ Support high resolution CG and animation
- ◆ Understanding water flow – networks and hydrology
- ◆ Support use of project data

#### Track Two: Grids and Surfaces

- ◆ Supports image processing, grid analysis and DEMs
- ◆ Vector Surfaces (TIN, X-section and alignments)

Phase three, deploys a consolidated project database with an efficient job management system capable of data views that best meet user needs. All features share connectivity through the database and are raked according to

known user needs, e.g. class projects, protection and restoration, visualization, Program performance measures, etc.. (year four)

Phase four focuses on establishing a permanent home for the portal with support centers for core program areas based on supporting the needs kids and those of active participants. Program will always support the needs of kids and environmental protection.

**1.4 Mandates Served**

Clean Water Act

Safe Drinking Water Act

Endangered Species Act

(National, state and local educational mandates)

**1.5 Reference Documents**

Project Work Plan: Kids GIS Environmental Portal Project Work Plan

Functional Requirements: Surface Waterway Integration Project

PNW HYDRO Framework Summary (doc)

PNW HYDRO Framework MOU (doc)

PNW HYDRO Framework Roles & Responsibilities (doc)

PNW HYDRO Framework Data Dictionary (doc)

PNW HYDRO Framework Application Interface (doc)

PNW HYDRO Framework Training Manual (doc)

PNW HYDRO Framework User Guide (doc)

PNW HYDRO Framework Metadata (doc)

PNW HYDRO Framework Disclaimer (doc)

SPFLD Electronic Acceptance Standards (doc)

SPFLD GIS Phase 2 Requirements: Surface Waterways Integration (doc)

Local, State and Federal Surface Water Systems Codes & Definitions (xls, doc)

***(What other docs need to be taken into consideration when doing this project?)***

**1.6 Abbreviations and Glossary**

***(Container for acronyms and anything else that tends to cause confusion)***

Case Law Definitions of Watercourse Elements (see diagram)

**Bank**

**Bed**

**Littoral** (shore line defining property ownership)

**Normal** (ordinary) **Water Level**

**Ordinary High water Line** (OHWL)

**Ordinary Low Water Line** (OLWL)

**Riparian** (river bank defining property ownership)

**Shore** (zone between OHWL and OLWL)

**Thalweg** (centreline of deepest channel-water course)

**Thread** (equidistant from the waters edge – usually applied to OLWL)

PNW HYDRO Framework Layer Definitions (see data dictionary)

**Water Point (WP)** a repository for springs, seeps and other hydro features with limited spatial extent. Feature Class is Point.

**Watercourse (WC)** consists of streams, canals, flumes, pipelines, and other linear hydro feature centerlines. Feature Class is link-node and all lines must point downstream.

**Water Body (WB)** consists of lakes, ponds, wetlands, inundation areas, the double lined portions (banks) of streams and other hydro features best represented as areas. Feature Class is Polygonal (Region).

**Water Body Shoreline (WS)** consists of one or more representations of the shoreline (OHWL or OLWL) of each water body. Feature Class is routed linear (along lines defining WB).

Kids GIS Map Features

**Ponds** (Includes naturally occurring and constructed Ponds)

A pond is a small water body with little to no flow, primarily still water. Ponds typically provide volume (flow) control, have dams 4-5 feet tall and a water depth of 4-5 feet. Although not generally

compatible with treatment, infiltration, and water quality, ponds include detention ponds, retention ponds, natural ponds, agricultural ponds, fire suppression ponds, cooling ponds, quarry ponds, bio-filtration ponds, industrial ponds, etc.

**Swales** (Includes naturally occurring and constructed Swales)

Swales typically appear as channels dug on contour or as natural shallow drainages. Swales typically have 3/4 side slope and serve water treatment and water quality functions; can have a small dams (check dams) 4-6 inches high and can have standing water at approximately the same depth. Swales normally do not serve as detention devise. Swales are often grassy and contain vegetation.

**Sloughs** (Includes naturally occurring and constructed Sloughs.)

A slough is an elongated swamp or shallow lake system, often adjacent to a river or stream. Sloughs can be easily confused with river side cannels. *(If water has current and is connected to rivers then it may fall under stype of sf\_open\_flow\_river with ftype and hydr\_ftr code indicating that it is a side channel.)* Sloughs usually occur as an inlet from river or back water. Some sloughs do not directly connect back to a river.

**Streams and Creeks** (Includes naturally formed Streams and Creeks)

A Stream is a small body of running water, a flow of water in a meandering channel or bed like a brook, rivulet, or small river. Creeks are small streams that tend to dry up at certain times of the year.

**Rivers** (Includes both Rivers and River Side Channels)

A river is flow of water in a natural channel, larger than a stream. Some languages have words for rivers of varying sizes; in English a river can vary from a small water body that can be waded across to channels navigable by ocean-going ships. *(A "slough" that connects to a river is a sf\_open\_flow\_river stype with the side channel attributes as listed below, with the user changing the branchtype to 4 for link channel.)*

**Canals, Channels** (Includes the following constructed features: canal, channel and roadside ditch)

Canals are larger than channels. Canals include artificial waterways or artificially improved rivers used for travel, shipping, or irrigation. Channels include trenches, furrows, or grooves built to channel water. (this needs work and simple rules to enforce consistency)

**Ditch** (Includes the following constructed features: ditch, roadside ditch, and site drainage ditch)

A ditch is a smaller channel constructed to support drainage. (Note: for site ditches, ESD tracks upstream sink and link period characteristics such as 1) "Sheet" where water comes from impervious surface or high volume events and then dry out, and 2) "Log deck" where water comes from fire suppression sprinklers and remain wet most of the year)

**Filters** (vegetated, sand, planter, soakage trenches, porous filters, etc.)

**Wetlands**

**Regulated Setbacks** (buffer areas)

**Water Quality Monitoring Devices**

Local Environmental Services Division Definitions



<b>DITCH:</b>	A long narrow trench or furrow dug in the ground, as for irrigation, drainage, or a boundary line.
<b>CANAL LOCK:</b>	Artificial channel filled with water and designed for navigation, or for irrigating land, etc.
<b>CANAL:</b>	Artificial waterway or artificially improved river used for travel, shipping, or irrigation.
<b>DAM:</b>	Barrier constructed across a waterway to control the flow or raise the level of water.
<b>GRAVEL PIT:</b>	Quarry for gravel.
<b>IMPOUNDMENT:</b>	Body of water such as a pond, confined by a dam, dike, floodgate or other barrier. It is used to collect and store water for future use.
<b>INUNDATION:</b>	To cover with water, especially floodwaters.
<b>ISLAND:</b>	A small land mass entirely surrounded by water.
<b>LAKE:</b>	A large inland body of fresh water or salt water.
<b>MARSH:</b>	An area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.
<b>QUARRY:</b>	Areas are periodically inundated and treeless and often characterized by grasses, cattails, and other monocotyledons.
<b>RIVER:</b>	An open excavation or pit from which stone is obtained by digging, cutting, or blasting.
<b>SIDE CHANNEL:</b>	A natural stream of water of considerable volume, larger than a brook or creek.
<b>SLOUGH:</b>	Side channels to streams or rivers.
<b>SLUICE:</b>	A stagnant swamp, marsh, bog, or pond, especially as part of a bayou, inlet, or backwater. (Also slue).
<b>SPILLWAY:</b>	An artificial channel for conducting water, with a valve or gate to regulate the flow.
	The channel or passageway around or over a dam through which excess water is diverted.

## 1.7 Issues Requiring Clarification or Further Information

*(Container for exceptions to business rules, exceptions to business practice, and/or other items that could cause problems or conflict with the overall project design)*

- Clarity on the distinction between serving clearinghouse functions and supporting specific educational programs
- Clarity on how the project can be divided up into phases (current requirements clearly exceed phase one)
- How do other technologies such as Scalable Vector Graphics (IW3C XML) fit in to the scope? These may be required to support very young kids and the ability to place and scale geometric shapes over maps of the school yard
- Section of the best OS database (PostgreSQL) and OS spatial database layers (PostGIS) to support needed clearing house functions
- Accommodating the appropriate federal identifiers, e.g., LLIDS, US National Grid Zone Designations (GZDs), etc.
- Clarity on development languages and development tools
- Clarify on definitions for Kids GIS features and the development of definitions that make sense to kids

## 2. BACKGROUND AND OVERVIEW

### 2.1 Project Description

#### Background

Several advances now enable the creation of robust web-based mapping application based on a complete stack of Open Source (OS) applications components.

The recent contribution of Autodesk's MapGuide application to the OS domain provides required mapping functionality. Second, PostGIS provides an OS layer to move required spatial data types between web-based mapping applications and relational databases. And third, PostgreSQL, an OS relational database, supports needed database functionality, such as nested transactions, views, asynchronous replication, triggers, stored procedures and the storage of binary large objects (geometries, pictures, sounds or video) and most SQL92 and SQL99 data types. A sufficient base of advanced technologies now exists to support the project's complex set of requirements.

Several well-documented industry standard hydrologic and hydrographic data models provide a solid blueprint for development. For construction, ESRI's ArcHdro template data model and Pacific Northwest Hydro's data dictionary, both developed by GIS, earth science and academic professionals provide a useful data construct, a physical expression of the required skeletal structure.

A small group of professionals, with over a hundred years of accumulative experience in GIS, IT and education have come together to design, document and deploy the application.

## Project Vision

Provide an intuitive environmental geospatial portal for kids of all ages, based on open source software, open exchange formats and industry standard data models.

## Project Goals

Develop an interoperable (OPEN SOURCE) surface waterway inventory system able to track the same information public agencies use to meet Federal, State and local mandates for the protection of surface water. Project outcomes shall provide general support for K-12 educational programs, advance environmental awareness and help protect natural habitat along surface waterways.

Provide an OS solution to assess system health, system capacity, conveyance, visualization, etc.

## Project Objectives:

- ✓ Develop an integrated database to serve as a clearing house for surface waterways and relevant phenomena that impacts the health of surface waterways.
- ✓ Develop an intuitive set of tools to build, maintain and integrate data sets that comply with local, State, Regional (PNW) and Federal data formats
- ✓ Track and assess inputs from individuals, teams, and projects (assign scores based on completeness, quality, and understanding of work – OLAP analysis and quiz scores)
- ✓ Provide interoperability to support data flows between major GIS and CAD systems, and support a diverse user group of kids, educators and decision makers
- ✓ Support existing K-12 environmental education programs and provide decisions support to other public stake holders at the regional, State and Federal level

## Project Phases:

(see section one above for all project phases)

## 2.2 Scope of Work and Project Deliverables

Develop an environmental portal and set of tools for creating, editing, loading and displaying surface waterway features. To ensure on-going maintenance, the work includes the development of a complete set of system integration and job management tools.

Phase one scope of work

(See section one above for all project phases.)

This phase, to be completed in the first year, consists of establishing a skeletal link node structure capable of supporting events, networks, symbology and long transactions within project.

Phase one will deploy simple transactions where project team members have exclusive access to features within their own project, i.e., their work occurs within a single project – a project based versioning environment. Project reconciliation rules (e.g. who's edits take precedence) are coordinated and resolved verbally by team members. *(Future phases will incrementally begin enforcing rules and eventually support job management between projects.)*

Feature types include 3d points, strings, polygons and linear events. Import functionality supports preformatted SHP, DBF and LandXML files. Phase one features include Projects, Jobs, seven linear features, two nodal features, seven polygonal features, eight events and Ortho imagery. Attributes consist of core ArcHydro and PNW Hydro.

Input-output tools shall support the following systems:

- ✓ Existing school project data sets
- ✓ Existing local data sets (data from cities, counties, watershed councils, etc.)
- ✓ CAD data sets from engineering and surveying firms
- ✓ Data from field observations such as GPS, flow gauges, samplings, etc.
- ✓ Shared framework (NSDI) inventories

Portal tools shall provide the following functionality:

- ✓ View Ortho imagery
- ✓ Create, modify and delete simple independent geometric shapes and networked surface waterway features from a single interface (updating all targeted systems)
- ✓ Maintain interconnectivity between surface waterway features and systems
- ✓ Enforce rules to insure proper Quality Control and Quality Assurance (QA/QC) on newly created information
- ✓ Job Management (long transactions at the record level)
- ✓ Import and export data sets from the systems referenced above

Portal Interface

Although phase one project scope does not include the data acquisition or the correction of spatial inaccuracies encountered in existing data sets, such data development work may follow in future phases.

2.3 Project Team Members

*(Include all potential team members, describe their role, and why they are qualified.)*

Team Member	% Involvement	Role
<i>Public Sponsorship and Coordination</i>		
URISA	10%	Project sponsor
City of Springfield	35%	Project coordination and management
Oregon DAS	10%	Coordination with other state agencies
Oregon DWR	10%	Water Resources Coordination
University of Oregon	35%	Coordination with educational institutions
<i>Corporate Sponsorship and Coordination</i>		
AutoDesk Inc.	80%	Software and programming resource
SPATIALinfo Inc.	20%	Guidance with Database Design
<i>Project Development Team</i>		
Brandt Melick	30%	Project Manager, database and application design, requirements documentation
Andy Morsell	40%	Programming, Analyst, Data/Documentation Development
Allan Branscomb	15%	Analyst, Data/Documentation Development
Chuck Orton	5%	IT system design and implementation
Cy Smith	5%	Review of Requirements Doc's
Robert Harmon	5%	Review of Requirements Doc's
<i>Educational Material Team</i>		
Allan Branscomb	40%	Functional Specialist (curriculum development and outreach)
Rick Ellis	30%	Functional Specialist (publishing class material)
Brandt Melick	30%	Meeting facilitation, requirements documentation

*\* The core team identified above is responsible for oversight of extended team members to be listed below.*

## **2.4 Project Team Commitment to the Project**

*(Define their time allotted to the project, identify any risks that could pull them from the project – if the risk is high then identify a backup that could fill their spot.)*

All team members other than Andy Morsell, who will be working under a paid contract from AutoDesk, are volunteering time during the first year. Relying on volunteer resources does create risk . . . . to deal with this risk (teams with backup members, contingency plans, etc. . . )

### 3. EXISTING SYSTEMS AND BUSINESS PROCESSES

#### 3.1 Existing System Overview

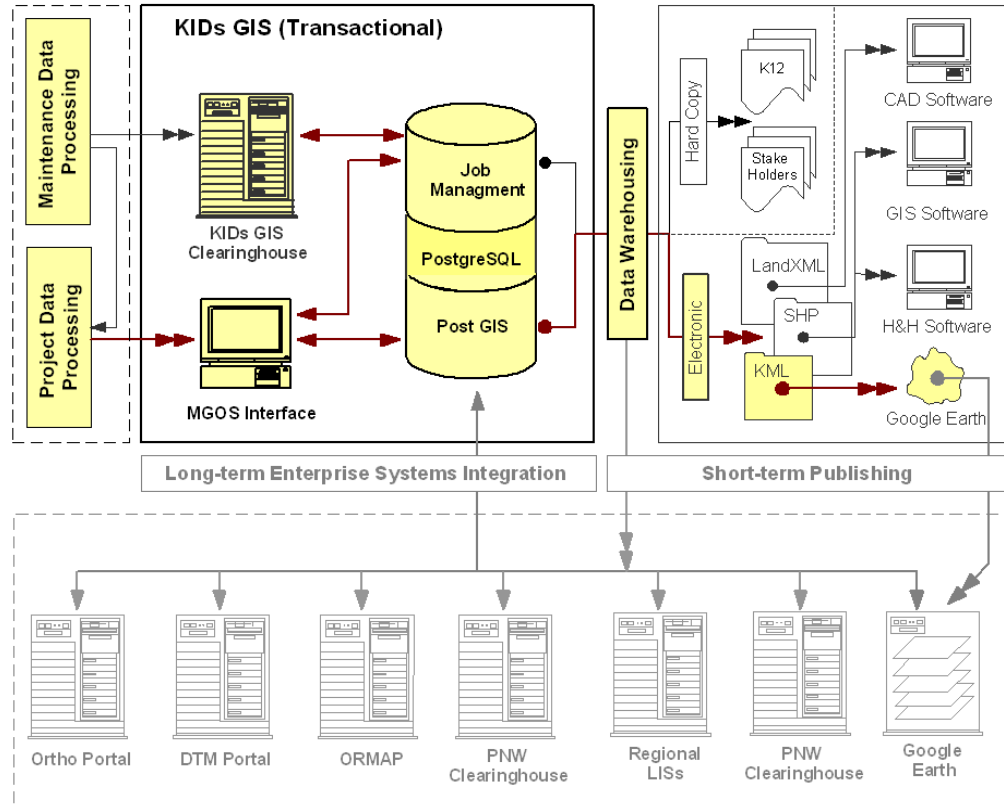
Sections 3.1, briefly describes each of the major systems in the Kids GIS's will replace, illustrate limitations, bottleneck, and impediments to overcome with project deliverables.

#### 3.2 Business Process Descriptions

*(List and describe business processes served by this project's deliverables. For each business process, describe its 1) purpose, 2) process initiation, 3) how frequently it occurs, 4) procedures - actual process step-by step, 5) information flow, 6) existing system (3.2 above) involvement, and 7) personnel involvement. Use flow charts to help illustrate rules, decision points, and data flows as necessary.)*

## 4. SYSTEM REQUIREMENTS

### 4.1 Enterprise System Overview (phase one)



### 4.2 Software Components (phase one)

Phase one software components include MapGuide Open Source (MGOS), PostGIS, PostgreSQL, and Google Earth. A thin layer of proprietary software on top of an entirely OS transactional stack provides a common look and feel for key users.



### 4.2.1 MapGuide Open Source (MGOS)

Source: <https://mapguide.osgeo.org/features.html>

#### MapGuide Open Source - Features

MapGuide Open Source is a web-based platform that enables users to quickly develop and deploy web mapping applications and geospatial web services.

#### Interactive Map Viewing

- Offers an AJAX Viewer (pure DHTML no plug-in required) or a vector-based DWF Viewer (requires an ActiveX Control) with a common user interface and JavaScript API
- AJAX Viewer offers a tiled map display for smooth navigation
- Allows feature selection by point, rectangle, radius, or polygon with immediate feedback
- Displays feature properties in multi-line tool tips
- Displays properties of the selected feature in a property browser panel
- Supports feature buffering, querying features that fall within selected polygons, and a tool for measuring distance
- Provides printing and plotting support

#### Quality Cartographic Output

- Scale-dependent detail
- Rule-driven thematic layer stylization
- Dynamic labeling with overpost detection, labels that follow the path of a line, and automatic label resizing
- Anti-aliased image rendering
- True color support
- TrueType font support

#### Built-in Resource Database for Manageability

- Provides hierarchical storage of XML resource documents that define maps, layers, data connections, symbology, and viewer layout
- Allows you to define data sources and layers once and then reference them from multiple maps
- Provides an access-based security model with inheritable permissions
- Permits metadata and binary data to be associated with resource documents

#### Uniform Data Access

- Exclusive use of the [Feature Data Objects](#) (FDO) API for vector and raster feature data access
  - Support for ESRI SHP and SDF (available now)
  - Support for ESRI ArcSDE, MySQL, ODBC, GDAL Raster, WMS, and WFS (coming soon)
- Exclusive use of DWF for CAD-based data access

#### Flexible Application Development

- Write your application logic once within the web server environment and it will work with either viewer on any client
- Develop your applications in PHP, .NET, or Java

#### Extensive Server-Side APIs

- Create, query, read, and write permanent and session based XML resource documents

- Query and update feature data across all supported data sources, including spatial and attribute data, and schema discovery
- Perform coordinate reprojection and great circle distance computation
- Create, manipulate, and analyze geometry with support for spatial predicates based on the DE-9IM model, overlay functions (intersection, union, difference, symmetric difference), buffer, convex hull, area, and distance functions
- Produce stylized vector and raster maps and legends
- Manipulate runtime maps and layers, add / remove / change layers, change layer and group visibility, modify the definition of a layer, and alter the current view

**Fast, Scalable, Secure Server Platform**

- Fully multi-threaded and takes advantage of multi-core / multi-processor technology
- Multiple servers can be configured as one logical site to improve scalability
- FastCGI based Map Agent loads once and stays loaded for use with both Apache and Microsoft IIS
- Database connections are pooled and shared between users, improving performance
- Tile caching ensures map image tiles are only rendered once for the AJAX Viewer no matter how many users are viewing the map
- Connection-oriented, role-based security
- Configurable logging of client access, administrative access, authentication attempts, errors, session lifetimes, and request tracing
- Web-based site administration allows remote site and server configuration, and log file access

**Multiple Platform Support**

- Deploy on Microsoft Windows or Linux
- Serve applications with Apache or Microsoft IIS
- Browse applications with Microsoft Internet Explorer, Mozilla Firefox, and Safari

**Open Geospatial Consortium Standards**

- Web Map Service
- Web Feature Service

~~~~~  
Source: <https://mapguide.osgeo.org/features.html>

### 4.2.2 PostGIS

PostGIS adds support for geographic objects to the [PostgreSQL](#) object-relational database. In effect, PostGIS "spatially enables" the PostgreSQL server, allowing it to be used as a backend spatial database for geographic information systems (GIS), much like ESRI's SDE or Oracle's Spatial extension. PostGIS follows the [OpenGIS "Simple Features Specification for SQL"](#) and has been submitted for conformance testing.

PostGIS has been developed by [Refractions Research](#) as a project in open source spatial database technology. PostGIS is released under the [GNU General Public License](#). We continue to develop PostGIS, and have added [user interface tools](#), basic topology support, data validation, coordinate transformation, programming APIs and much more. Our list of future projects includes full topology support, raster support, networks and routing, three dimensional surfaces, curves and splines and other features.

~~~~~  
Source: <http://postgis.refractions.net/>

### 4.2.3 PostgreSQL

PostgreSQL is a powerful, open source relational database system. It has more than 15 years of active development and a proven architecture that has earned it a strong reputation for reliability, data integrity, and correctness. It runs on all major operating systems, including Linux, UNIX (AIX, BSD, HP-UX, SGI IRIX, Mac OS X, Solaris, Tru64), and Windows. It is fully ACID compliant, has full support for foreign keys, joins, views, triggers, and stored procedures (in multiple languages). It includes most SQL92 and SQL99 data types, including INTEGER, NUMERIC, BOOLEAN, CHAR, VARCHAR, DATE, INTERVAL, and TIMESTAMP. It also supports storage of binary large objects, including pictures, sounds, or video. It has native programming interfaces for C/C++, Java, Perl, Python, Ruby, Tcl, ODBC, among others, and [exceptional documentation](#).

An enterprise class database, PostgreSQL boasts sophisticated features such as Multi-Version Concurrency Control (MVCC), point in time recovery, tablespaces, asynchronous replication, nested transactions (savepoints), online/hot backups, a sophisticated query planner/optimizer, and write ahead logging for fault tolerance. It supports international character sets, multibyte character encodings, Unicode, and it is locale-aware for sorting, case-sensitivity, and formatting. It is highly scalable both in the sheer quantity of data it can manage and in the number of concurrent users it can accommodate. There are active PostgreSQL systems in production environments that manage in excess of 4 terabytes of data. Some general PostgreSQL limits are included in the table below.

~~~~~  
Source: <http://www.postgresql.org/about/>

#### **4.2.4 Google Earth**

(site examples and explain)

#### **4.2.5 Industry standard H&H software**

Many tools support the simulation of hydrology, hydraulics, water quality and sediment transport in urban and regional drainage systems. Most support fast and robust numerical scheme, advanced hydrological modules and comprehensive Real-Time Control (RTC) analysis. Although Kids GIS does not need to replicate this functionality – data outputs, in future phases, shall support this functionality.

The primary purpose of H&H software tools is to assist the environmental, engineering and scientific hydraulic modelling of regional and local wastewater collection system to determine capacity and performance. The software also assists in determining the impacts of wet weather infiltration inflows (INI flows.)

Engineers evaluate capacity for future development, review of new major flow (wastewater), perform what if studies, assess the specific impacts of proposed development on system performance and capacity, and simulate wastewater conditions under certain storm events. H&H software is used model the storm system, i.e., surface water simulations (ditches, swells, etc.)

Although H&H applications have a limited roll in the early phases of this project, longer term results shall include a public set of warehoused data that can support analysis with these tools.

To support H&H functions and data sharing with these tools, core database elements within Kids GIS have been designed in accordance with the ArcHydro Template data model and with special consideration of the Danish Hydraulic Institute's (DHI) data structures.

#### **4.2.6 GIS software like ArcGIS**

Application shall support common exchange formats such as:

Year One: SHP and DBF files

Year Two/Three: GML files

#### **4.2.7 CAD software like AutoCAD**

Application shall support open exchange formats such as:

Year One: Simple LandXML files

Year Two: Complex Land XML files

### 4.3 System interfaces Requirements

*This section identifies functional requirements for phase one development. A few sub sections, like X-Sections and Break lines, describe features and functionality for future phases.*

#### 4.3.1 Projects

The following example illustrates a typical project:

Thirty kids from a local fifth grade class map local tributaries of the Willamette River. The project lasts for one year. Over the course of the year, the students map seventy five percent of tributary shoreline and locate and identify two flowers and two nutria burrows. The students map the shoreline and the burrows using 2004 half foot Orthophotography from the City of Eugene. The other features are located using GPS with assistance from a Springfield engineering firm. Surveyors then transmit the GPS data via email back to the classroom for mapping.

In this case, the Kids GIS clearing house stores all project data because no server or enough IT support exist on-site to house the data. All data collected during the year gets associated with the project along with contact information for both teachers (project managers) and the principle (project sponsor). Teachers from both classrooms administer the project; print out tables, match teams or individuals with Project and feature IDs and then track associations on paper in the classroom. And the application provides a score at the end of the project based on completeness and correctness. Only thirty scores, two endangered plant species, two invasive animal habitats and 500 feet of shoreline make it into the clearing house this paragraph needs work – I'm not really sure what to do with it

Next year, the project team can decide to either resume the project or start a new one. Project features are updated by extending the project, creating a new project or by using an existing project – unless the project was locked down by the Corridor Team.

#### **Relationships:**

- X-walk to feature
- X-walk to field observation
- X-walk to contact
- X-walk to job

#### **Key Attributes:**

- Project ID (never changes, always unique)
- Project name
- Create date
- Last update date

Party ID (school or other agency)  
Manager(s) ID  
Sponsor(s) ID

#### **Creating project boundaries:**

*Project boundaries consist of a simple buffered area 100 feet beyond the extents of the map features. The application generates project boundaries on the fly every time a team member posts geospatial data. These boundaries, seldom seen by the user, contain few attributes and appear in the database as two point boxes – spatially indexed and simply used for zoom extents.*

*When a user adds a project boundary to their session, the application creates a buffer polygon at a user specified distance around the project features. Proxy boundary polygons can be associated with project. Polygon boundaries exist on a separate layer so as not to clutter the indexed layer containing two point boxes.*

***Projects never accept or post any personal information about kids. Teachers are discouraged from posting any personal information about the kids to the internet.***

#### **4.3.2 Jobs**

Jobs serve two functions: 1) long transactions (explain) and 2) a temporary workspace to create, edit and modify features. Jobs transact with existing features in the clearinghouse as well as with features that may never enter the clearinghouse. For example, when starting a job the user may select a local data set like a simple SHP file or a LandXML alignment and begin editing. The user can edit this data set and then decide to post it or simply continue editing it within their personal space. Jobs are personal spatial data sets – within which the user is only limited by the application's functionality.

#### **Creating Jobs**

*When creating a job, users are prompted to start a project, select an existing project or assign the job to a project at another time. Before a job can be posted to the clearing house, it must be associated with a project.*

*A user may select features (parent features) from the clearing house and begin editing. However, if not a member of (parent) project team who created the features, the user may edit but cannot post these project features back without permission from a manager of the parent project. Without permission from this project manager, the application converts the selected features to new (child) features with new IDs. These new features can be assigned to another project and then posted back into the clearinghouse. Upon creating the features, parent feature associations are transferred to the new (child) features to retain connectivity with adjoining networks.*

*Jobs can become orphans and result in desperate islands of data. As such, we encourage associations with projects and frequent posts into the clearinghouse. The intent is to share data thru the portal and make it available for others to use and build upon.*

**Relationships:**

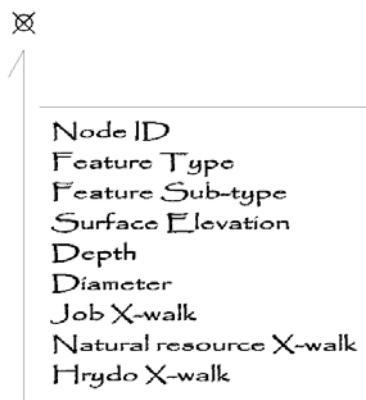
- X-walk to feature
- X-walk to field observation
- X-walk to contact
- X-walk to job

In early phases, the application handles all job functions internally. Each edit session begins and ends with a job function. Features post up to the clearinghouse after the job has been closed. Jobs occur at the record level.

***Jobs never accept or post any personal information about kids. Teachers are discouraged from posting any personal information about the kids to the internet.***

**4.3.3 Nodes (points)**

In a hydro networks, nodes – also referred to as points and Hydro Junctions contain special information to establish connectivity, horizontal and vertical location, point based flow information such as water capacity, elevation, volume and impedance to flow. In networks nodes typically fall at the end of line segments and represent a structure that affects flow, denote a significant change in channel characteristics, a confluence or a drainage point.



In natural resource inventories, these features provide locations to associate natural features like field observations and samples, animal and plant species, habitat and system health indicators.

**Editing Nodes**

*Editing nodes occurs independently when creating a stand-alone point or because of editing other features such as lines, polygons and events. (Early phases establish common point dialog boxes for use in these situations.)*

*When editing independent nodes, the user clicks on a point button, clicks on the screen to place it, and then receives a prompt to begin changing attributes. Some attributes automatically symbolize the node.*

*When editing attributes, the user can re-place a feature by changing horizontal coordinates and vertical values with the location tab and re-symbolize with the symbology tab.*

*For young kids learning about geometric shapes, functionality to place and scale various geometric shapes with simple grip and drag mouse functions is desirable.*

*Attribute dialog boxes will be tab based, wherein each tab represents a distinct dimension of data, e.g., hydro tab, resource tab, health tab, location tab, symbology tab, project tab, etc. (general – move to top)*

*Consists of a node based editing system where lines extend from nodes with the ability to add multiple vertices, a nodal/vertex “grips” based system.*

**4.3.4 Lines**

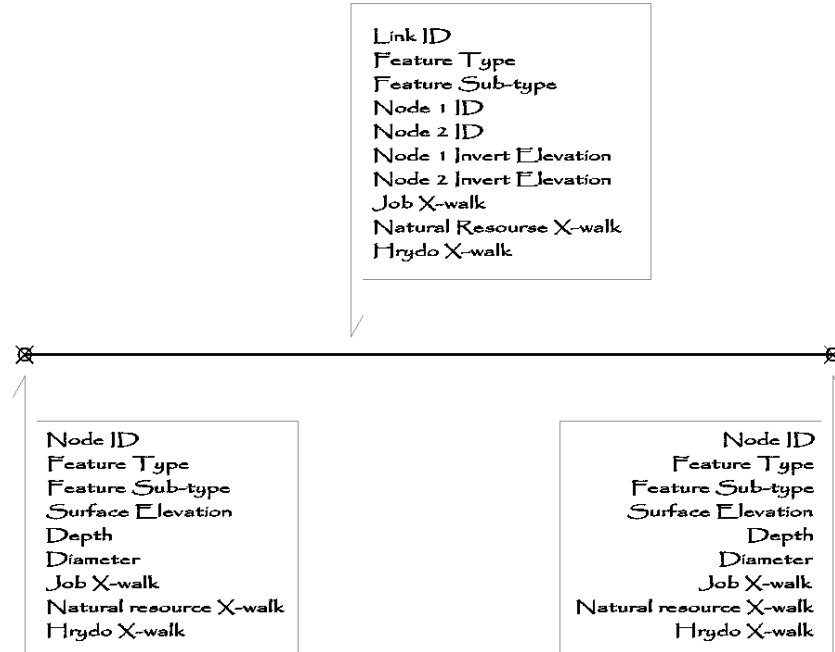
Lines can only exist in a “link-node” relationship. Every line must have a beginning and end node. The beginning of a linear feature always includes either the creation or selection of a node.

In natural resource inventories, these features provide locations and help establish alignments to associate natural features like field observations and samples, animal and plant species, habitat and system health indicators.

In phase one, water lines represent several basic feature types. These include:

1. Hydro Flow Lines include the center line of a watercourse or an artificial flow line through a water body. These features connect to two distinct features, a down stream node and an up stream node.
2. Hydro Edges include the shoreline of water bodies. These features connect to the same node (out fall node) and support the creation of water bodies, discussed below.



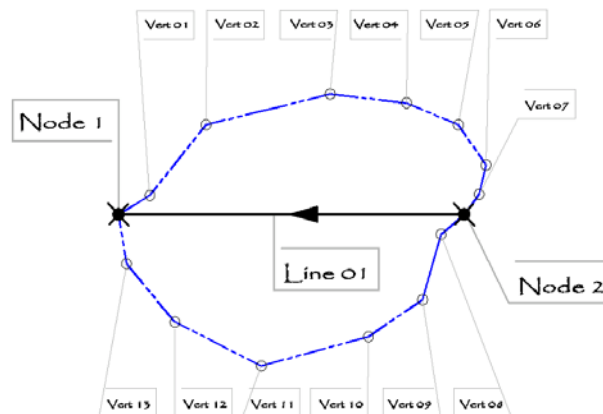


**Editing Lines**

After creating nodes, the user is free to digitize as many vertices as required to delineate a feature accurately. Upon completion, the user receives a prompt to select an inflow point or to create a new one at the end of the line. Selecting a node establishes a link-node relationship.

**4.3.5 Polygons**

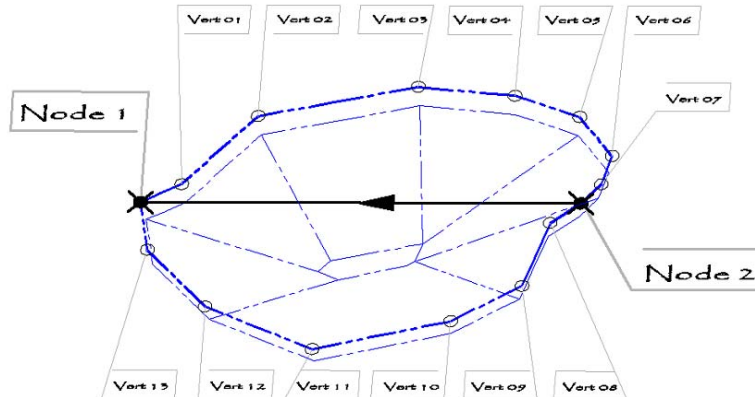
Polygons in phase one include water body shore lines. These simple closed polygons start and end at the same point, the out flow point where water drains from the water body. Attributes for these features are similar to attributes described above for linear features.



The creation of a polygon includes an inflow (node 2), an outflow node (node 1) and a string of vertices. The outflow and string of verities are

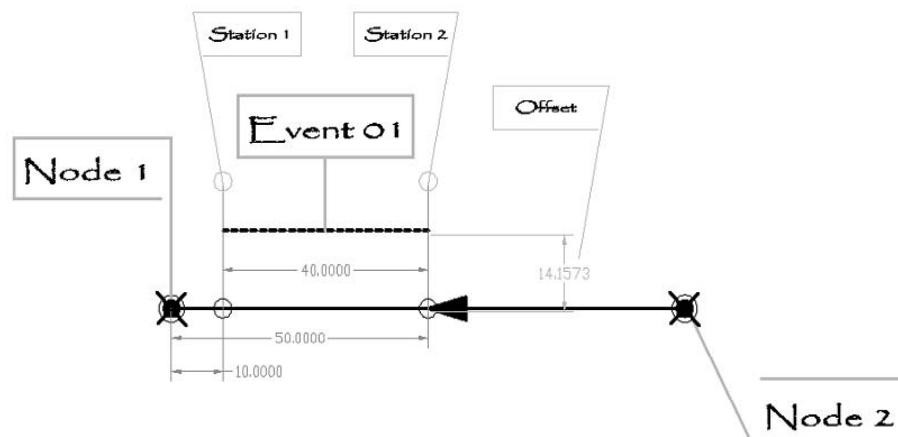
always required. Polygonal water bodies should include a flow line (line 1) through the water body to enable participation in contiguous link-node systems. Since water bodies tend to connect with linear stream networks, creating a flow line this is good practice.

Vertical values for verities along the shoreline (vert 01- Vert 13) as well as bathymetric data for water bodies will be calculated from surfaces in later phases.



#### 4.3.6 Events (linear and point events)

Linear events consist of two reference points along a line and a simple offset. To establish relative geometry, these events retain a line ID and three measures. One measure (Station 1) marks the beginning of the linear event and another (Station 2) represents the end. Length is between the two measures. The third measure is offset – how far the linear event is offset from the line.



Relative geometry attributes of events include:

Line ID  
Station 1 Distance  
Station 2 Distance  
Offset  
Length

X,Y,Z coordinates for the collection of vertices in the string, where the actual event occurs on the ground, establish the absolute geometry of a linear event. One vertex represents the beginning node, one represents the end node, and a string of vertices represents the points in between. Length is from feature geometry.

**Absolute geometry of events includes:**

Beginning Node Coordinates  
Ending Node Coordinates  
String of vertices

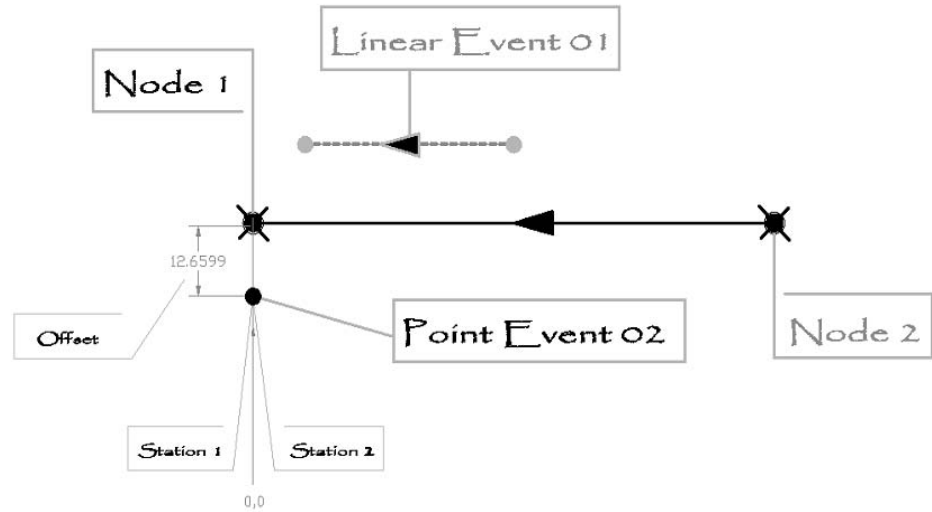
**Absolute attributes of linear events include:**

Line ID  
Length  
(Along with line attributes illustrated above)

Linear events can occur on all lines, polygonal edges and points . . .

**Creating and deleting linear events and point events (0 length linear events)**

*Consists of selecting points along existing linear features, like lines, poly-lines, arcs, etc. make complete sentence Clicking once selects the object, traces to beginning node and prepares for clicking on or near the line to snap and establish needed measures like station 1 and station 2. After viewing the gathered data (dialog), user accepts and the application creates the relative geometry and feature attributes in the project database.*



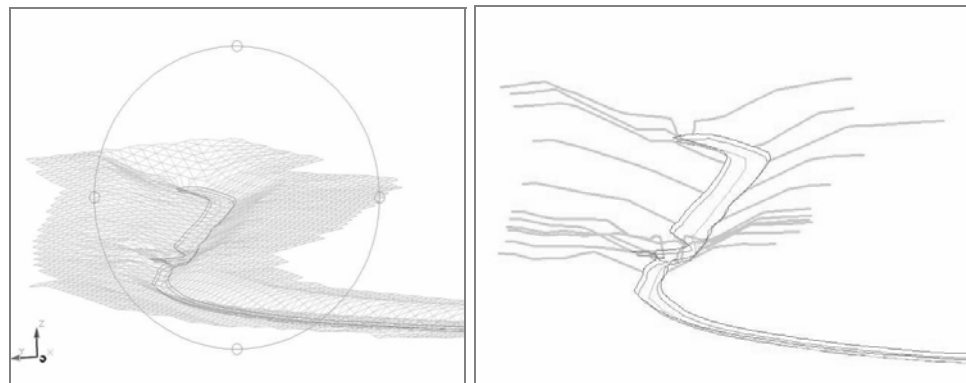
Station 1 equals Station 2 in point event placed along a linear feature.

**4.3.7 Channels: Watercourse flow characteristics**

Features used to establish flow characteristics typically include surfaces, break lines and cross sections. Although these features will not be supported in phase one, this supplemental information helps provide context for future phases so that development efforts in phase one supports future develop of these features.

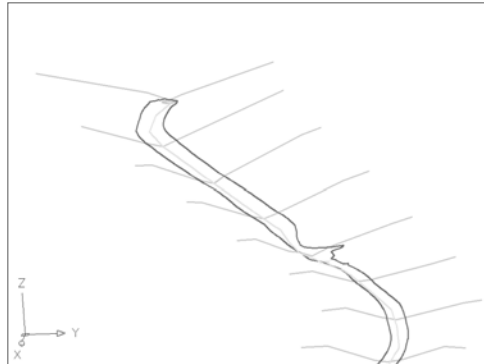
These features support hydraulic modelling and visualization. In order to calculate flow in surface water features, certain parameters describing the containment of water must be established and associated with a watercourse flow line (Hydro Flow line). When creating 3D models of a site, a surface helps establish the ground or base elevation for placing 3D objects (like trees, animals, and habitat areas – where patterns or many 3D objects are placed according to density settings).

Overview



(Surface, Break Lines and Cross Sections)

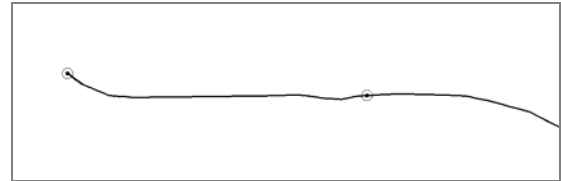
The 3D Diagram above illustrates a typical surface, 3D break lines and derived cross sections, products that will typically be generated prior to processing with KIDs GIS. Some of these features will be contained in associated events along hydro flow lines and others will be stored as referenced LandXML files.



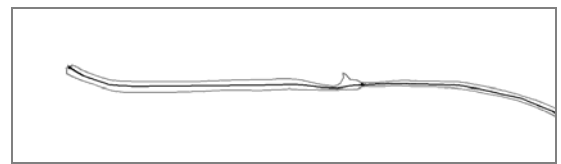
3D view of objects to be processed with KIDs GIS.

Process:

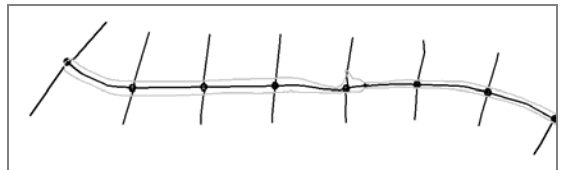
1. Select Hydro Junctions and Hydro Edges
2. Associate and load surface
3. Associate and load shore line and break lines
4. Associate and load X-sections



1. Hydro edge (flow line) and Hydro Junctions

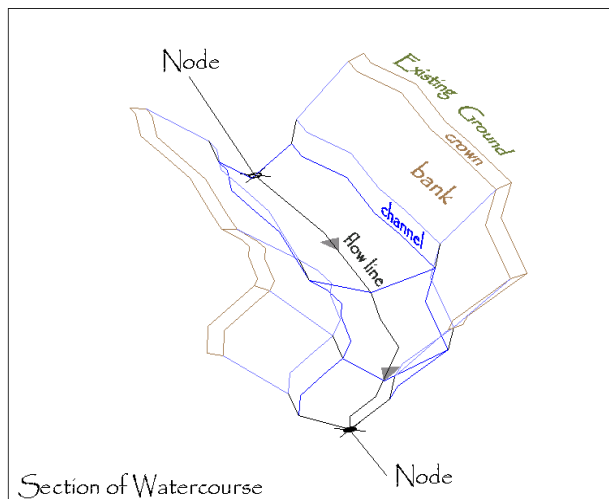


2. Hydro flow line and shore line



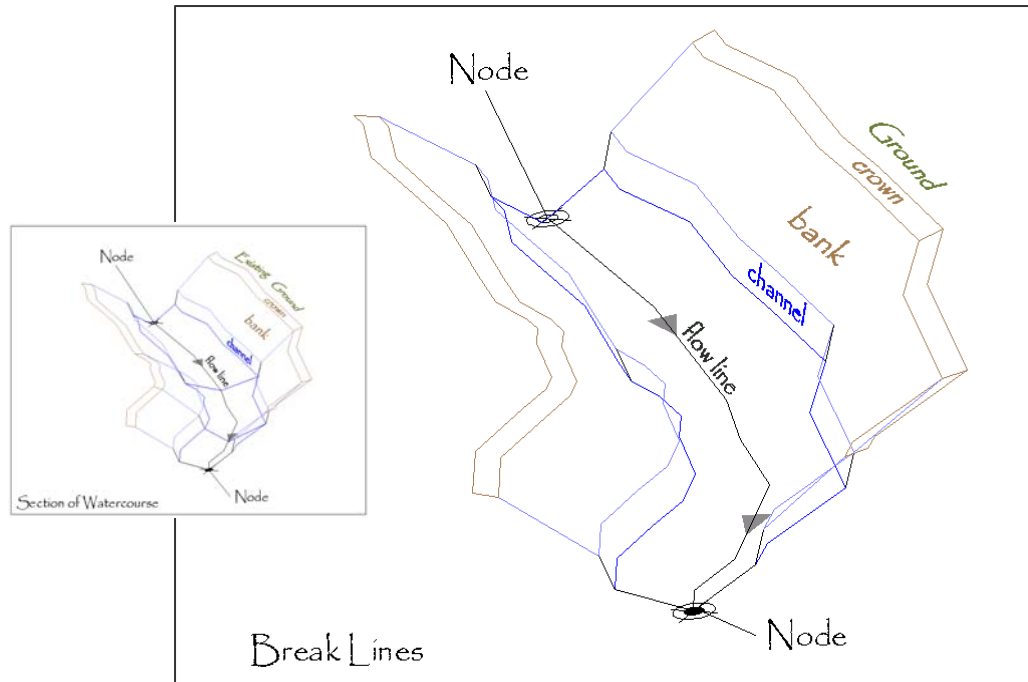
3. Hydro flow line, shore line, and X-section

Break lines support the creation of surfaces and establish horizontal and vertical alignments along surface waterways. Unlike contours that follow the surface at one elevation (2D polylines drawn at elevation), break lines follow natural breaks in terrain such as at the top and bottom of a bank. In a break line each vertex can be at a different elevation (true 3D lines).

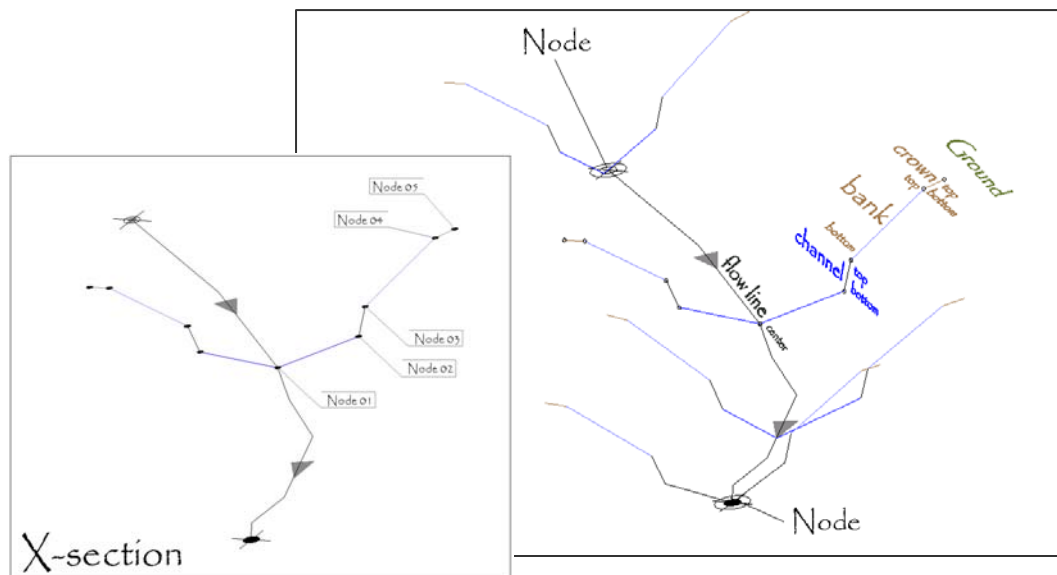


This diagram illustrates 1) hydro junctions, 2) hydro flow lines, 3) break lines running parallel to the flow line, and 4) cross sections running perpendicular to the flow line.

Water flow is typically contained within the channel. The bank provides a transition zone, may occasionally fill during a deluge but normally remains dry. The crown represents the top of bank that contains the water features. These transition zones are delineated with break lines.



X-sections slice through the watercourse along a plane that is perpendicular to the center line. Points mark the deepest point, the bottom of the channel, top of channel, top of bank, etc. Lines connect the points. This series of nodes and lines provide a diagram for calculating flow characteristics.



In the City's system, break lines are stored as linear events. Cross sections are stored in cross-section tables as parsed out and transposed marker points and stored as 3D strings that include the marker points along with additional vertices that may have been collected in-between the markers.

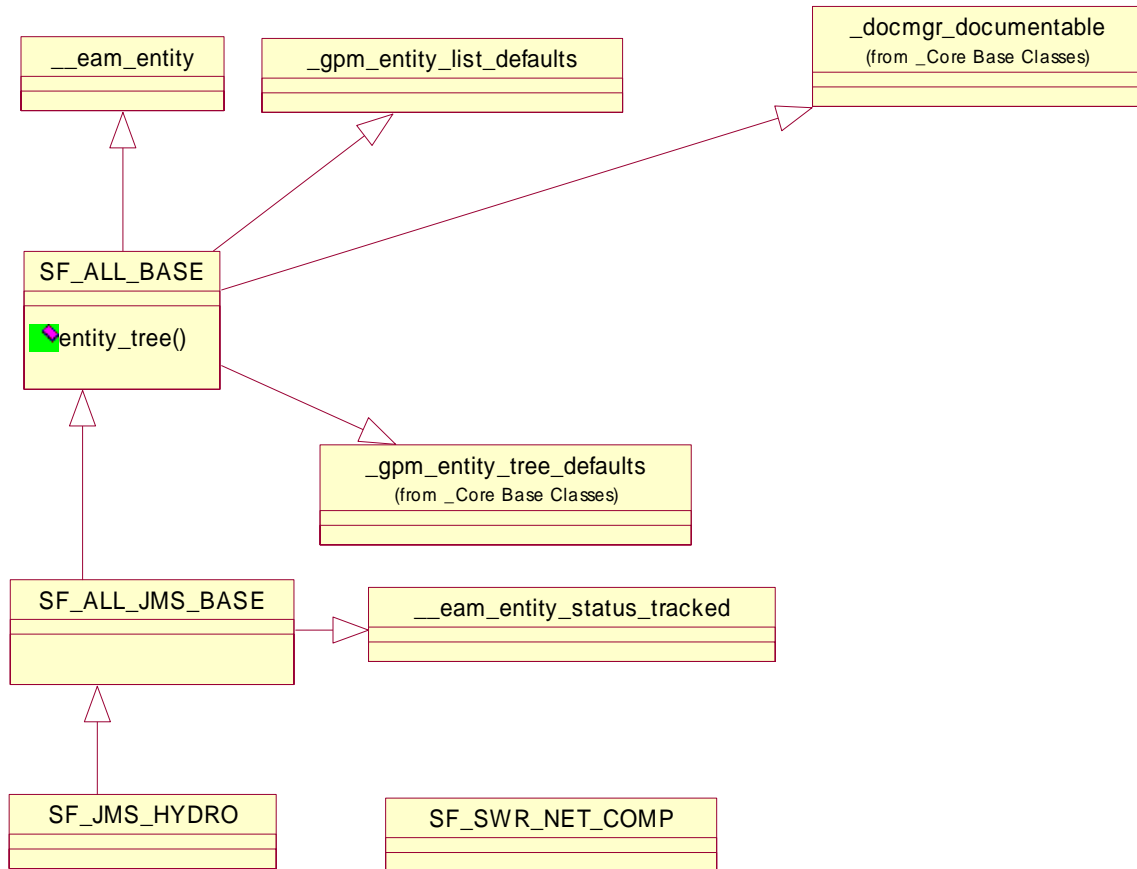
Of import to phase one is the need to store points, lines and events as 3D objects. During implementation this may be achieved with proxy objects, e.g., 2D features and 3D strings as proxy objects.

#### **4.4 Data Model Requirements**

***(List and describe the data entities to be developed within the scope of the current project. Develop a matrix that identifies 1) entity name, 2) description, 3) spatial data type, 4) symbology, 5) source, 6) connectivity/containment, and 7) associations. Then for each data entity list out the attributes in a table that identifies 1) attribute name, 2) description, 3) whether or not the attribute is required, 4) data type, and 5) data domain.)***

## 5. DATA MODEL

### 5.1 Hydro Base



Hydro Base Class Inheritance

|                                               |                  |
|-----------------------------------------------|------------------|
| <b>Class Name:</b>                            | SF_JMS_HYDRO     |
| <b>Notes/Comments:</b>                        | Hydro Base Class |
| <b>Storage Table Name in Schema:</b>          |                  |
| <b>JMS Controlled? (Y/N):</b>                 | Y                |
| <b>Object Record Label (selection.format)</b> |                  |

| Attribute | Data | Mand- | Attribute | Default | Picker | ARCHydro (A) /PNW | Target FK | NOTES/COMMENTS |
|-----------|------|-------|-----------|---------|--------|-------------------|-----------|----------------|
|-----------|------|-------|-----------|---------|--------|-------------------|-----------|----------------|

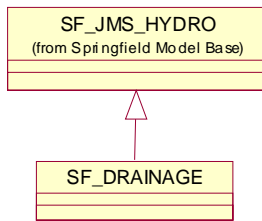


| Name      | Type        | atory? | Label         | value | Type                          | (P) | class |                                        |
|-----------|-------------|--------|---------------|-------|-------------------------------|-----|-------|----------------------------------------|
| OBJECTID  | Integer     | Y      | Arc object ID |       | Auto generated using sequence | A   |       | ArcHydro Internal ID                   |
| HydroID   | Integer     | Y      | Hydro ID      |       | Auto generated using sequence | A   |       | ArcHydro Primary Key                   |
| HydroCode | Varchar(30) | N      | Hydro Code    | null  | Text                          | A   |       | Permanent Public Identifier of Feature |

|                                               |                   |
|-----------------------------------------------|-------------------|
| <b>Class Name:</b>                            | SF_SWR_NET_COMP   |
| <b>Notes/Comments:</b>                        | Hansen Base Class |
| <b>Storage Table Name in Schema:</b>          |                   |
| <b>JMS Controlled? (Y/N):</b>                 | Y                 |
| <b>Object Record Label (selection.format)</b> |                   |

| Attribute Name         | Data Type    | Mand-atory? | Attribute Label | Default value | Picker Type         | ARCHydro (A) /PNW (P)/Hansen (H) | Target FK class | NOTES/COMMENTS |
|------------------------|--------------|-------------|-----------------|---------------|---------------------|----------------------------------|-----------------|----------------|
| SF_DATE_CREATE         | Date         | N           | Creation Date   |               | Date/Auto populated | H                                |                 |                |
| SF_SERVSTAT            | Varchar(4)   | N           | Service Status  |               | LOV                 | H                                |                 |                |
| SF_REQ_SPATIAL_REG     | Integer      | N           | Req Sp Reg      |               | Number              | H                                |                 |                |
| SF_STATUS              | Varchar(10)  | N           | Status          |               | LOV                 | H                                |                 |                |
| SF_DATE_RETIRE         | Date         | N           | Retire Date     |               | date                | H                                |                 |                |
| SF_OWNER               | Varchar(20)  | N           | Owner           |               | LOV                 | H                                |                 |                |
| SF_MAINTAINER          | Varchar(20)  | N           | Maintainer      |               | LOV                 | H                                |                 |                |
| SF_EXTERNAL_CREATION   | Integer      | N           | Ext Creation    |               | Number              | H                                |                 |                |
| SF_LOC_SITETYPE        | Varchar(4)   | N           | Site Type       | R             | LOV                 | H                                |                 |                |
| SF_LOC_MAPSHT_NO       | Varchar(14)  | N           | Map No          |               | Text                | H                                |                 |                |
| SF_LOC_BASIN_NO        | Varchar(10)  | N           | Basin No        |               | Text                | H                                |                 |                |
| SF_LOC_ADDR_MEMO       | Varchar(254) | N           | Address Memo    |               | Text                | H                                |                 |                |
| SF_LOC_ADDR_ID         | Integer      | N           | Address ID      |               | Number              | H                                |                 |                |
| SF_ASBLT_PROJ_NO       | Varchar(15)  | N           | Asblt Proj No   |               | Text                | H                                |                 |                |
| SF_SURF                | Varchar(4)   | N           | Surf Mat        |               | LOV                 | H                                |                 |                |
| SF_DATE_COUNCIL_ACCEPT | Date         | N           | C Accept Date   |               | Date                | H                                |                 |                |
| SF_SOURCE              | Varchar(10)  | N           | Source          |               | LOV                 | H                                |                 |                |
| SF_UNITID              | Varchar(16)  | N           | Unit ID         |               | Auto populated      | H                                |                 |                |
| SF_COMPKEY_OLD         | Integer      | N           | Old Compkey     |               | Number              | H                                |                 |                |
| SF_COMPKEY             | Integer      | N           | Compkey         |               | Auto populated      | H                                |                 |                |

### 5.2 Drainage Base

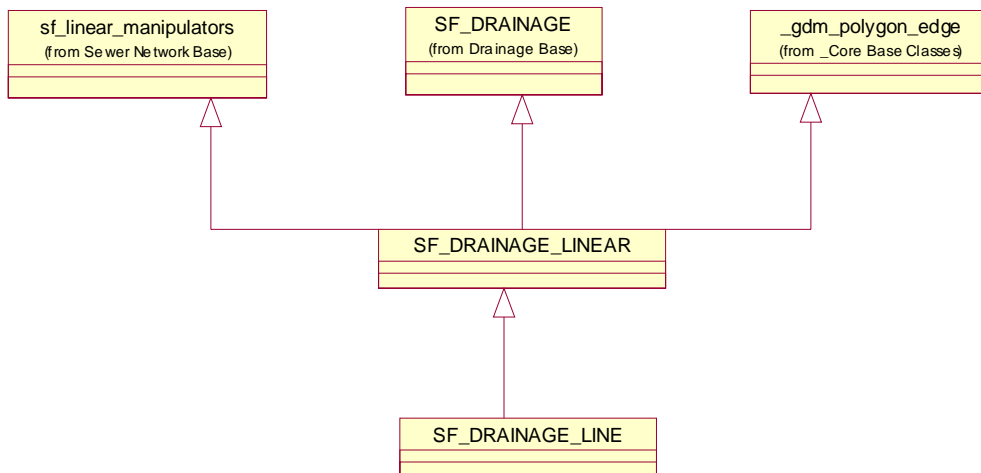


Drainage Base Class Inheritance

|                                               |                     |
|-----------------------------------------------|---------------------|
| <b>Class Name:</b>                            | SF_DRAINAGE         |
| <b>Notes/Comments:</b>                        | Drainage Base Class |
| <b>Storage Table Name in Schema:</b>          |                     |
| <b>JMS Controlled? (Y/N):</b>                 | Y                   |
| <b>Object Record Label (selection.format)</b> |                     |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                                 |
|----------------|-----------|-------------|-----------------|---------------|----------------|-----------------------|-----------------|------------------------------------------------|
| DrainID        | Integer   | N           | Drain ID        |               | Auto populated | A                     |                 | HydroID of the reference drainage area feature |

### 5.3 Drainage Linear



Drainage Linear Class Inheritance

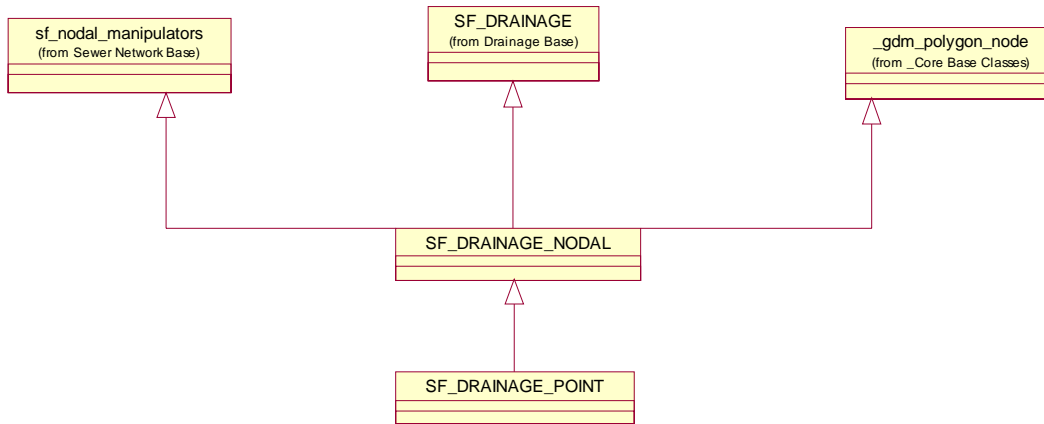
|                    |                    |
|--------------------|--------------------|
| <b>Class Name:</b> | SF_DRAINAGE_LINEAR |
|--------------------|--------------------|

|                                               |                            |
|-----------------------------------------------|----------------------------|
| <b>Notes/Comments:</b>                        | Drainage Linear Base Class |
| <b>Storage Table Name in Schema:</b>          |                            |
| <b>JMS Controlled? (Y/N):</b>                 | Y                          |
| <b>Object Record Label (selection.format)</b> |                            |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS         |
|----------------|-----------|-------------|-----------------|---------------|----------------|-----------------------|-----------------|------------------------|
| ShapeLength    | Double    | Y           | ShapeLength     |               | Auto populated | A                     |                 | Lenth of linear entity |
| ShapeArea      | Double    | Y           | ShapeArea       |               | Auto populated | A                     |                 | Area of linear entity  |

|                                               |                     |
|-----------------------------------------------|---------------------|
| <b>Class Name:</b>                            | SF_DRAINAGE_LINE    |
| <b>Notes/Comments:</b>                        | Drainage Line Class |
| <b>Storage Table Name in Schema:</b>          | SF_DRAINAGE_LINE    |
| <b>JMS Controlled? (Y/N):</b>                 | Y                   |
| <b>Object Record Label (selection.format)</b> |                     |

### 5.4 Drainage Nodal



Drainage Nodal Class Inheritance

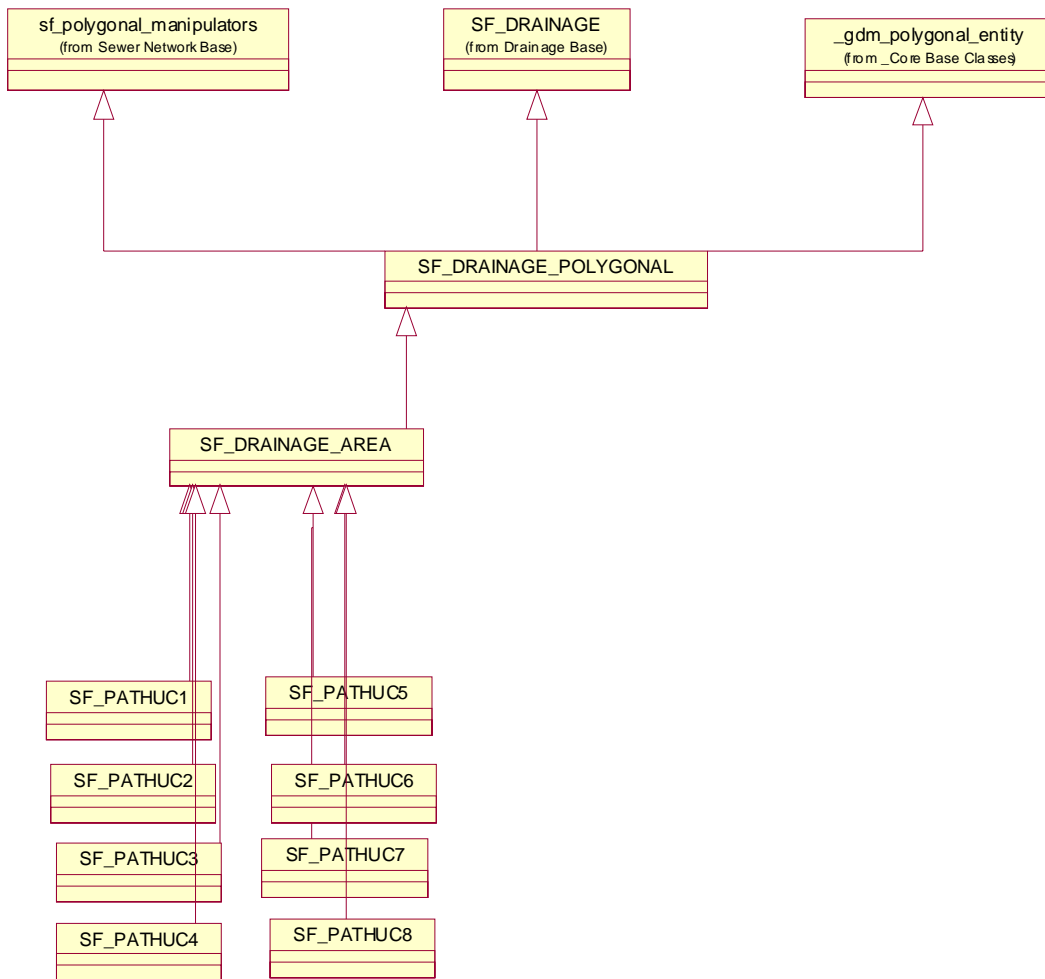
|                                      |                           |
|--------------------------------------|---------------------------|
| <b>Class Name:</b>                   | SF_DRAINAGE_NODAL         |
| <b>Notes/Comments:7</b>              | Drainage Nodal Base Class |
| <b>Storage Table Name in Schema:</b> |                           |

|                                               |   |
|-----------------------------------------------|---|
| <b>JMS Controlled? (Y/N):</b>                 | Y |
| <b>Object Record Label (selection.format)</b> |   |

|                                               |                      |
|-----------------------------------------------|----------------------|
| <b>Class Name:</b>                            | SF_DRAINAGE_POINT    |
| <b>Notes/Comments:</b>                        | Drainage Point Class |
| <b>Storage Table Name in Schema:</b>          | SF_DRAINAGE_POINT    |
| <b>JMS Controlled? (Y/N):</b>                 | Y                    |
| <b>Object Record Label (selection.format)</b> |                      |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                                       |
|----------------|-----------|-------------|-----------------|---------------|----------------|-----------------------|-----------------|------------------------------------------------------|
| JunctionID     | Integer   | N           | Junction ID     |               | Auto populated | A                     |                 | HydroID of the hydro junction at the drainage outlet |

### 5.5 Drainage Polygonal



#### Drainage Polygonal Class Inheritance



#### Drainage Polygonal Class Relationships

|                                               |                               |
|-----------------------------------------------|-------------------------------|
| <b>Class Name:</b>                            | SF_DRAINAGE_POLYGONAL         |
| <b>Notes/Comments:</b>                        | Drainage Polygonal Base Class |
| <b>Storage Table Name in Schema:</b>          |                               |
| <b>JMS Controlled? (Y/N):</b>                 | Y                             |
| <b>Object Record Label (selection.format)</b> |                               |

|                                               |                          |
|-----------------------------------------------|--------------------------|
| <b>Class Name:</b>                            | SF_DRAINAGE_AREA         |
| <b>Notes/Comments:</b>                        | Drainage Area Base Class |
| <b>Storage Table Name in Schema:</b>          | SF_DRAINAGE_AREA         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                        |
| <b>Object Record Label (selection.format)</b> |                          |

| Attribute Name | Data Type   | Mandatory? | Attribute Label    | Default value | Picker Type                          | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                                       |
|----------------|-------------|------------|--------------------|---------------|--------------------------------------|-----------------------|-----------------|------------------------------------------------------|
| AreaSqKm       | Double      | Y          | Area               |               | Auto populated based on polygon area | A                     |                 | Area in square kilometers                            |
| JunctionID     | Integer     | N          | Junction ID        |               | Auto populated                       | A                     |                 | HydroID of the hydro junction at the drainage outlet |
| NextDownID     | Integer     | N          | Next Down ID       |               | Auto populated                       | A                     |                 | HydroID of the next downstream basin                 |
| PERIMETER      | Double      | Y          | Perimeter          |               | Auto populated                       | P                     |                 | Perimeter of the feature in coverage units           |
| HU_BOUNDARY_NO | Integer     | Y          | Boundary #         |               | Auto populated based on sequence     | P                     |                 | Internal feature identifier                          |
| HU_BOUNDARY_ID | Varchar(40) | N          | Boundary ID        | null          | Text                                 | P                     |                 | Feature identifier assigned by the user              |
| ACRES          | Double      | Y          | Acres              |               | Auto populated                       | P                     |                 | Area of polygon in GIS Acres                         |
| HUC_NUM        | Integer     | Y          | Unit Field Code    |               | Auto populated                       | P                     |                 | See Appendix A                                       |
| HUC_TYPE       | Varchar(8)  | N          | Boundary Type      |               | Auto populated                       | P                     |                 | See Appendix A                                       |
| REGION_NAME    | Varchar(60) | N          | Region Name        |               | Text                                 | P                     |                 | See Appendix A                                       |
| SUBREGION_NAME | Varchar(60) | N          | Subregion Name     |               | Text                                 | P                     |                 | See Appendix A                                       |
| BASIN_NAME     | Varchar(60) | N          | Basin Name         |               | Text                                 | P                     |                 | See Appendix A                                       |
| SUBBASIN_NAME  | Varchar(60) | N          | Sub-basin name     |               | Text                                 | P                     |                 | See Appendix A                                       |
| WATERSHED_NAME | Varchar(60) | N          | Watershed Name     |               | Text                                 | P                     |                 | See Appendix A                                       |
| SUBWAT_NAME    | Varchar(60) | N          | Sub Watershed name |               | Text                                 | P                     |                 | See Appendix A                                       |
| CATCHMENT_NAME | Varchar(60) | N          | Catchment Name     |               | Text                                 | P                     |                 | See Appendix A                                       |
| SUBCATCH_NAME  | Varchar(60) | N          | Sub Catchment Name |               | Text                                 | P                     |                 | See Appendix A                                       |
| OLD_HUCNUM     | Integer     | N          | Old                |               | Number                               | P                     |                 | See Appendix A                                       |

|                     |              |   |                                       |  |                        |   |  |                |
|---------------------|--------------|---|---------------------------------------|--|------------------------|---|--|----------------|
|                     |              |   | Boundary #                            |  |                        |   |  |                |
| STATES              | Varchar(20)  | N | States                                |  | Text                   | P |  | See Appendix A |
| NCONTRIB_DA         | Double       | N | Non Contributin g                     |  | Number                 | P |  | See Appendix A |
| DS_HUC5             | Integer      | N | 5 <sup>th</sup> Level Downstrea m HUC |  | Number                 | P |  | See Appendix A |
| DS_HUC6             | Integer      | N | 6 <sup>th</sup> Level Downstrea m HUC |  | Number                 | P |  | See Appendix A |
| HUC_MOD             | Varchar(2)   | N | Unit Modificatio ns                   |  | Text                   | P |  | See Appendix A |
| COMMENTS            | Varchar(200) | N | Comments                              |  | Multilin e Text        | P |  | See Appendix A |
| REGION              | Integer      | N | Region                                |  | Number                 | P |  | See Appendix A |
| SUBREGION           | Integer      | N | Sub Region                            |  | Number                 | P |  | See Appendix A |
| BASIN               | Integer      | N | Basin                                 |  | Number                 | P |  | See Appendix A |
| SUBBASIN            | Integer      | N | Sub Basin                             |  | Number                 | P |  | See Appendix A |
| WATERSHED           | Integer      | N | Watershed                             |  | Number                 | P |  | See Appendix A |
| SUBWAT              | Integer      | N | Sub Watershed                         |  | Number                 | P |  | See Appendix A |
| CATCHMENT           | Integer      | N | Catchment                             |  | Number                 | P |  | See Appendix A |
| SUBCATCH            | Integer      | N | Sub Catchment                         |  | Number                 |   |  | See Appendix A |
| F_NODE_NO           | Integer      | N | F Node #                              |  | Auto Populat ed        | P |  | See Appendix A |
| T_NODE_NO           | Integer      | N | T Node #                              |  | Auto Populat ed        | P |  | See Appendix A |
| L_POLY_NO           | Integer      | N | L Poly #                              |  | Auto Populat ed        | P |  | See Appendix A |
| R_POLY_NO           | Integer      | N | R Poly #                              |  | Auto Populat ed        | P |  | See Appendix A |
| LENGTH              | double       | Y | Length                                |  | Auto Populat ed        | P |  | See Appendix A |
| ARC_HU_BOUNDAR Y_NO | Integer      | Y | Arc Boundary #                        |  | Auto Populat ed        | P |  | See Appendix A |
| ARC_HU_BOUNDAR Y_ID | Varchar(40)  | N | Arc Boundary ID                       |  | Text                   | P |  | See Appendix A |
| HUC_LEVEL           | Integer      | Y | Unit Level                            |  | LOV                    | P |  | See Appendix A |
| LINESOURCE          | Integer      | N | Line Source                           |  | LOV                    | P |  | See Appendix A |
| LINEVER             | Integer      | N | Edit Verification                     |  | LOV                    | P |  | See Appendix A |
| LINEDATE            | Date         | Y | Last Edit Date                        |  | Date – Auto populat ed | P |  | See Appendix A |
| LINEORG             | Varchar(20)  | N | Last Org to Edit                      |  | LOV – Auto populat ed  | P |  | See Appendix A |
| METADATA_ID         | Varchar(100) | N | Metadata ID                           |  | Text                   | P |  | See Appendix A |
| ARC_COMMENTS        | Varchar(200) | N | Arc Comments                          |  | Multilin e Text        | P |  | See Appendix A |

|                    |            |
|--------------------|------------|
| <b>Class Name:</b> | SF_PATHUC1 |
|--------------------|------------|

|                                               |                          |
|-----------------------------------------------|--------------------------|
| <b>Notes/Comments:</b>                        | Drainage Region Boundary |
| <b>Storage Table Name in Schema:</b>          |                          |
| <b>JMS Controlled? (Y/N):</b>                 | Y                        |
| <b>Object Record Label (selection.format)</b> |                          |

|                                               |                              |
|-----------------------------------------------|------------------------------|
| <b>Class Name:</b>                            | SF_PATHUC2                   |
| <b>Notes/Comments:</b>                        | Drainage Sub-region Boundary |
| <b>Storage Table Name in Schema:</b>          |                              |
| <b>JMS Controlled? (Y/N):</b>                 | Y                            |
| <b>Object Record Label (selection.format)</b> |                              |

|                                               |                         |
|-----------------------------------------------|-------------------------|
| <b>Class Name:</b>                            | SF_PATHUC3              |
| <b>Notes/Comments:</b>                        | Drainage Basin Boundary |
| <b>Storage Table Name in Schema:</b>          |                         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                       |
| <b>Object Record Label (selection.format)</b> |                         |

|                                               |                             |
|-----------------------------------------------|-----------------------------|
| <b>Class Name:</b>                            | SF_PATHUC4                  |
| <b>Notes/Comments:</b>                        | Drainage Sub-basin Boundary |
| <b>Storage Table Name in Schema:</b>          |                             |
| <b>JMS Controlled? (Y/N):</b>                 | Y                           |
| <b>Object Record Label (selection.format)</b> |                             |

|                                               |                             |
|-----------------------------------------------|-----------------------------|
| <b>Class Name:</b>                            | SF_PATHUC5                  |
| <b>Notes/Comments:</b>                        | Drainage Watershed Boundary |
| <b>Storage Table Name in Schema:</b>          |                             |
| <b>JMS Controlled? (Y/N):</b>                 | Y                           |
| <b>Object Record Label (selection.format)</b> |                             |

| Attribute Name | Data Type | Mand-ator y? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P)/DHI (D) | Target FK class | NOTES/COMMENTS                                |
|----------------|-----------|--------------|-----------------|---------------|----------------|-------------------------------|-----------------|-----------------------------------------------|
| BasinID        | Integer   | Y            | Basin ID        |               | Auto Populated | D                             |                 | Refers to the HydroID of the associated Basin |

|                                      |                                 |
|--------------------------------------|---------------------------------|
| <b>Class Name:</b>                   | SF_PATHUC6                      |
| <b>Notes/Comments:</b>               | Drainage Sub-watershed Boundary |
| <b>Storage Table Name in Schema:</b> |                                 |



|                                               |   |
|-----------------------------------------------|---|
| <b>JMS Controlled? (Y/N):</b>                 | Y |
| <b>Object Record Label (selection.format)</b> |   |

|                                               |                             |
|-----------------------------------------------|-----------------------------|
| <b>Class Name:</b>                            | SF_PATHUC7                  |
| <b>Notes/Comments:</b>                        | Drainage Catchment Boundary |
| <b>Storage Table Name in Schema:</b>          |                             |
| <b>JMS Controlled? (Y/N):</b>                 | Y                           |
| <b>Object Record Label (selection.format)</b> |                             |

| Attribute Name | Data Type                 | Mandator y? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P)/DHI (D) | Target FK class | NOTES/COMMENTS                                                  |
|----------------|---------------------------|-------------|-----------------|---------------|----------------|-------------------------------|-----------------|-----------------------------------------------------------------|
| Name           | Varchar(30)               | N           | Name            |               | String         | D                             |                 | Holds a user-defined name of the catchment                      |
| DischargeType  | DHICatchmentDischargeType | N           | Discharge Type  |               | LOV            | D                             |                 | Domain identifying the discharge type for the catchment         |
| ModelType      | DHICatchmentModelType     | N           | Model Type      |               | LOV            | D                             |                 | Domain identifying the model that defines the type of catchment |
| AssignedArea   | Double                    | N           | Assigned Area   |               | Auto populated | D                             |                 | Holds a user assigned area for the catchment                    |
| WSshedID       | integer                   | Y           | Watershed ID    |               | Auto Populated | D                             |                 | Refers to the HydroID of the associated Watershed               |

**DHICATCHMENTMODELTYPE DOMAIN VALUES:**

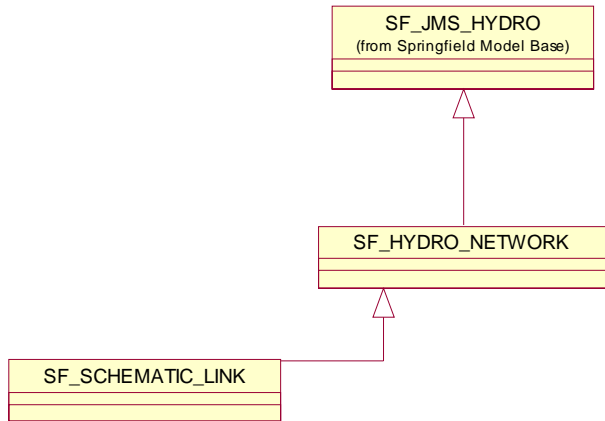
1. NAM
2. UHM
3. SMAP
4. URBAN

**DHICATCHMENTDISCHARGEType DOMAIN VALUES:**

1. NONE
2. OBSERVED
3. CALCULATED
4. BOTH

|                                               |                                 |
|-----------------------------------------------|---------------------------------|
| <b>Class Name:</b>                            | SF_PATHUC8                      |
| <b>Notes/Comments:</b>                        | Drainage Sub-catchment Boundary |
| <b>Storage Table Name in Schema:</b>          |                                 |
| <b>JMS Controlled? (Y/N):</b>                 | Y                               |
| <b>Object Record Label (selection.format)</b> |                                 |

5.6 Network Base



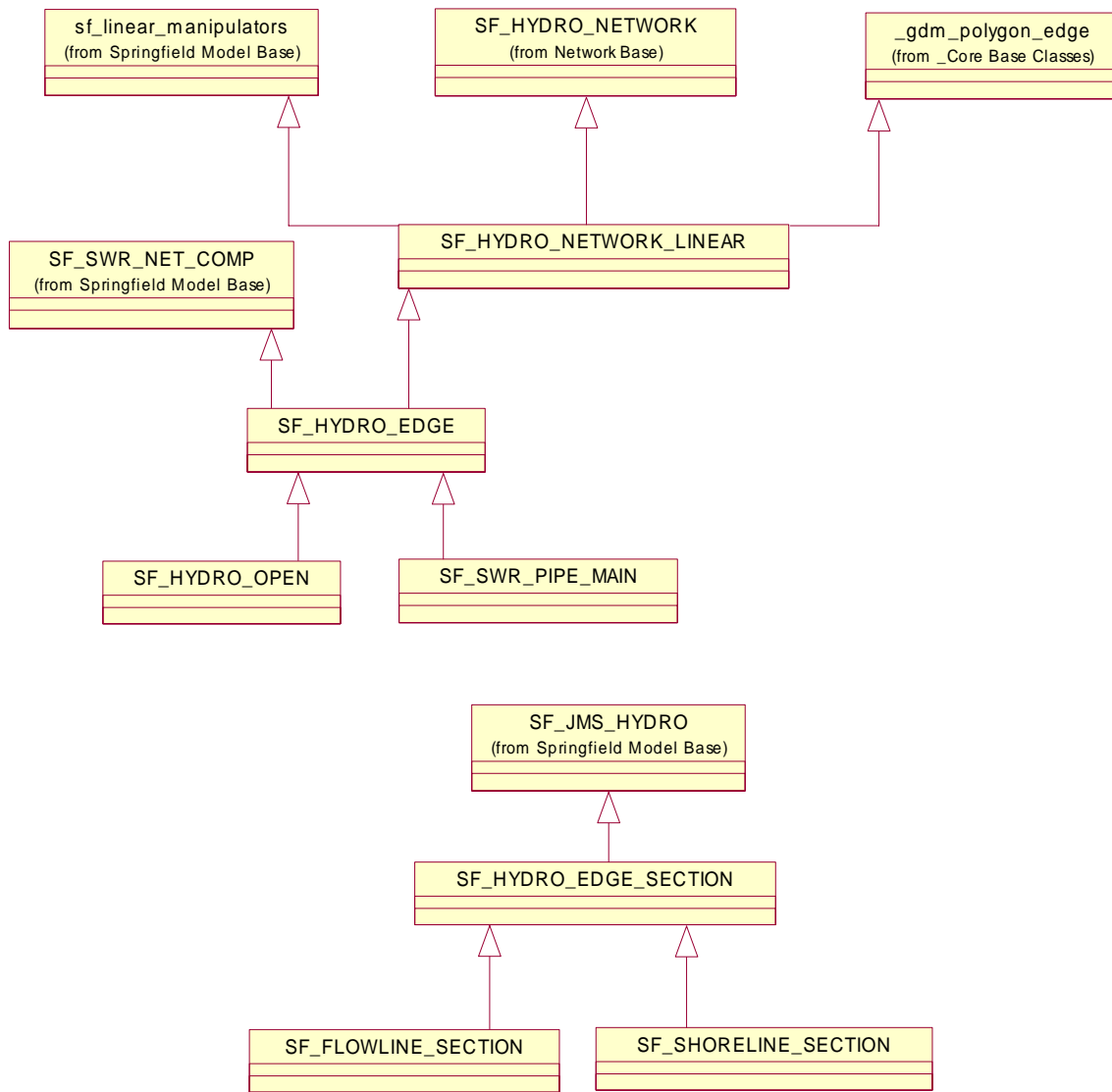
Network Base Class Inheritance

|                                               |                          |
|-----------------------------------------------|--------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_NETWORK         |
| <b>Notes/Comments:</b>                        | Hydro Network Base Class |
| <b>Storage Table Name in Schema:</b>          |                          |
| <b>JMS Controlled? (Y/N):</b>                 | Y                        |
| <b>Object Record Label (selection.format)</b> |                          |

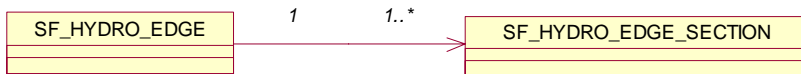
|                                               |                      |
|-----------------------------------------------|----------------------|
| <b>Class Name:</b>                            | SF_SCHEMATIC_LINK    |
| <b>Notes/Comments:</b>                        | Schematic Link Class |
| <b>Storage Table Name in Schema:</b>          | SF_SCHEMATIC_LINK    |
| <b>JMS Controlled? (Y/N):</b>                 | Y                    |
| <b>Object Record Label (selection.format)</b> |                      |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P) | Target FK class   | NOTES/COMMENTS                                            |
|----------------|-----------|-------------|-----------------|---------------|----------------|-----------------------|-------------------|-----------------------------------------------------------|
| FromNodeID     | Integer   | Y           | From Node ID    |               | Auto populated | A                     | SF_SCHEMATIC_NODE | HydroID of the schematic node at the from end of the link |
| ToNodeID       | Integer   | Y           | To Node ID      |               | Auto populated | A                     | SF_SCHEMATIC_NODE | HydroID of the schematic node at the to end of the link   |

5.7 Network Linear



Network Linear Class Inheritance



Network Linear Class Relationships

|                                      |                                 |
|--------------------------------------|---------------------------------|
| <b>Class Name:</b>                   | SF_HYDRO_NETWORK_LINEAR         |
| <b>Notes/Comments:</b>               | Hydro Network Linear Base Class |
| <b>Storage Table Name in Schema:</b> |                                 |

|                                               |   |
|-----------------------------------------------|---|
| <b>JMS Controlled? (Y/N):</b>                 | Y |
| <b>Object Record Label (selection.format)</b> |   |

|                                               |                  |
|-----------------------------------------------|------------------|
| <b>Class Name:</b>                            | SF_HYDRO_EDGE    |
| <b>Notes/Comments:</b>                        | Hydro Edge Class |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_EDGE    |
| <b>JMS Controlled? (Y/N):</b>                 | Y                |
| <b>Object Record Label (selection.format)</b> |                  |

| Attribute Name   | Data Type     | Mand-atory? | Attribute Label        | Default value | Picker Type            | ARCHydro (A) /PNW (P)/Hansen (H)/DHI (D) | Target FK class | NOTES/COMMENTS                                               |
|------------------|---------------|-------------|------------------------|---------------|------------------------|------------------------------------------|-----------------|--------------------------------------------------------------|
| ReachCode        | Varchar(30)   | N           | Reach Code             | null          | Text                   | A                                        |                 | An identifier for a river or stream segment                  |
| HydroEdgeName    | Varchar(100)  | N           | Geographic Name        | null          | Text                   | A                                        |                 | Geographic Name                                              |
| LengthKm         | Double        | N           | Length                 | 0             | Autopopulated – Number | A                                        |                 | Length (Km)                                                  |
| LengthDown       | Double        | N           | Length Down            | 0             | Number                 | A                                        |                 | Length to nearest downstream sink (usually the basin outlet) |
| FlowDir          | Integer       | N           | Flow Direction         | 1             | Autopopulated          | A                                        |                 | Defines the direction of flow on the edge                    |
| Ftype            | Varchar(30)   | N           |                        | null          | Text                   | A                                        |                 | Descriptor of feature type                                   |
| EdgeType         | Integer       | N           | Edge Type              | 1             | Autopopulated          | A                                        |                 | Defines the edge as being either a flowline or a shoreline   |
| DHIBranchType    | DHIBranchType | N           | Branch Type            |               | LOV                    | D                                        |                 | Subtype Field                                                |
| F_NODE_NO        | Integer       | N           | F Node #               |               | Auto Populated         | P                                        |                 | See Appendix A                                               |
| T_NODE_NO        | Integer       | N           | T Node #               |               | Auto Populated         | P                                        |                 | See Appendix A                                               |
| L_POLY_NO        | Integer       | N           | L Poly #               |               | Auto Populated         | P                                        |                 | See Appendix A                                               |
| R_POLY_NO        | Integer       | N           | R Poly #               |               | Auto Populated         | P                                        |                 | See Appendix A                                               |
| LENGTH           | double        | Y           | Length                 |               | Auto Populated         | P                                        |                 | See Appendix A                                               |
| EDGE_NO          | Integer       | Y           | Edge #                 |               | Auto Populated         | P                                        |                 | See Appendix A                                               |
| EDGE_ID          | Varchar(40)   | N           | Edge ID                |               | Text                   | P                                        |                 | See Appendix A                                               |
| EDGE_LLID_NR     | Integer       | Y           | EDGE LL ID             |               | Number                 | P                                        |                 | See Appendix A                                               |
| WS_DATUM_CD      | Varchar(10)   | N           | Shoreline Datum Code   |               | LOV                    | P                                        |                 | See Appendix A                                               |
| WS_DFLT_SHORE_CD | Varchar(10)   | N           | Default Shoreline Code |               | LOV                    | P                                        |                 | See Appendix A                                               |
| SF_UNITID2       | Varchar(16)   | Y           | UnitID2                |               | Auto populated         | H                                        |                 |                                                              |
| SF_DWNDPTH       | Double        | N           | Dwn Depth              |               | Number                 | H                                        |                 |                                                              |
| SF_SOURCE_FLOW   | Varchar(10)   | N           | Source Flow            |               | LOV                    | H                                        |                 |                                                              |
| SF_DWNELEV       | double        | N           | Dwn Elev               |               | Number                 | H                                        |                 |                                                              |
| SF_PARLINENO     | Varchar(1)    | N           | Par Line No            |               | Text                   | H                                        |                 |                                                              |

|                  |             |   |                    |   |                |   |  |  |
|------------------|-------------|---|--------------------|---|----------------|---|--|--|
| SF_UPSDPTH       | Double      | N | Ups Dpth           |   | Number         | H |  |  |
| SF_UPSELEV       | Double      | N | Ups Elev           |   | Number         | H |  |  |
| SF_SLOPE         | Double      | N | Slope              |   | Number         | H |  |  |
| SF_NVALUE        | Double      | N | NValue             |   | Number         | H |  |  |
| SF_MAINCOMP1     | Integer     | N | Maincomp1          |   | Auto populated | H |  |  |
| SF_MAINCOMP2     | Integer     | N | Maincomp2          |   | Auto populated | H |  |  |
| SF_MAINKEY1      | Integer     | N | Mainkey1           |   | Auto populated | H |  |  |
| SF_MAINKEY2      | Integer     | N | Mainkey2           |   | Auto populated | H |  |  |
| SF_SWR_LINE_TYPE | Varchar(6)  | N | Line Type          | M | LOV            | H |  |  |
| SF_DIRFRDWN      | Varchar(3)  | N | Dir Down Node      |   | LOV            | H |  |  |
| SF_DIRFRUPS      | Varchar(3)  | N | Dir Up Node        |   | LOV            | H |  |  |
| SF_STATION_BEG   | Varchar(10) |   | Beg Station Number |   | Number         | H |  |  |
| SF_STATION_END   | Varchar(10) |   | End Station Number |   | Number         | H |  |  |

DHIBranchType

| COLUMN      | DATA TYPE     | KEY | DEFINITION OR VALID VLAUES |
|-------------|---------------|-----|----------------------------|
| River       | DHIBranchType | 1   | Subtype Field              |
| Shoreline   | DHIBranchType | 2   | Subtype Field              |
| Stratified  | DHIBranchType | 3   | Subtype Field              |
| LinkChannel | DHIBranchType | 4   | Subtype Field              |

|                                               |                     |
|-----------------------------------------------|---------------------|
| <b>Class Name:</b>                            | SF_HYDRO_OPEN       |
| <b>Notes/Comments:</b>                        | Surface Water Class |
| <b>Storage Table Name in Schema:</b>          |                     |
| <b>JMS Controlled? (Y/N):</b>                 | Y                   |
| <b>Object Record Label (selection.format)</b> |                     |

|                                               |                    |
|-----------------------------------------------|--------------------|
| <b>Class Name:</b>                            | SF_SWR_PIPE_MAIN   |
| <b>Notes/Comments:</b>                        | Piped Linear Class |
| <b>Storage Table Name in Schema:</b>          |                    |
| <b>JMS Controlled? (Y/N):</b>                 | Y                  |
| <b>Object Record Label (selection.format)</b> |                    |

|                                      |                               |
|--------------------------------------|-------------------------------|
| <b>Class Name:</b>                   | SF_HYDRO_EDGE_SECTION         |
| <b>Notes/Comments:</b>               | Hydro Edge Section Base class |
| <b>Storage Table Name in Schema:</b> | SF_HYDRO_EDGE_SECTION         |
| <b>JMS Controlled? (Y/N):</b>        | Y                             |

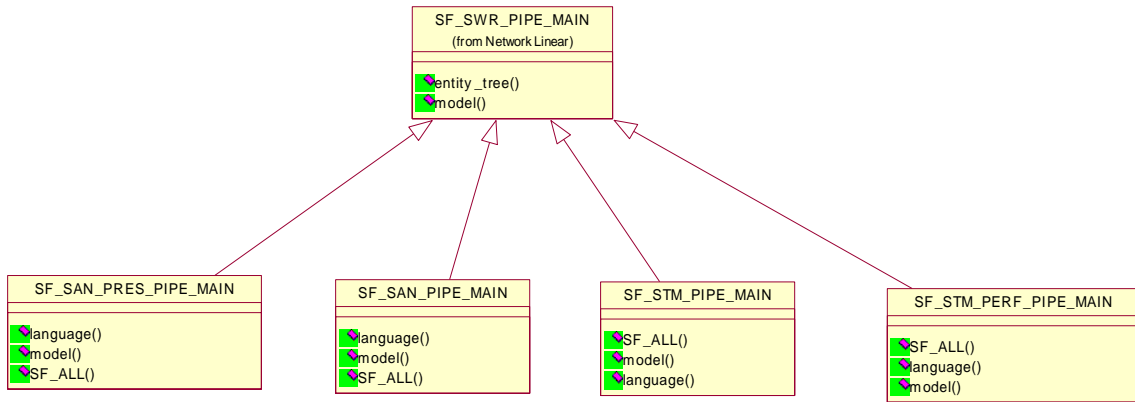
|                                               |  |
|-----------------------------------------------|--|
| <b>Object Record Label (selection.format)</b> |  |
|-----------------------------------------------|--|

| <b>Attribute Name</b> | <b>Data Type</b> | <b>Mand-atory?</b> | <b>Attribute Label</b> | <b>Default value</b> | <b>Picker Type</b>  | <b>ARCHydro (A) /PNW (P)</b> | <b>Target FK class</b> | <b>NOTES/COMMENTS</b> |
|-----------------------|------------------|--------------------|------------------------|----------------------|---------------------|------------------------------|------------------------|-----------------------|
| ROUTELINK_NO          | Integer          | Y                  | Routelink #            |                      | Auto populated      | P                            |                        | See Appendix A        |
| ARCLINK_NO            | Integer          | Y                  | Arclink #              |                      | Auto populated      | P                            |                        | See Appendix A        |
| F_MEAS                | Double           | Y                  | From Measure           |                      | Auto populated      | P                            |                        | See Appendix A        |
| T_MEAS                | Double           | Y                  | To Measure             |                      | Auto populated      | P                            |                        | See Appendix A        |
| F_POS                 | Double           | Y                  | From Position          |                      | Auto populated      | P                            |                        | See Appendix A        |
| T_POS                 | Double           | Y                  | To Position            |                      | Auto populated      | P                            |                        | See Appendix A        |
| EDGE_NO               | Integer          | Y                  | Edge #                 |                      | Auto populated      | P                            |                        | See Appendix A        |
| EDGE_ID               | Varchar(40)      | Y                  | Edge ID                |                      | Auto populated      | P                            |                        | See Appendix A        |
| OWNING_EDGE           | Varchar(16)      | Y                  | Owning Edge            |                      | FK (Auto populated) |                              | SF_HYDRO_EDGE          |                       |

|                                               |                        |
|-----------------------------------------------|------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_EDGE_SECTION  |
| <b>Notes/Comments:</b>                        | Hydro Flowline Section |
| <b>Storage Table Name in Schema:</b>          |                        |
| <b>JMS Controlled? (Y/N):</b>                 | Y                      |
| <b>Object Record Label (selection.format)</b> |                        |

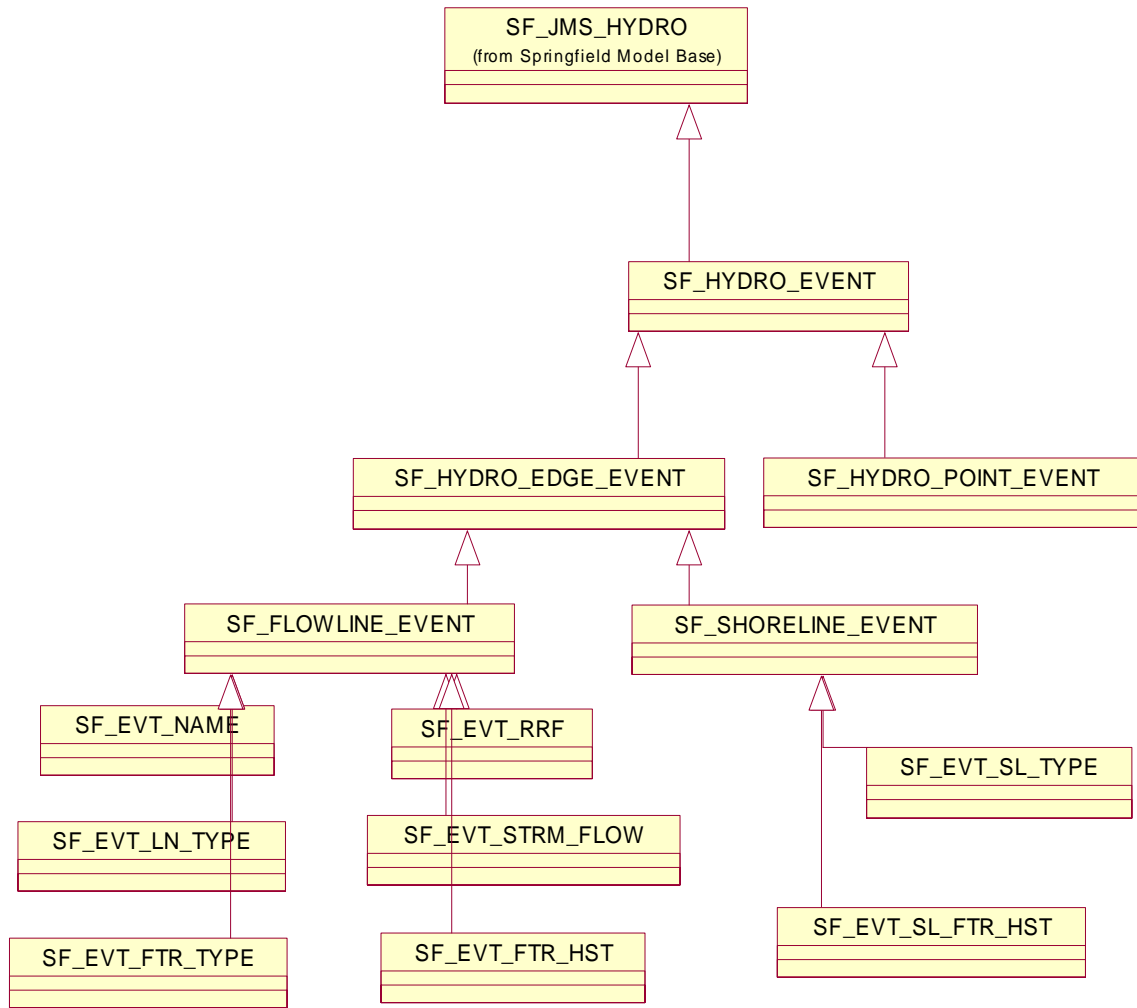
|                                               |                         |
|-----------------------------------------------|-------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_EDGE_SECTION   |
| <b>Notes/Comments:</b>                        | Hydro Shoreline Section |
| <b>Storage Table Name in Schema:</b>          |                         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                       |
| <b>Object Record Label (selection.format)</b> |                         |

### 5.8 Network Pipe Linear



Network Pipe Linear Class Relationships – Note that these leaf classes exist in the current model. Please refer to the current model for the specifications of these classes.

### 5.9 Network Events



Network Event Class Inheritance

|                                               |                        |
|-----------------------------------------------|------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_EVENT         |
| <b>Notes/Comments:</b>                        | Hydro Event Base Class |
| <b>Storage Table Name in Schema:</b>          |                        |
| <b>JMS Controlled? (Y/N):</b>                 | Y                      |
| <b>Object Record Label (selection.format)</b> |                        |

|                                               |                     |
|-----------------------------------------------|---------------------|
| <b>Class Name:</b>                            | SF_HYDRO_EDGE_EVENT |
| <b>Notes/Comments:</b>                        | Hydro Edge Event    |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_EDGE_EVENT |
| <b>JMS Controlled? (Y/N):</b>                 | Y                   |
| <b>Object Record Label (selection.format)</b> |                     |



| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type               | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                                        |
|----------------|-------------|-------------|-----------------|---------------|---------------------------|-----------------------|-----------------|-------------------------------------------------------|
| ReachCode      | Varchar(30) | Y           | Reach Code      |               | String                    | A                     |                 | An identifier for a river or stream segment           |
| FMeasure       | Double      | Y           | F Measure       |               | Number                    | A                     |                 | Measure value at the start of the line event          |
| TMeasure       | Double      | Y           | T Measure       |               | Number                    | A                     |                 | Measure value at the end of the line event            |
| Offset         | Double      | Y           | Offset          |               | Number                    | A                     |                 | Distance from the center of the line to display event |
| EDGE_LLID_NR   | Integer     | Y           | Edge LL ID      |               | Number                    | P                     |                 | See Appendix A                                        |
| EDGE_BEGIN_AD  | Varchar(40) | Y           | Begin Address   |               | Text or Click pos in View | P                     |                 | See Appendix A                                        |
| EDGE_END_AD    | Varchar(30) | Y           | End Address     |               | Text or click pos in view | P                     |                 | See Appendix A                                        |

|                                               |                          |
|-----------------------------------------------|--------------------------|
| <b>Class Name:</b>                            | SF_EVT_LN_TYPE           |
| <b>Notes/Comments:</b>                        | Flowline Line Type Event |
| <b>Storage Table Name in Schema:</b>          | SF_EVT_LN_TYPE           |
| <b>JMS Controlled? (Y/N):</b>                 | Y                        |
| <b>Object Record Label (selection.format)</b> |                          |

| Attribute Name  | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|-----------------|-------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
| WC_LN_TYPE_CD   | Varchar(20) | Y           | Line Type       |               | LOV         | P                     |                 | See Appendix A |
| WC_FLOW_PATH_CD | Varchar(20) | Y           | Flow Path       |               | LOV         | P                     |                 | See Appendix A |

|                                               |                     |
|-----------------------------------------------|---------------------|
| <b>Class Name:</b>                            | SF_EVT_NAME         |
| <b>Notes/Comments:</b>                        | Flowline Name Event |
| <b>Storage Table Name in Schema:</b>          | SF_EVT_NAME         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                   |
| <b>Object Record Label (selection.format)</b> |                     |

| Attribute Name | Data Type    | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|--------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
| WC_GNIS_NM     | Varchar(100) | Y           | GNIS Name       |               | Text        | P                     |                 | See Appendix A |
| WC_GNIS_NR     | Varchar(50)  | Y           | GNIS Number     |               | Text        | P                     |                 | See Appendix A |

|                                      |                             |
|--------------------------------------|-----------------------------|
| <b>Class Name:</b>                   | SF_EVT_FTR_TYPE             |
| <b>Notes/Comments:</b>               | Flowline Feature Type Event |
| <b>Storage Table Name in Schema:</b> | SF_EVT_FTR_TYPE             |

|                                               |   |
|-----------------------------------------------|---|
| <b>JMS Controlled? (Y/N):</b>                 | Y |
| <b>Object Record Label (selection.format)</b> |   |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
| WC_HYDR_FTR_CD | Varchar(10) | Y           | Hydro Ftr Code  |               | LOV         | P                     |                 | See Appendix A |
| WC_CART_FTR_CD | Varchar(10) | Y           | Carto Ftr Code  |               | LOV         | P                     |                 | See Appendix A |

|                                               |                                 |
|-----------------------------------------------|---------------------------------|
| <b>Class Name:</b>                            | SF_EVT_RRF                      |
| <b>Notes/Comments:</b>                        | Flowline River Reach File Event |
| <b>Storage Table Name in Schema:</b>          | SF_EVT_RRF                      |
| <b>JMS Controlled? (Y/N):</b>                 | Y                               |
| <b>Object Record Label (selection.format)</b> |                                 |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label     | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-------------|-------------|---------------------|---------------|-------------|-----------------------|-----------------|----------------|
| WC_RRF_NR      | Varchar(50) | N           | River Reach File No |               | Text        | P                     |                 | See Appendix A |

|                                               |                           |
|-----------------------------------------------|---------------------------|
| <b>Class Name:</b>                            | SF_EVT_STRM_FLOW          |
| <b>Notes/Comments:</b>                        | Flowline Streamflow Event |
| <b>Storage Table Name in Schema:</b>          | SF_EVT_STRM_FLOW          |
| <b>JMS Controlled? (Y/N):</b>                 | Y                         |
| <b>Object Record Label (selection.format)</b> |                           |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label  | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-------------|-------------|------------------|---------------|-------------|-----------------------|-----------------|----------------|
| WC_CONTU_CD    | Varchar(10) | Y           | Continuity Code  |               | LOV         | P                     |                 | See Appendix A |
| WC_PERIOD_CD   | Varchar(10) | Y           | Periodicity Code |               | LOV         | P                     |                 | See Appendix A |

|                                               |                          |
|-----------------------------------------------|--------------------------|
| <b>Class Name:</b>                            | SF_EVT_FTR_HST           |
| <b>Notes/Comments:</b>                        | Flowline Feature History |
| <b>Storage Table Name in Schema:</b>          | SF_EVT_FTR_HST           |
| <b>JMS Controlled? (Y/N):</b>                 | Y                        |
| <b>Object Record Label (selection.format)</b> |                          |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|

|                 |             |  |                |  |        |   |  |                |
|-----------------|-------------|--|----------------|--|--------|---|--|----------------|
| FTR_MOD_CD      | Varchar(10) |  | Modify Code    |  | LOV    | P |  | See Appendix A |
| FTR_INPUT_CD    | Varchar(10) |  | Input Code     |  | LOV    | P |  | See Appendix A |
| FTR_INTRP_CD    | Varchar(10) |  | Intrp Code     |  | LOV    | P |  | See Appendix A |
| FTR_SRC_CD      | Varchar(10) |  | Source Code    |  | LOV    | P |  | See Appendix A |
| FTR_SRC_DT      | Date        |  | Source Date    |  | DATE   | P |  | See Appendix A |
| FTR_SRCSCALE_NR | Integer     |  | Src Scale No   |  | NUMBER | P |  | See Appendix A |
| FTR_ACCUR_NR    | Double      |  | Acc No         |  | NUMBER | P |  | See Appendix A |
| FTR_ORG_CD      | Varchar(10) |  | Org Code       |  | LOV    | P |  | See Appendix A |
| FTR_EDIT_DT     | Date        |  | Last Edit Date |  | DATE   | P |  | See Appendix A |

|                                               |                      |
|-----------------------------------------------|----------------------|
| <b>Class Name:</b>                            | SF_EVT_SL_TYPE       |
| <b>Notes/Comments:</b>                        | Shoreline Type Event |
| <b>Storage Table Name in Schema:</b>          | SF_EVT_SL_TYPE       |
| <b>JMS Controlled? (Y/N):</b>                 | Y                    |
| <b>Object Record Label (selection.format)</b> |                      |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
| WS_TYPE_CD     | Varchar(10) | Y           | Shoreline Type  |               | LOV         | P                     |                 | See Appendix A |

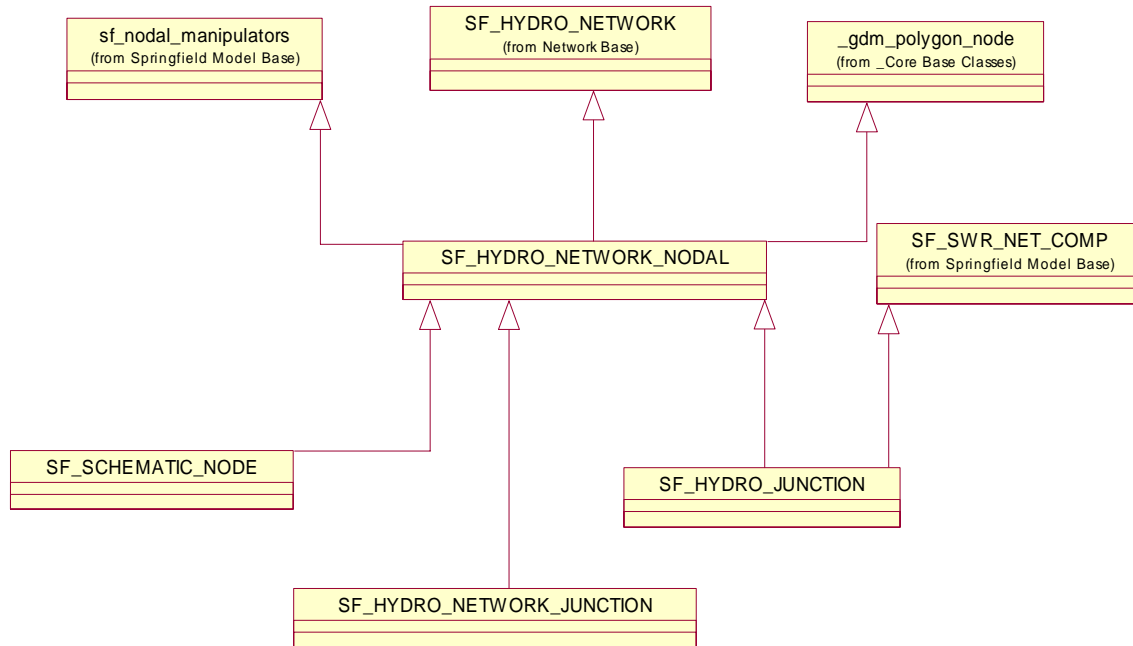
|                                               |                           |
|-----------------------------------------------|---------------------------|
| <b>Class Name:</b>                            | SF_EVT_SL_FTR_HST         |
| <b>Notes/Comments:</b>                        | Shoreline Feature History |
| <b>Storage Table Name in Schema:</b>          | SF_EVT_SL_FTR_HST         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                         |
| <b>Object Record Label (selection.format)</b> |                           |

| Attribute Name  | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|-----------------|-------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
| FTR_MOD_CD      | Varchar(10) |             | Modify Code     |               | LOV         | P                     |                 | See Appendix A |
| FTR_INPUT_CD    | Varchar(10) |             | Input Code      |               | LOV         | P                     |                 | See Appendix A |
| FTR_INTRP_CD    | Varchar(10) |             | Intrp Code      |               | LOV         | P                     |                 | See Appendix A |
| FTR_SRC_CD      | Varchar(10) |             | Source Code     |               | LOV         | P                     |                 | See Appendix A |
| FTR_SRC_DT      | Date        |             | Source Date     |               | DATE        | P                     |                 | See Appendix A |
| FTR_SRCSCALE_NR | Integer     |             | Src Scale No    |               | NUMBER      | P                     |                 | See Appendix A |
| FTR_ACCUR_NR    | Double      |             | Acc No          |               | NUMBER      | P                     |                 | See Appendix A |
| FTR_ORG_CD      | Varchar(10) |             | Org Code        |               | LOV         | P                     |                 | See Appendix A |
| FTR_EDIT_DT     | Date        |             | Last Edit Date  |               | DATE        | P                     |                 | See Appendix A |

|                                               |                      |
|-----------------------------------------------|----------------------|
| <b>Class Name:</b>                            | SF_HYDRO_POINT_EVENT |
| <b>Notes/Comments:</b>                        | Hydro Point Event    |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_POINT_EVENT |
| <b>JMS Controlled? (Y/N):</b>                 | Y                    |
| <b>Object Record Label (selection.format)</b> |                      |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                              |
|----------------|-------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|---------------------------------------------|
| ReachCode      | Varchar(30) | Y           | Reach Code      |               | String      | A                     |                 | An identifier for a river or stream segment |
| Measure        | Double      | Y           | Measure         |               | Number      | A                     |                 | Measure value for the point event           |

### 5.10 Network Nodal



#### Network Nodal Base Class Inheritance

|                                               |                                |
|-----------------------------------------------|--------------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_NETWORK_NODAL         |
| <b>Notes/Comments:</b>                        | Hydro Network Nodal Base Class |
| <b>Storage Table Name in Schema:</b>          |                                |
| <b>JMS Controlled? (Y/N):</b>                 | Y                              |
| <b>Object Record Label (selection.format)</b> |                                |

|                                               |                   |
|-----------------------------------------------|-------------------|
| <b>Class Name:</b>                            | SF_HYDRO_JUNCTION |
| <b>Notes/Comments:</b>                        | Hydro Junction    |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_JUNCTION |
| <b>JMS Controlled? (Y/N):</b>                 | Y                 |
| <b>Object Record Label (selection.format)</b> |                   |

| Attribute Name    | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type                  | ARCHydro (A) /PNW (P)/Hansen(H)/DHI (D) | Target FK class | NOTES/COMMENTS                                                     |
|-------------------|-------------|-------------|-----------------|---------------|------------------------------|-----------------------------------------|-----------------|--------------------------------------------------------------------|
| AncillaryRole     | Integer     | N           | Ancillary Role  |               | Number                       | A                                       |                 | Defines whether a junction is a sink, a source or neither of these |
| Enabled           | Integer     | N           | Enabled         | 1             |                              | A                                       |                 |                                                                    |
| NextDownID        | Integer     | N           | Next Down ID    |               |                              | A                                       |                 | HydroID of the next downstream hydrojunction                       |
| LengthDown        | Double      | N           | Length Down     |               | Number                       | A                                       |                 | Length to the nearest downstream sink (usually the basin outlet)   |
| DrainArea         | Double      | N           | Drain Area      |               | Number                       | A                                       |                 | The total upstream area draining to this Hydrojunction             |
| FType             | Varchar(30) | N           | F Type          |               | String                       | A                                       |                 | Descriptor of feature type                                         |
| SF_ABOVGRND       | Varchar(1)  | N           | Above Ground    |               | String                       | H                                       |                 |                                                                    |
| DHINodeType       | DHINodeType | N           | Node Type       |               | LOV                          | D                                       |                 | Subtype Field                                                      |
| SF_RINGSTYPE      | Varchar(4)  | N           | Rings Type      | CON           | LOV                          | H                                       |                 |                                                                    |
| SF_CONETYPE       | Varchar(4)  | N           | Cone Type       | CON           | LOV                          | H                                       |                 |                                                                    |
| SF_CHNLTYPE       | Varchar(4)  | N           | Channel Type    | CON           | LOV                          | H                                       |                 |                                                                    |
| SF_STEPSTYPE      | Varchar(4)  | N           | Steps Type      | CON           | LOV                          | H                                       |                 |                                                                    |
| SF_RIMELEV        | Varchar(15) | N           | Rim Elev        |               | Text                         | H                                       |                 |                                                                    |
| SF_WALLTYPE       | Varchar(4)  | N           | Wall Type       | CON           | LOV                          | H                                       |                 |                                                                    |
| SF_SWR_NODE_TYPE  | Varchar(6)  | N           | Node Type       | MH            | LOV                          | H                                       |                 |                                                                    |
| SF_FRAMETYPE      | Varchar(4)  | N           | Frame Type      | MET           | LOV                          | H                                       |                 |                                                                    |
| SF_DROPMH         | Varchar(1)  | N           | Drop Manhole    | Y             | "gui\$checkbox" { "Y", "N" } | H                                       |                 |                                                                    |
| SF_NEW_Z_COORD    | Double      | N           | New Z Coord     |               | Number                       | H                                       |                 |                                                                    |
| SF_NEW_Y_COORD    | Double      | N           | New Y Coord     |               | Number                       | H                                       |                 |                                                                    |
| SF_NEW_X_COORD    | Double      | N           | New X Coord     |               | Number                       | H                                       |                 |                                                                    |
| SF_COVER_TYPE     | Varchar(4)  | N           | Cover Type      |               | LOV                          | H                                       |                 |                                                                    |
| SF_COVER_DIAM     | double      | N           | Cover Diam      |               | Number                       | H                                       |                 |                                                                    |
| SF_BENCHTYPE      | Varchar(4)  | N           | Bench Type      | CON           | LOV                          | H                                       |                 |                                                                    |
| SF_BASETYPE       | Varchar(4)  | N           | Base Type       | RD            | LOV                          | H                                       |                 |                                                                    |
| SF_SWR_SOURCE_XYZ | Varchar(10) | N           | Source          | ASBLT         | LOV                          | H                                       |                 |                                                                    |

|          |        |   |       |  |        |   |  |
|----------|--------|---|-------|--|--------|---|--|
|          |        |   | XYZ   |  |        |   |  |
| SF_DEPTH | Double | N | Depth |  | Number | H |  |

DHINodeType

| COLUMN         | DATA TYPE   | KEY | DEFINITION OR VALID VLAUES |
|----------------|-------------|-----|----------------------------|
| RiverNode      | DHINodeType | 1   | Subtype Field              |
| HydroPowerNode | DHINodeType | 2   | Subtype Field              |
| WaterUserNode  | DHINodeType | 3   | Subtype Field              |
| ReservoirNode  | DHINodeType | 4   | Subtype Field              |

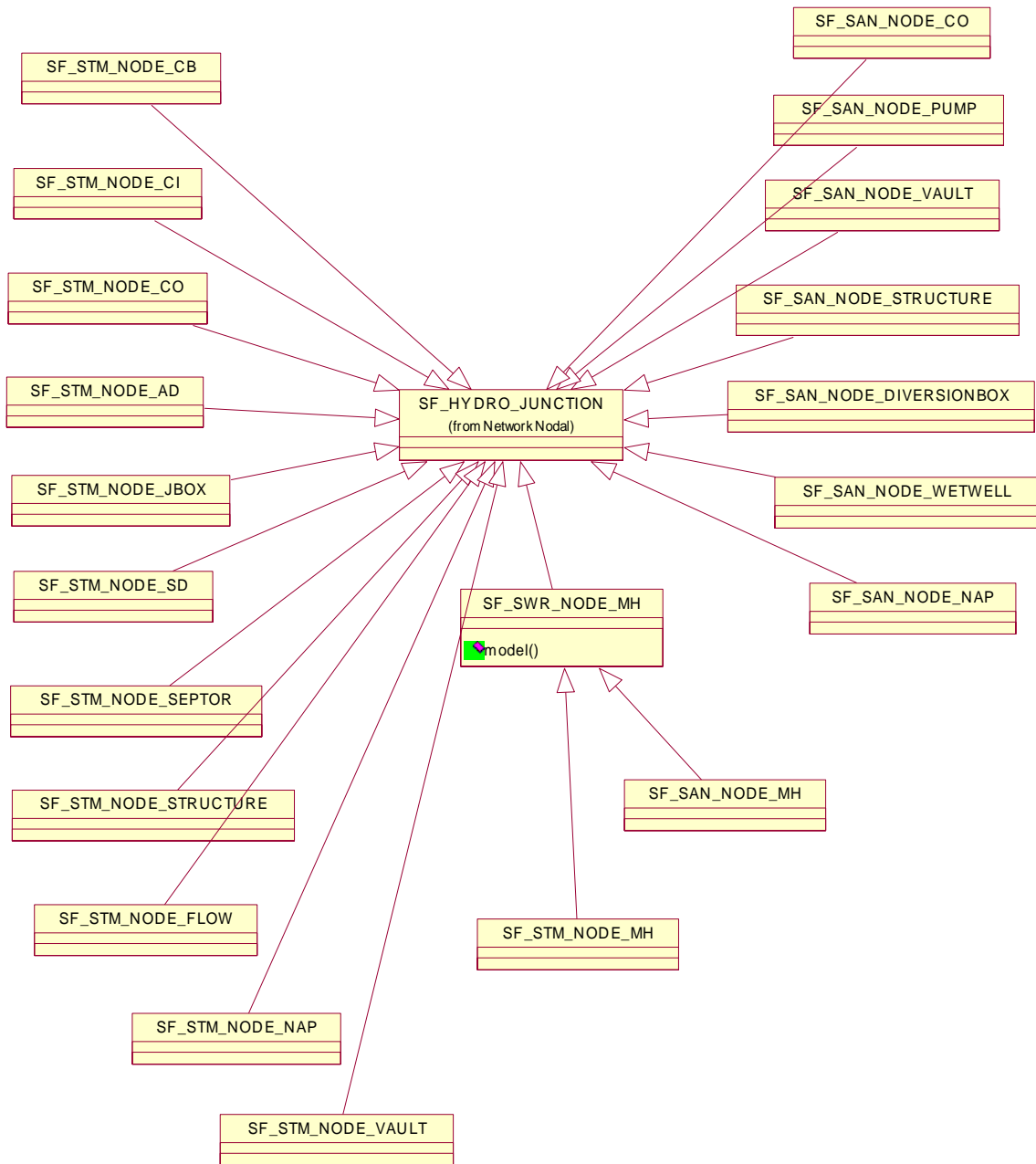
|                                               |                           |
|-----------------------------------------------|---------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_NETWORK_JUNCTION |
| <b>Notes/Comments:</b>                        | Hydro Network Junction    |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_NETWORK_JUNCTION |
| <b>JMS Controlled? (Y/N):</b>                 | Y                         |
| <b>Object Record Label (selection.format)</b> |                           |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
| Enabled        | Integer   | N           | Enabled         | 1             |             | A                     |                 |                |

|                                               |                   |
|-----------------------------------------------|-------------------|
| <b>Class Name:</b>                            | SF_SCHEMATIC_NODE |
| <b>Notes/Comments:</b>                        | Schematic Node    |
| <b>Storage Table Name in Schema:</b>          | SF_SCHEMATIC_NODE |
| <b>JMS Controlled? (Y/N):</b>                 | Y                 |
| <b>Object Record Label (selection.format)</b> |                   |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                          |
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|-----------------------------------------|
| FeatureID      | Integer   | Y           | Feature ID      |               | Number      | A                     |                 | HydroID of the associated hydro feature |

5.11 Network Pipe Nodal



Network Pipe Nodal Class Relationships – Note that these leaf classes exist in the current model. Please refer to the current model for the specifications of these classes.

**5.12 Object Data Render Requirements for Network Classes**

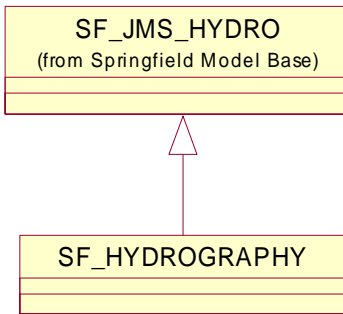
The following attributes will be rendered as object data on nodal network classes:

Spatialnet ID  
SF\_UNITID

The following attributes will be rendered as object data linear network classes:

Spatialnet ID  
SF\_UNITID  
SF\_UNITID2

**5.13 Hydrography Base**



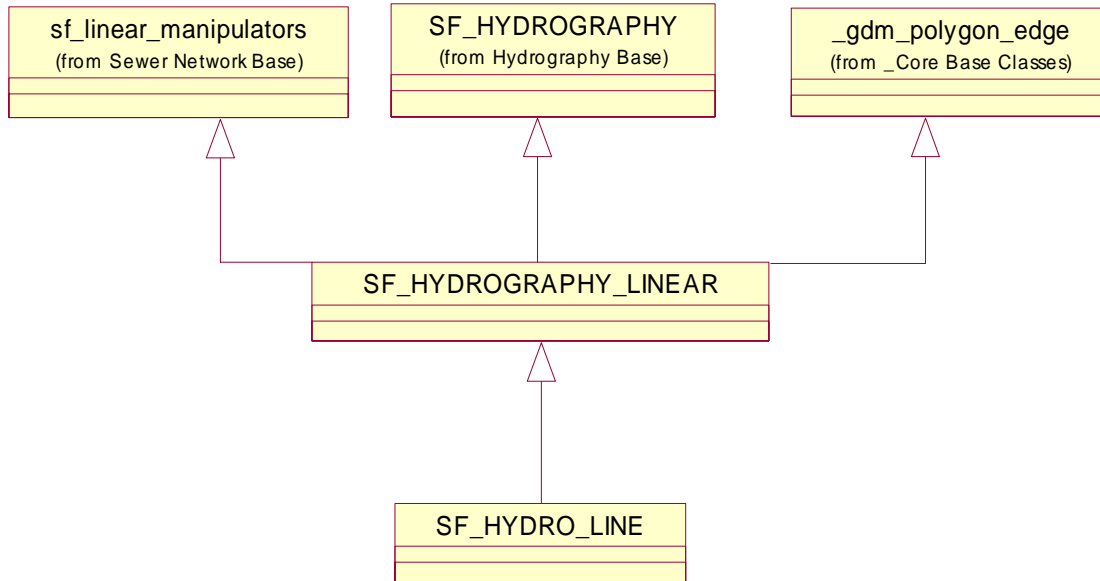
Hydrography Base Class Inheritance

|                                               |                        |
|-----------------------------------------------|------------------------|
| <b>Class Name:</b>                            | SF_HYDROGRAPHY         |
| <b>Notes/Comments:</b>                        | Hydrography Base Class |
| <b>Storage Table Name in Schema:</b>          |                        |
| <b>JMS Controlled? (Y/N):</b>                 | Y                      |
| <b>Object Record Label (selection.format)</b> |                        |

| Attribute Name | Data Type    | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS             |
|----------------|--------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------------------|
| FType          | Varchar(30)  | Y           | Feature Type    |               | Text        | A                     |                 | Descriptor of feature type |
| Name           | Varchar(100) | Y           | Geographic Name |               | Text        | A                     |                 | Geographic Name            |

**5.14 Hydrography Linear**



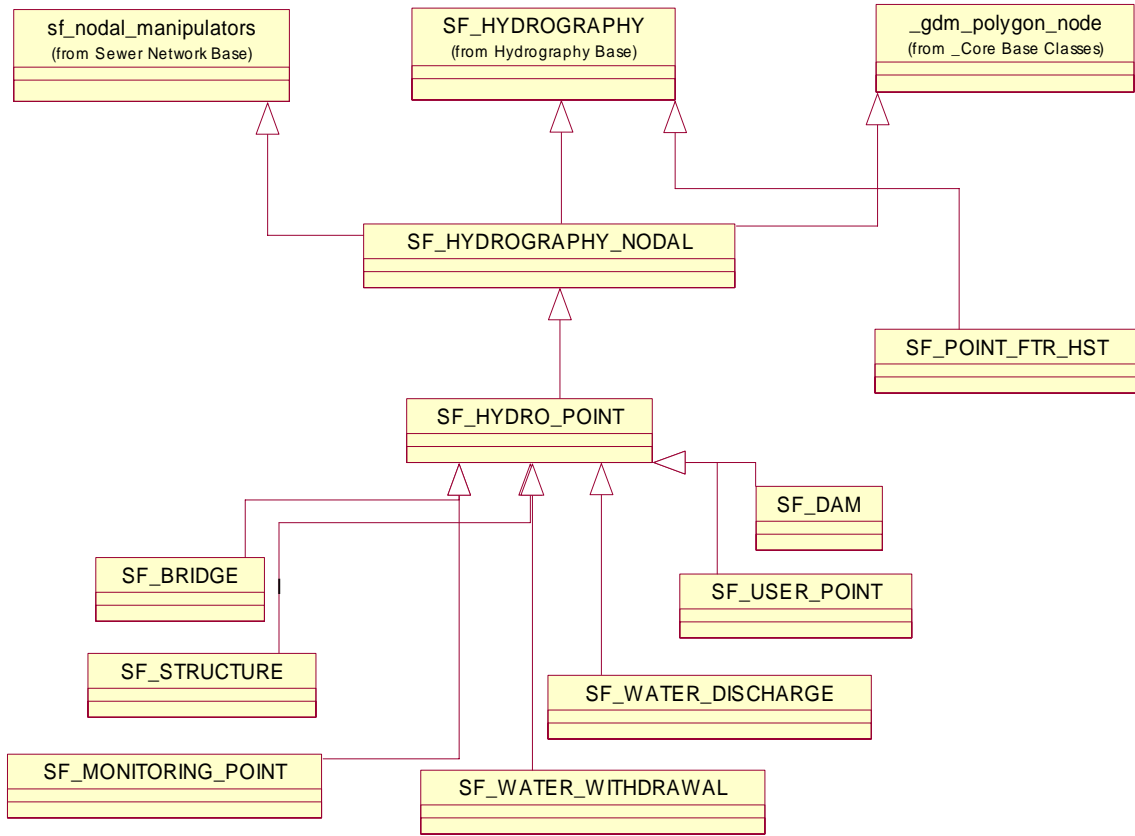


Hydrography Linear Class Inheritance

|                                               |                               |
|-----------------------------------------------|-------------------------------|
| <b>Class Name:</b>                            | SF_HYDROGRAPHY_LINEAR         |
| <b>Notes/Comments:</b>                        | Hydrography Linear Base Class |
| <b>Storage Table Name in Schema:</b>          |                               |
| <b>JMS Controlled? (Y/N):</b>                 | Y                             |
| <b>Object Record Label (selection.format)</b> |                               |

|                                               |                        |
|-----------------------------------------------|------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_LINE          |
| <b>Notes/Comments:</b>                        | Hydrography Line Class |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_LINE          |
| <b>JMS Controlled? (Y/N):</b>                 | Y                      |
| <b>Object Record Label (selection.format)</b> |                        |

### 5.15 Hydrography Nodal



Hydrography Nodal Class Inheritance



Hydrography Nodal Class Relationships

|                                               |                              |
|-----------------------------------------------|------------------------------|
| <b>Class Name:</b>                            | SF_HYDROGRAPHY_NODAL         |
| <b>Notes/Comments:</b>                        | Hydrography Nodal Base Class |
| <b>Storage Table Name in Schema:</b>          |                              |
| <b>JMS Controlled? (Y/N):</b>                 | Y                            |
| <b>Object Record Label (selection.format)</b> |                              |

|                                               |                         |
|-----------------------------------------------|-------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_POINT          |
| <b>Notes/Comments:</b>                        | Hydrography Point Class |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_POINT          |
| <b>JMS Controlled? (Y/N):</b>                 | Y                       |
| <b>Object Record Label (selection.format)</b> |                         |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                        |
|----------------|-------------|-------------|-----------------|---------------|----------------|-----------------------|-----------------|---------------------------------------|
| JunctionID     | Integer     | N           | Junction ID     |               | Number         | A                     |                 | HydroID of the related hydro junction |
| AREA           | Double      | Y           | Area            |               | Auto populated | P                     |                 | See Appendix A                        |
| PERIMETER      | Double      | Y           | Perimeter       |               | Auto populated | P                     |                 | See Appendix A                        |
| WP_NO          | Integer     | Y           | Point #         |               | Number         | P                     |                 | See Appendix A                        |
| WP_ID          | Varchar(40) | N           | Point ID        |               | Text           | P                     |                 | See Appendix A                        |
| WP_LLID_NR     | Integer     | N           | Point LLID      |               | Number         | P                     |                 | See Appendix A                        |
| WP_HYDR_FTR_CD | Varchar(10) | N           | Hydro Feat Code |               | LOV            | P                     |                 | See Appendix A                        |
| WP_CART_FTR_CD | Varchar(10) | N           | Carto Feat Code |               | LOV            | P                     |                 | See Appendix A                        |
| WP_PERIOD_CD   | Varchar(10) | N           | Period Code     |               | LOV            | P                     |                 | See Appendix A                        |

|                                               |              |
|-----------------------------------------------|--------------|
| <b>Class Name:</b>                            | SF_BRIDGE    |
| <b>Notes/Comments:</b>                        | Bridge Class |
| <b>Storage Table Name in Schema:</b>          |              |
| <b>JMS Controlled? (Y/N):</b>                 | Y            |
| <b>Object Record Label (selection.format)</b> |              |

|                                               |                 |
|-----------------------------------------------|-----------------|
| <b>Class Name:</b>                            | SF_STRUCTURE    |
| <b>Notes/Comments:</b>                        | Structure Class |
| <b>Storage Table Name in Schema:</b>          |                 |
| <b>JMS Controlled? (Y/N):</b>                 | Y               |
| <b>Object Record Label (selection.format)</b> |                 |

|                                               |                        |
|-----------------------------------------------|------------------------|
| <b>Class Name:</b>                            | SF_MONITORING_POINT    |
| <b>Notes/Comments:</b>                        | Monitoring Point Class |
| <b>Storage Table Name in Schema:</b>          |                        |
| <b>JMS Controlled? (Y/N):</b>                 | Y                      |
| <b>Object Record Label (selection.format)</b> |                        |

|                                               |           |
|-----------------------------------------------|-----------|
| <b>Class Name:</b>                            | SF_DAM    |
| <b>Notes/Comments:</b>                        | Dam Class |
| <b>Storage Table Name in Schema:</b>          |           |
| <b>JMS Controlled? (Y/N):</b>                 | Y         |
| <b>Object Record Label (selection.format)</b> |           |

|                        |                  |
|------------------------|------------------|
| <b>Class Name:</b>     | SF_USER_POINT    |
| <b>Notes/Comments:</b> | User Point Class |

|                                               |   |
|-----------------------------------------------|---|
| <b>Storage Table Name in Schema:</b>          |   |
| <b>JMS Controlled? (Y/N):</b>                 | Y |
| <b>Object Record Label (selection.format)</b> |   |

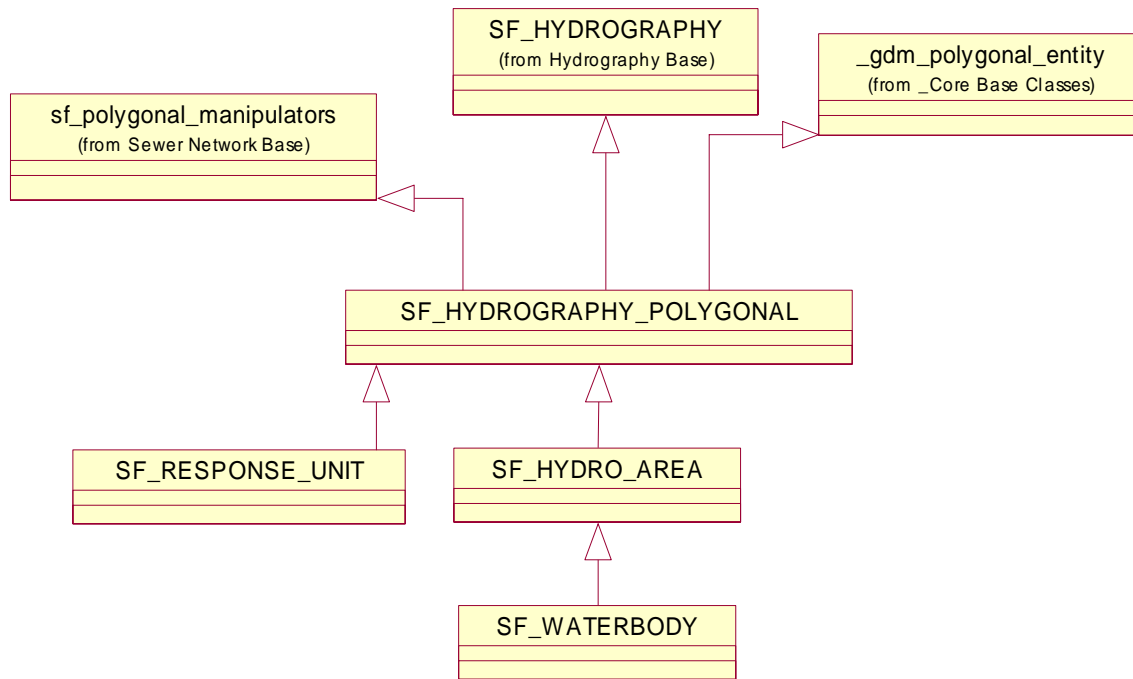
|                                               |                       |
|-----------------------------------------------|-----------------------|
| <b>Class Name:</b>                            | SF_WATER_DISCHARGE    |
| <b>Notes/Comments:</b>                        | Water Discharge Class |
| <b>Storage Table Name in Schema:</b>          |                       |
| <b>JMS Controlled? (Y/N):</b>                 | Y                     |
| <b>Object Record Label (selection.format)</b> |                       |

|                                               |                        |
|-----------------------------------------------|------------------------|
| <b>Class Name:</b>                            | SF_HYDRO_WITHDRAWAL    |
| <b>Notes/Comments:</b>                        | Water Withdrawal Class |
| <b>Storage Table Name in Schema:</b>          |                        |
| <b>JMS Controlled? (Y/N):</b>                 | Y                      |
| <b>Object Record Label (selection.format)</b> |                        |

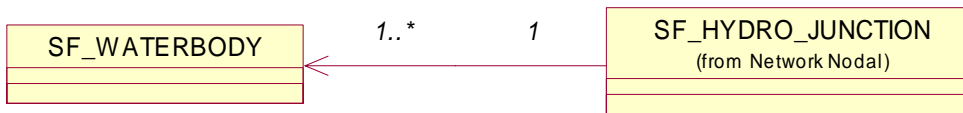
|                                               |                             |
|-----------------------------------------------|-----------------------------|
| <b>Class Name:</b>                            | SF_POINT_FTR_HST            |
| <b>Notes/Comments:</b>                        | Point Feature History Class |
| <b>Storage Table Name in Schema:</b>          | SF_POINT_FTR_HST            |
| <b>JMS Controlled? (Y/N):</b>                 | Y                           |
| <b>Object Record Label (selection.format)</b> |                             |

| Attribute Name  | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|-----------------|-------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
| WP_LLID_NR      | Integer     | Y           | Point LL ID     |               | Number      | P                     |                 | See Appendix A |
| FTR_MOD_CD      | Varchar(10) | Y           | Modify Code     |               | LOV         | P                     |                 | See Appendix A |
| FTR_INPUT_CD    | Varchar(10) | Y           | Input Code      |               | LOV         | P                     |                 | See Appendix A |
| FTR_INTRP_CD    | Varchar(10) | Y           | Intrp Code      |               | LOV         | P                     |                 | See Appendix A |
| FTR_SRC_CD      | Varchar(10) | Y           | Source Code     |               | LOV         | P                     |                 | See Appendix A |
| FTR_SRC_DT      | Date        | Y           | Source Date     |               | DATE        | P                     |                 | See Appendix A |
| FTR_SRCSCALE_NR | Integer     | Y           | Src Scale No    |               | NUMBER      | P                     |                 | See Appendix A |
| FTR_ACCUR_NR    | Double      | Y           | Acc No          |               | NUMBER      | P                     |                 | See Appendix A |
| FTR_ORG_CD      | Varchar(10) | Y           | Org Code        |               | LOV         | P                     |                 | See Appendix A |
| FTR_EDIT_DT     | Date        | Y           | Last Edit Date  |               | DATE        | P                     |                 | See Appendix A |

### 5.16 Hydrography Polygonal



Hydrography Polygonal Class Inheritance



Hydrography Polygonal Class Relationships

|                                               |                                  |
|-----------------------------------------------|----------------------------------|
| <b>Class Name:</b>                            | SF_HYDROGRAPHY_POLYGONAL         |
| <b>Notes/Comments:</b>                        | Hydrography Polygonal Base Class |
| <b>Storage Table Name in Schema:</b>          |                                  |
| <b>JMS Controlled? (Y/N):</b>                 | Y                                |
| <b>Object Record Label (selection.format)</b> |                                  |

|                                               |                           |
|-----------------------------------------------|---------------------------|
| <b>Class Name:</b>                            | SF_RESPONSE_UNIT          |
| <b>Notes/Comments:</b>                        | Hydrography Response Unit |
| <b>Storage Table Name in Schema:</b>          | SF_RESPONSE_UNIT          |
| <b>JMS Controlled? (Y/N):</b>                 | Y                         |
| <b>Object Record Label (selection.format)</b> |                           |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|

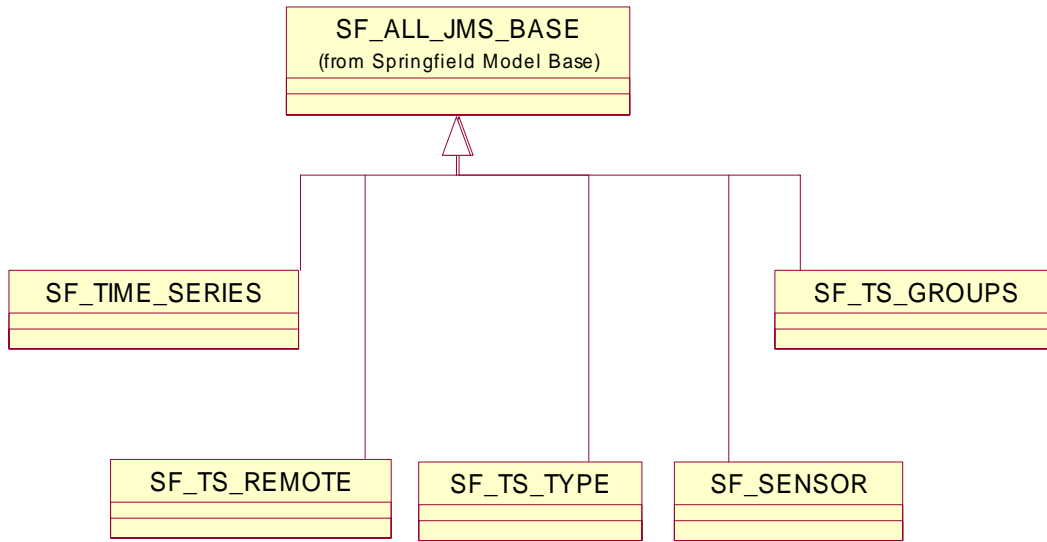
|          |        |   |      |  |                         |   |  |                           |
|----------|--------|---|------|--|-------------------------|---|--|---------------------------|
| AreaSqKm | Double | Y | Area |  | Number (Auto populated) | A |  | Area in square kilometers |
|----------|--------|---|------|--|-------------------------|---|--|---------------------------|

|                                               |                  |
|-----------------------------------------------|------------------|
| <b>Class Name:</b>                            | SF_HYDRO_AREA    |
| <b>Notes/Comments:</b>                        | Hydrography Area |
| <b>Storage Table Name in Schema:</b>          | SF_HYDRO_AREA    |
| <b>JMS Controlled? (Y/N):</b>                 | Y                |
| <b>Object Record Label (selection.format)</b> |                  |

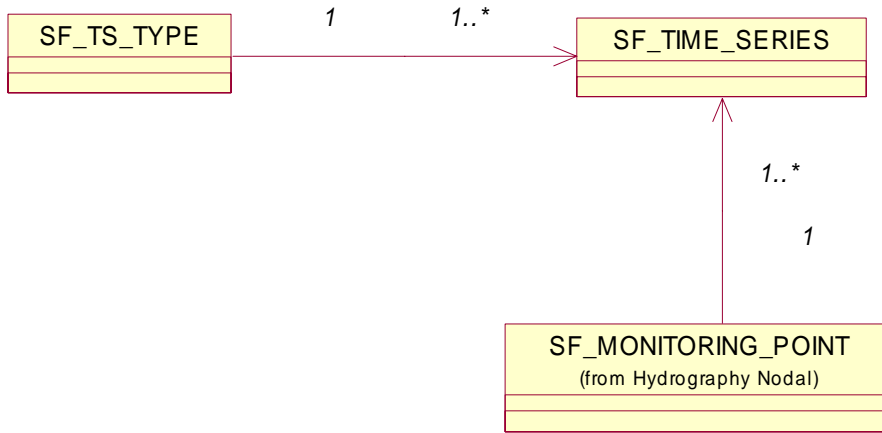
|                                               |              |
|-----------------------------------------------|--------------|
| <b>Class Name:</b>                            | SF_WATERBODY |
| <b>Notes/Comments:</b>                        | Waterbody    |
| <b>Storage Table Name in Schema:</b>          | SF_WATERBODY |
| <b>JMS Controlled? (Y/N):</b>                 | Y            |
| <b>Object Record Label (selection.format)</b> |              |

| Attribute Name | Data Type    | Mand-atory? | Attribute Label | Default value | Picker Type             | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                                         |
|----------------|--------------|-------------|-----------------|---------------|-------------------------|-----------------------|-----------------|--------------------------------------------------------|
| AreaSqKm       | Double       | Y           | Area            |               | Number (Auto populated) | A                     |                 | Area in square kilometers                              |
| JunctionID     | Integer      | N           | Junction ID     |               | Auto populated          | A                     |                 | HydroID of the hydro junction at the water body outlet |
| AREA           | Double       | Y           | Area            |               | Auto populated          | P                     |                 | See Appendix A                                         |
| PERIMETER      | Double       | Y           | Perimeter       |               | Auto populated          | P                     |                 | See Appendix A                                         |
| WB_NO          | Integer      | Y           | WB #            |               | Number                  | P                     |                 | See Appendix A                                         |
| WB_ID          | Varchar(40)  | N           | WB ID           |               | Text                    | P                     |                 | See Appendix A                                         |
| WB_LLID_NR     | Integer      | N           | WB LLID         |               | Number                  | P                     |                 | See Appendix A                                         |
| WB_HYDR_FTR_CD | Varchar(10)  | N           | Hydro Feat Code |               | LOV                     | P                     |                 | See Appendix A                                         |
| WB_CART_FTR_CD | Varchar(10)  | N           | Carto Feat Code |               | LOV                     | P                     |                 | See Appendix A                                         |
| WB_GNIS_NM     | Varchar(100) | Y           | GNIS Name       |               | Text                    | P                     |                 | See Appendix A                                         |
| WB_GNIS_NR     | Varchar(50)  | Y           | GNIS Number     |               | Text                    | P                     |                 | See Appendix A                                         |
| WB_PERIOD_CD   | Varchar(10)  | N           | Period Code     |               | LOV                     | P                     |                 | See Appendix A                                         |

5.17 Hydrography Time Series



Hydrography Time Series Class Inheritance



Hydrography Time Series Class Relationships

|                                               |                                    |
|-----------------------------------------------|------------------------------------|
| <b>Class Name:</b>                            | SF_TS_TYPE                         |
| <b>Notes/Comments:</b>                        | Index of Types of Time Series Data |
| <b>Storage Table Name in Schema:</b>          | SF_TS_TYPE                         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                                  |
| <b>Object Record Label (selection.format)</b> |                                    |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS         |
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|------------------------|
| FeatureID      | Integer   | N           | Feature ID      |               | Number      | A                     |                 | HydroID of the feature |

|            |         |   |           |  |                  |   |  |                                        |
|------------|---------|---|-----------|--|------------------|---|--|----------------------------------------|
|            |         |   |           |  | (Auto populated) |   |  | described by the time series           |
| TSTypeID   | Integer | Y | TS Type   |  | LOV              | A |  | Identifier for the type of time series |
| TSDatetime | Date    | Y | Date-Time |  | Date             | A |  | Date and time of the time series value |
| TSValue    | Double  | Y | Value     |  | Number           | A |  | Time Series Value                      |

|                                               |                |
|-----------------------------------------------|----------------|
| <b>Class Name:</b>                            | SF_TIME_SERIES |
| <b>Notes/Comments:</b>                        | Time Series    |
| <b>Storage Table Name in Schema:</b>          | SF_TIME_SERIES |
| <b>JMS Controlled? (Y/N):</b>                 | Y              |
| <b>Object Record Label (selection.format)</b> |                |

| Attribute Name | Data Type    | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                                                     |
|----------------|--------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|--------------------------------------------------------------------|
| TSTypeID       | Integer      | Y           | TS Type         |               | LOV         | A                     |                 | Identifier for the type of time series                             |
| Variable       | Varchar(30)  | N           | Variable        |               | Text        | A                     |                 | The variable described by the time series, like streamflow         |
| Units          | Varchar(30)  | N           | Units           |               | Text        | A                     |                 | Units of Measurement                                               |
| IsRegular      | Integer      | N           | Regular         |               | checkbox    | A                     |                 | Whether data regularly or irregularly measured by time             |
| TSInterval     | Integer      | N           | Interval        |               | LOV         | A                     |                 | Time Interval represented by each measurement                      |
| DataType       | Integer      | N           | Data Type       |               | LOV         | A                     |                 | Type of time series data e.g. instantaneous, cumulative            |
| Origin         | Integer      | N           | Origin          |               | LOV         | A                     |                 | Origin of the time series data                                     |
| TSName         | Varchar(30)  | N           | Name            |               | Text        | D                     |                 | Name of time series                                                |
| Tablename      | Varchar(30)  | N           | Tablename       |               | Text        | D                     |                 | Name of the table in the geodatabase holding time series           |
| TSGroupID      | Integer      | Y           | TS Group        |               | Number      | D                     |                 | Specifies the ID of the group                                      |
| ItemIndex      | Integer      | N           | Item Index      |               | Number      | D                     |                 | Defines the position of the item in the time series                |
| TimeType       | DHITimeTypes | N           | Time Type       |               | LOV         | D                     |                 | Domain defining the type of time values being held.                |
| ValueType      | EUMValueType | N           | Value Type      |               | LOV         | D                     |                 | Domain defining the type data being measured                       |
| ValueUnits     | EUMValueType | N           | Value Units     |               | LOV         | D                     |                 | Domain defining the Units of the values being measured             |
| XAxisType      | EUMXAxisType | N           | X Axis Type     |               | LOV         | D                     |                 | Domain defining the type of Xaxis being used to measure the values |
| StartTime      | Date         | N           | Start Time      |               | Date        | D                     |                 | The beginning date/time entry of the time series                   |
| EndTime        | Date         | N           | End Time        |               | Date        | D                     |                 | Then ending date/time entry of the time series                     |



|          |                |   |          |  |     |   |  |                                                 |
|----------|----------------|---|----------|--|-----|---|--|-------------------------------------------------|
| Location | TSLocationType | N | Location |  | LOV | D |  | Domain defining the location of the time series |
|----------|----------------|---|----------|--|-----|---|--|-------------------------------------------------|

DHITimeTypes Domain Values:

0. Undefined
1. EquidistantTime
2. NonEquidistantTime
3. EquidistantCalendar
4. NonEquidistantCaldendar

TSLocationType Domain Values:

0. Undefined
1. EquidistantTime

EUMValueType Domain Values:

The domain values are too numerous to list here and is auto-generated by a dll provided by DHI with the TimeSeries Manager

EUMValueUnits Domain Values:

The domain values are too numerous to list here and is auto-generated by a dll provided by DHI with the TimeSeries Manager

EUMXAxisType Domain Values:

The domain values are too numerous to list here and is auto-generated by a dll provided by DHI with the TimeSeries Manager

|                                               |                                                                          |
|-----------------------------------------------|--------------------------------------------------------------------------|
| <b>Class Name:</b>                            | SF_TS_REMOTE                                                             |
| <b>Notes/Comments:</b>                        | Class for holding the reference to time series data that is being stored |
| <b>Storage Table Name in Schema:</b>          | SF_TS_REMOTE                                                             |
| <b>JMS Controlled? (Y/N):</b>                 | Y                                                                        |
| <b>Object Record Label (selection.format)</b> |                                                                          |

| Attribute Name  | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P)/DHI (D) | Target FK class | NOTES/COMMENTS                                                            |
|-----------------|-------------|-------------|-----------------|---------------|-------------|-------------------------------|-----------------|---------------------------------------------------------------------------|
| TimeSeriesID    | Integer     | Y           | TS ID           |               | Number      | D                             |                 | Specifies the ID of the Time Series                                       |
| TSItemNum       | Varchar(30) | N           | Item No         |               | String      | D                             |                 | Holds the position index value of the item                                |
| TSBridge        | Double      | N           | Bridge          |               | Number      | D                             |                 | Identifies the bridge to be used to access the remote time series         |
| TSSpecification | Varchar(30) | N           | Spec            |               | String      | D                             |                 | Holds the specification string (SQL) needed for accessing the time series |
| TSUserName      | Varchar(30) | N           | User name       |               | String      | D                             |                 | Holds the user name required for making a connection to the               |

|                |             |   |               |  |        |   |  |                                                                            |
|----------------|-------------|---|---------------|--|--------|---|--|----------------------------------------------------------------------------|
|                |             |   |               |  |        |   |  | remote database.                                                           |
| TSUserPassword | Varchar(30) | N | User password |  | String | D |  | Holds the password required for making a connection to the remote database |

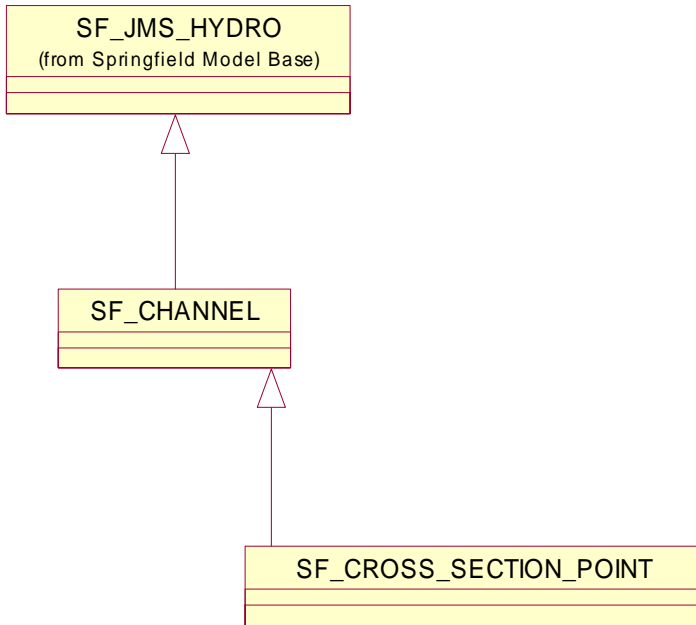
|                                               |                                            |
|-----------------------------------------------|--------------------------------------------|
| <b>Class Name:</b>                            | SF_SENSOR                                  |
| <b>Notes/Comments:</b>                        | Class for linking Features and Time Series |
| <b>Storage Table Name in Schema:</b>          | SF_SENSOR                                  |
| <b>JMS Controlled? (Y/N):</b>                 | Y                                          |
| <b>Object Record Label (selection.format)</b> |                                            |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P)/DHI (D) | Target FK class | NOTES/COMMENTS                                                      |
|----------------|-------------|-------------|-----------------|---------------|-------------|-------------------------------|-----------------|---------------------------------------------------------------------|
| TimeSeriesID   | Integer     | Y           | TS ID           |               | Number      | D                             |                 | Specifies the ID of the Time Series                                 |
| FeatureID      | Integer     | N           | Feature ID      |               | Number      | D                             |                 | Specifies the ID of the Feature                                     |
| FeatureClass   | Varchar(30) | N           | Feature Class   |               | String      | D                             |                 | Identifies the Feature Class of the feature identified by FeatureID |
| SensorName     | Varchar(30) | N           | Sensor Name     |               | String      | D                             |                 | User determined name for sensor                                     |
| MeasureID      | Integer     | Y           | Measure ID      |               | Number      | D                             |                 | Specifies the ID of the Measurement                                 |

|                                               |                                           |
|-----------------------------------------------|-------------------------------------------|
| <b>Class Name:</b>                            | SF_TS_GROUPS                              |
| <b>Notes/Comments:</b>                        | Class for holding time series group names |
| <b>Storage Table Name in Schema:</b>          | SF_TS_GROUPS                              |
| <b>JMS Controlled? (Y/N):</b>                 | Y                                         |
| <b>Object Record Label (selection.format)</b> |                                           |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P)/DHI (D) | Target FK class | NOTES/COMMENTS                   |
|----------------|-------------|-------------|-----------------|---------------|-------------|-------------------------------|-----------------|----------------------------------|
| TSGroupName    | Varchar(30) | N           | Group Name      |               | String      | D                             |                 | Identifies the name of the Group |

**5.18 Channel Base**



Channel Base Class Inheritance

|                                               |                    |
|-----------------------------------------------|--------------------|
| <b>Class Name:</b>                            | SF_CHANNEL         |
| <b>Notes/Comments:</b>                        | Channel Base Class |
| <b>Storage Table Name in Schema:</b>          | SF_CHANNEL         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                  |
| <b>Object Record Label (selection.format)</b> |                    |

| Attribute Name | Data Type | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS |
|----------------|-----------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|----------------|
|                |           |             |                 |               |             |                       |                 |                |
|                |           |             |                 |               |             |                       |                 |                |
|                |           |             |                 |               |             |                       |                 |                |

|                                               |                           |
|-----------------------------------------------|---------------------------|
| <b>Class Name:</b>                            | SF_CROSS_SECTION_POINT    |
| <b>Notes/Comments:</b>                        | Cross Section Point Class |
| <b>Storage Table Name in Schema:</b>          | SF_CROSS_SECTION_POINT    |
| <b>JMS Controlled? (Y/N):</b>                 | Y                         |
| <b>Object Record Label (selection.format)</b> |                           |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P)/DHI (D) | Target FK class | NOTES/COMMENTS                    |
|----------------|-------------|-------------|-----------------|---------------|----------------|-------------------------------|-----------------|-----------------------------------|
| CSCode         | Varchar(30) | N           | CS Code         | Null          | Auto populated | A                             |                 | An identifier for a cross section |
| CrossM         | Double      | N           | Cross           | Null          | Auto           | A                             |                 | The measure location              |

|             |                |   |              |      |                |   |  |                                             |
|-------------|----------------|---|--------------|------|----------------|---|--|---------------------------------------------|
|             |                |   | Measure      |      | populated      |   |  | of the point along the cross section        |
| Elevation   | Double         | N | Elevation    | Null | Auto populated | A |  | Elevation of the point above mean sea level |
| Resistance  | Double         | N | Resistance   |      | Number         | D |  |                                             |
| MarkType    | DHIMarkType    | N | Mark Type    |      | LOV            | D |  |                                             |
| UserMarker  | Integer        | N | User Marker  |      | Number         | D |  |                                             |
| SegmentType | DHISegmentType | N | Segment Type |      | LOV            | D |  |                                             |
| VegDepth    | double         | N | Veg Depth    |      | Number         | D |  |                                             |

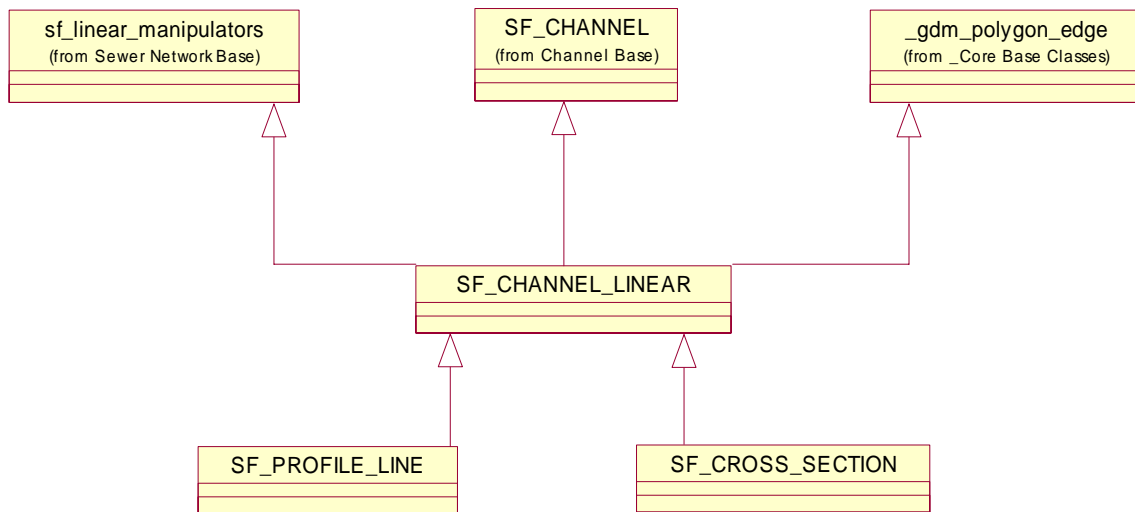
DHIMARKERTYPE DOMAIN VALUES:

- 0. NOMARK
- 1. LEFTLEVEE
- 2. LOWEST
- 4. RIGHTLEVEE
- 8. LEFTLOWFLOW
- 16. RIGHTLOWFLOW
- 32. LEFTCOORD
- 64. RIGHTCOORD
- 128. LEFTCHANNELBANK
- 256. RIGHTCHANNELBANK

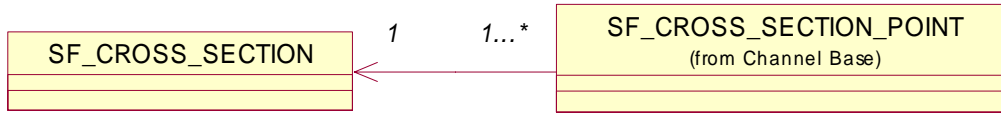
DHISEGMENTTYPE DOMAIN VALUES:

- 1. NORMAL
- 2. DEADWATER
- 3. VEGETATION
- 4. BANKVEGETATION

5.19 Channel Linear



Channel Linear Class Inheritance



Channel Linear Class Relationships

|                                               |                           |
|-----------------------------------------------|---------------------------|
| <b>Class Name:</b>                            | SF_CHANNEL_LINEAR         |
| <b>Notes/Comments:</b>                        | Channel Linear Base Class |
| <b>Storage Table Name in Schema:</b>          | SF_CHANNEL_LINEAR         |
| <b>JMS Controlled? (Y/N):</b>                 | Y                         |
| <b>Object Record Label (selection.format)</b> |                           |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                              |
|----------------|-------------|-------------|-----------------|---------------|----------------|-----------------------|-----------------|---------------------------------------------|
| ShapeLength    | Double      | Y           | ShapeLength     |               | Auto populated | A                     |                 | Lenth of linear entity                      |
| ShapeArea      | Double      | Y           | ShapeArea       |               | Auto populated | A                     |                 | Area of linear entity                       |
| ReachCode      | Varchar(30) | N           | Reach Code      |               | Text           | A                     |                 | An identifier for a river or stream segment |
| RiverCode      | Varchar(30) | N           | River Code      |               | Text           | A                     |                 | An identifier for a river                   |

|                                               |                                                                                                                                                                                   |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Class Name:</b>                            | SF_PROFILE_LINE                                                                                                                                                                   |
| <b>Notes/Comments:</b>                        | Profile Line Class – This class is not currently used by DHI, however has been left in the model so that SPATIALnet fully supports storage of all the standard ArchHydro classes. |
| <b>Storage Table Name in Schema:</b>          | SF_PROFILE_LINE                                                                                                                                                                   |
| <b>JMS Controlled? (Y/N):</b>                 | Y                                                                                                                                                                                 |
| <b>Object Record Label (selection.format)</b> |                                                                                                                                                                                   |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type | ARCHydro (A) /PNW (P) | Target FK class | NOTES/COMMENTS                                                   |
|----------------|-------------|-------------|-----------------|---------------|-------------|-----------------------|-----------------|------------------------------------------------------------------|
| Ftype          | Varchar(30) | N           | Feature Type    | Null          | Text        | A                     |                 | Descriptor of feature type                                       |
| ProfOrigin     | Varchar(30) | N           | Origin          | Null          | Text        | A                     |                 | A classifier for the method by which the profileline was defined |

|                                      |                     |
|--------------------------------------|---------------------|
| <b>Class Name:</b>                   | SF_CROSS_SECTION    |
| <b>Notes/Comments:</b>               | Cross Section Class |
| <b>Storage Table Name in Schema:</b> | SF_CROSS_SECTION    |

|                                               |   |
|-----------------------------------------------|---|
| <b>JMS Controlled? (Y/N):</b>                 | Y |
| <b>Object Record Label (selection.format)</b> |   |

| Attribute Name | Data Type   | Mand-atory? | Attribute Label | Default value | Picker Type    | ARCHydro (A) /PNW (P)/DHI (D) | Target FK class | NOTES/COMMENTS                                                     |
|----------------|-------------|-------------|-----------------|---------------|----------------|-------------------------------|-----------------|--------------------------------------------------------------------|
| CSCode         | Varchar(30) | N           | CS Code         | Null          | Auto populated | A                             |                 | An identifier for a cross section                                  |
| JunctionID     | Integer     | N           | Junction ID     |               | Number         | A                             |                 | HydroID of the related hydro junction                              |
| CSOrigin       | Varchar(30) | N           | Origin          | Null          | Text           | A                             |                 | A classifier for the method by which the cross section was defined |
| ProfileM       | Double      | N           | Profile Measure | Null          | Auto populated | A                             |                 | The measure location of the cross section along the stream profile |
| RiverName      | Varchar(30) | N           | River Name      |               | String         | D                             |                 | User assigned name for the river                                   |
| TopoID         | Integer     | N           | MIKE II Ident   |               | Number         | D                             |                 | MIKE 11 Identifier for the river                                   |
| CSName         | Varchar(30) | N           | Name            |               | String         | D                             |                 | User assigned name for the CrossSection                            |

## 5.20 Appendix A

### 5.20.1 SF\_DRAINAGE\_AREA Class Attribute Comments

#### 5.20.1.1 AREA

Area of the feature in coverage units, value is assigned by the software.

#### 5.20.1.2 PERIMETER

Perimeter of the feature in coverage units; value is assigned by the software

#### 5.20.1.3 HU\_BOUNDARY# (or HU<mmddy>#)

An internal feature identifier; value is assigned by software.

#### 5.20.1.4 HU\_BOUNDARY-ID (or HU<mmddy>-ID)

Feature identifier assigned by user. This item is not used but must be present for the software.

#### 5.20.1.5 ACRES

Area of polygon in GIS acres. This item is to be generated from the internal ArcInfo item called "Area."

Example: 34476.917

#### 5.20.1.6 HUC\_NUM

Hydrologic Unit Field Code. In order to identify an area, be it 1st through Nth Levels, each is

assigned the combination of Levels which comprise it. Starting at the uppermost end of the drainage, the first 7th level hydrologic unit would be assigned the code 01 for the 13th and 14th digits.

Example: 170102150104XXXX

### **5.20.1.7 HUC\_TYPE**

Hydrologic Unit Types. This item allows users to query hydrologic units based on composition type.

Information is presented as a running string where each individual character of the string represents the composition type of a particular unit (e.g.- character number "1" represents the composition type of a "1st level" unit, character number "2" represents the composition type of a "2nd level" unit, etc). Where a hydrologic unit level has not been delineated or the type has yet to be classified, an "X" serves as a placeholder. This is an optional item that may be populated for 1st through 8th level units where deemed necessary.

Example: Closed Basin

Domain Value: T

Domain Value Definition: True, pure, or "classic" hydrologic units are land areas having all the surface drainage within its boundary converging at a single point.

Domain Value: C

Domain Value Definition:

Composite hydrologic units, or remnant areas are drainage areas typically formed as the residual areas after delineation of classic watersheds. The most common example of a remnant area is the small triangular wedge between the boundaries of adjacent hydrologic units flowing into the same side of another stream.

Domain Value: F

Domain Value Definition: Frontal hydrologic units are areas that include multiple, nonconvergent rivers. Frontal units would most likely be related to hydrologic units feeding into the Pacific Ocean or Columbia River.

Domain Value: X

Domain Value Definition: Unclassified hydrologic units

Domain Value: S

Domain Value Definition:

Domain Value: R

Domain Value Definition

### **5.20.1.8 REGION\_NAME**

1st Field Hydrologic Unit Naming Protocol

Example: PACIFIC NORTHWEST

### **5.20.1.9 SUBREGION\_NAME**

2nd Field Hydrologic Unit Naming Protocol

Example: UPPER COLUMBIA

### **5.20.1.10 BASIN\_NAME**

3rd Field Hydrologic Unit Naming Protocol

Example: SPOKANE

**5.20.1.11 SUBBASIN\_NAME**

4th Field Hydrologic Unit Naming Protocol  
Example: PRIEST

**5.20.1.12 WATERSHED\_NAME**

5th Field Hydrologic Unit Naming Protocol  
Example: COLUMBIA RIVER/LYNCH COULEE

**5.20.1.13 SUBWAT\_NAME**

6th Field Hydrologic Unit Naming Protocol  
Example: SOUTH SALMON RIVER

**5.20.1.14 CATCHMENT\_NAME**

7th Field Hydrologic Unit Naming Protocol

**5.20.1.15 SUBCATCH\_NAME**

8th Field Hydrologic Unit Naming Protocol

**5.20.1.16 OLD\_HUCNUM**

Historic Hydrologic Unit Number. Because of the national requirement for sequential downstream numbering of hydrologic units, there may be instances where the new hydrologic unit numbers may not be consistent with some historical hydrologic unit numbers. With the renumbering of the hydrologic units, a link may be needed to assist users in identifying hydrologic units based on the historical hydrologic unit numbers.  
Example: 17020010

**5.20.1.17 STATES**

State(s) containing HU polygon. This attribute should include the names of all states that a hydrologic unit falls within. Use the two-digit postal code abbreviation and sort the states in alphabetical order with a comma ??or hyphen?? separating each state.

Example: ID

Domain Value: OR

Domain Value Definition: Oregon

Domain Value: CA

Domain Value Definition: California

Domain Value: NV

Domain Value Definition: Nevada

Domain Value: ID

Domain Value Definition: Idaho

Domain Value: WA

Domain Value Definition: Washington

**5.20.1.18 NCONTRIB\_DA**

Drainage areas that do not flow toward the outlet of any hydrologic unit are considered noncontributing



areas. Such areas may be due to glaciated plains (potholes), enclosed basins, karst topography, playas, cirques, depression lakes, dry lakebeds, or similar landforms.  
Example: 325.9362

**5.20.1.19 DS\_HUC5**

Fifth Level Downstream HUC. This item represents the hydrologic unit code of the 5th level hydrologic unit receiving the majority of the downstream flow. Outlets created by ditching or other artificial drainage are not to be considered.  
Example: 1701021502

**5.20.1.20 DS\_HUC6**

Sixth Level Downstream Hydrologic Unit Code. This item represents the hydrologic unit code of the 6th level hydrologic unit receiving the majority of the downstream flow. Outlets created by ditching or other artificial drainage are not to be considered.  
Example: 170102150106

**5.20.1.21 HUC\_MOD**

Hydrologic Unit Modifications- This item should contain information about hydrologic unit modifications to natural overland flow (that affect boundary) unique to the 5th or 6th field level unit delineated in an area of interest. This may include information on the type of structure, date of construction or other features that may influence surface water flow. In the attribute field, identify from most significant to least significant modification(s).  
Example: SD

Domain Value: SC  
Domain Value Definition: Stormwater Canal  
Domain Value: BC  
Domain Value Definition: Barge Canal  
Domain Value: PD  
Domain Value Definition: Pipe Diversion  
Domain Value: KA  
Domain Value Definition: Karst  
Domain Value: OC  
Domain Value Definition: Overflow Channel  
Domain Value: ID  
Domain Value Definition: Irrigation Ditch  
Domain Value: SD  
Domain Value Definition: Stormwater Ditch  
Domain Value: CD  
Domain Value Definition: Channel Diversion  
Domain Value: LE  
Domain Value Definition: Levee  
Domain Value: OT  
Domain Value Definition: Other  
Domain Value: IT  
Domain Value Definition: Interbasin Transfer  
Domain Value: CB  
Domain Value Definition: Closed Basin  
Domain Value: NC  
Domain Value Definition: Non-Contributing  
Domain Value: NM  
Domain Value Definition: No Modifications

**5.20.1.22 COMMENTS**

Any additional information that pertains to the hydrologic unit's history or general characteristics that cannot be adequately described in previous items.

Example: Waldo Lake

**5.20.1.23 REGION**

1st Field Hydrologic Unit Code

Example:17

**5.20.1.24 SUBREGION**

2nd Field Hydrologic Unit Code

Example:1701

**5.20.1.25 BASIN**

3rd Field Hydrologic Unit Code

Example: 170102

**5.20.1.26 SUBBASIN**

4th Field Hydrologic Unit Code

Example: 17010215

**5.20.1.27 WATERSHED**

5th Field Hydrologic Unit Code

Example: 1701021501

**5.20.1.28 SUBWAT**

6th Field Hydrologic Unit Code

Example: 170102150104

**5.20.1.29 CATCHMENT**

7th Field Hydrologic Unit Code

Example: 170102150104XX

**5.20.1.30 FNODE#**

An internal node identifier; value is assigned by software.

**5.20.1.31 TNODE#**

An internal node identifier; value is assigned by software.

**5.20.1.32 LPOLY#**

An internal polygon identifier; value is assigned by software.

**5.20.1.33 RPOLY#**

An internal polygon identifier; value is assigned by software.

**5.20.1.34 LENGTH**

Length of feature in coverage units; value is assigned by software.

Example: 1 meter

**5.20.1.35 ARC HU\_BOUNDARY# (or HU<mmddy>#)**

An internal arc identifier; value is assigned by software.

**5.20.1.36 ARC HU\_BOUNDARY-ID (or HU<mmddy>-ID)**

Arc identifier assigned by user. This item is not used, nor is it changed. Presence is required by software.

**5.20.1.37 HUC\_LEVEL**

This item is used to identify the hydrologic unit groupings a given line segment belongs to. This item is used to identify the hydrologic unit groupings a given line segment belongs to. Primary order is always given to the largest hydrologic unit classification of any shared line segment (e.g. when a hydrologic unit boundary line is shared between a 5th level unit and a 6th level unit, the line

receives a code of 5).

Example: 5

Domain Value: 1

Domain Value Definition: 1st Level Unit Boundary

Domain Value: 2

Domain Value Definition: 2nd Level Unit Boundary, NOT Shared with a 1st Level Unit Boundary

Domain Value: 3

Domain Value Definition: 3rd Level Unit Boundary, NOT Shared with 1st or 2nd Level Unit Boundary

Domain Value: 4

Domain Value Definition: 4th Level Unit Boundary, NOT Shared with 1st - 3rd Level Unit Boundary

Domain Value: 5

Domain Value Definition: 5th Level Unit Boundary, NOT Shared with 1st - 4th Level Unit Boundary

Domain Value: 6

Domain Value Definition: 6th Level Unit Boundary, NOT Shared with 1st - 5th Level Unit Boundary

Domain Value: 7

Domain Value Definition: 7th Level Unit Boundary, NOT Shared with 1st - 6th Level Unit Boundary

Domain Value: 8

Domain Value Definition: 8th Level Unit Boundary, NOT Shared with 1st - 7th Level Unit Boundary

**5.20.1.38 LINESOURCE**

Information related to the original spatial data source from which the boundary line was derived. This item captures information related to the original spatial data source from which the boundary line was derived. In determining which code to use, preference should be given to the primary source employed to determine the boundary lines position. All line segments should be broken with a node where line sources change. The linesource domain value is case sensitive and must be entered in lowercase.

Example: drg24

Domain Value: drg24

Domain Value Definition: USGS 1:24,000 Digital Raster Graphics (DRG)

Domain Value: tv23

Domain Value Definition: USGS 1:24,000 Tagged Vector Contours (TVC)

Domain Value: dem10

Domain Value Definition: Derived from 10 Meter Digital Elevation Model (Surface modeling)

Domain Value: dem30

Domain Value Definition: Derived from 30 Meter Digital Elevation Model (Surface modeling)

Domain Value: dl

Domain Value Definition: USGS Digital Line Graph

Domain Value: ortho

Domain Value Definition: orthophotography

Domain Value: unk

Domain Value Definition: Unknown

**5.20.1.39 LINEVER**

Line Edit Verification. Indicates which level in a series of quality control checks the hydrologic boundary has undergone prior to being accepted as part of the finalized dataset. \* Only verification

levels of 4 and 5 are included in the regional dataset. This item may be used in local offices to track

the progress of edits as organizations delineate new hydrologic units and move toward regional and national certification of those units.

Example: 2

Domain Value: 1

Domain Value Definition: Initial Draft Line

Domain Value: 2

Domain Value Definition: Line accuracy certified by local hydrologist

Domain Value: 3

Domain Value Definition: Line accuracy certified by ALL local participating organizations

Domain Value: 4

Domain Value Definition: Line accuracy certified by Pacific Northwest stewards

Domain Value: 5

Domain Value Definition: Line accuracy certified by National stewards

**5.20.1.40 LINEDATE**

Date that the last line edit was performed. This item is used to record the last date a spatial edit was performed to a given line segment. The format should be in: YYYY/MM/DD.

Example: 2002/11/15

**5.20.1.41 LINEORG**

The organization who performed the last spatial edit to a given line segment. This item designates the organization who performed the last spatial edit to a given line segment. Depending on the variety of sources used, every line segment within a single hydrologic unit may have a different organization code. The codes are to be applied to individual line segments, not hydrologic unit polygons. The Lineorg domain value is case sensitive and must be entered in lowercase.

Example: usblm-eug

Domain Value: bcmelp

Domain Value Definition: British Columbia Ministry of Environment Lands and Parks

Domain Value: caspam

Domain Value Definition: California Sierra Province Area Management

Domain Value: calwater

Domain Value Definition: The California Interagency Watershed Mapping Committee

Domain Value: clams

Domain Value Definition: Coastal Landscape Analysis and Modeling Study

Domain Value: coclrkwa

Domain Value Definition: Clark County WA

Domain Value: cokingwa

Domain Value Definition: King County WA

Domain Value: copierwa

Domain Value Definition: Pierce County WA

Domain Value: cosnohwa

Domain Value Definition: Snohomish County WA

Domain Value: cospokwa

Domain Value Definition: Spokane County WA

Domain Value: cothurswa

Domain Value Definition: Thurston County WA

Domain Value: coyakwa

Domain Value Definition: Yakima County WA

Domain Value: ctyolywa

Domain Value Definition: City of Olympia WA

Domain Value: ctysteawa

Domain Value Definition: City of Seattle WA

Domain Value: ctyvanwa

Domain Value Definition: City of Vancouver WA

Domain Value: id

Domain Value Definition: Idaho

Domain Value: lvwfbr

Domain Value Definition: Longview Fiber Company

Domain Value: nwifc

Domain Value Definition: Northwest Indian Fisheries Commission

Domain Value: ordeq

Domain Value Definition: OR Dept. of Environmental Quality

Domain Value: ordf

Domain Value Definition: Oregon Dept. of Forestry

Domain Value: ordwr

Domain Value Definition: Oregon Dept. of Water Resources

Domain Value: orit

Domain Value Definition: Oregon Institute of Technology

Domain Value: psrc

Domain Value Definition: Puget Sound Regional Council

Domain Value: raynr

Domain Value Definition: ITT Rayonier

Domain Value: reo

Domain Value Definition: HUC 5 lines used as a starting basis  
Domain Value: smpsn  
Domain Value Definition: Simpson Timber Company  
Domain Value: titan  
Domain Value Definition: Titan Geospatial  
Domain Value: unknown  
Domain Value Definition: Unknown or unclassified input organization  
Domain Value: usace  
Domain Value Definition: U.S. Army Corps of Engineers  
Domain Value: usblm  
Domain Value Definition: U.S. Bureau of Land Management  
Domain Value: usblm-bns  
Domain Value Definition: U.S. Bureau of Land Management - Burns District  
Domain Value: usblm-cby  
Domain Value Definition: U.S. Bureau of Land Management - Coos Bay District  
Domain Value: usblm-eug  
Domain Value Definition: U.S. Bureau of Land Management - Eugene District  
Domain Value: usblm-lak  
Domain Value Definition: U.S. Bureau of Land Management - Lakeview District  
Domain Value: usblm-med  
Domain Value Definition: U.S. Bureau of Land Management - Medford District  
Domain Value: usblm-oso  
Domain Value Definition: U.S. Bureau of Land Management - Oregon State Office  
Domain Value: usblm-pri  
Domain Value Definition: U.S. Bureau of Land Management - Prineville District  
Domain Value: usblm-rsb  
Domain Value Definition: U.S. Bureau of Land Management - Roseburg District  
Domain Value: usblm-slm  
Domain Value Definition: U.S. Bureau of Land Management - Salem District  
Domain Value: usblm-spo  
Domain Value Definition: U.S. Bureau of Land Management - Spokane District  
Domain Value: usblm-val  
Domain Value Definition: U.S. Bureau of Land Management – Vale District  
Domain Value: usbor  
Domain Value Definition: U.S. Bureau of Reclamation  
Domain Value: usbpa  
Domain Value Definition: U.S. Bonneville Power Administration  
Domain Value: usepa  
Domain Value Definition: U.S. Environmental Protection Agency  
Domain Value: usepa-r10  
Domain Value Definition: U.S. Environmental Protection Agency - Region 10  
Domain Value: usfs  
Domain Value Definition: U.S. Forest Service  
Domain Value: usfs-col  
Domain Value Definition: U.S. Forest Service - Colville NF  
Domain Value: usfs-des  
Domain Value Definition: U.S. Forest Service - Deschutes NF  
Domain Value: usfs-fre  
Domain Value Definition: U.S. Forest Service - Freemont NF  
Domain Value: usfs-gip  
Domain Value Definition: U.S. Forest Service - Gifford Pinchot NF  
Domain Value: usfs-kla  
Domain Value Definition: U.S. Forest Service - Klamath NF  
Domain Value: usfs-mal  
Domain Value Definition: U.S. Forest Service - Malheur NF  
Domain Value: usfs-mbs

Domain Value Definition: U.S. Forest Service - Mt. Baker-Snoqualmie NF  
Domain Value: usfs-mth  
Domain Value Definition: U.S. Forest Service - Mt. Hood NF  
Domain Value: usfs-oka  
Domain Value Definition: U.S. Forest Service - Okanogan NF  
Domain Value: usfs-oly  
Domain Value Definition: U.S. Forest Service - Olympic NF  
Domain Value: usfs-sis  
Domain Value Definition: U.S. Forest Service - Siskiyou NF  
Domain Value: usfs-siu  
Domain Value Definition: U.S. Forest Service - Siuslaw NF  
Domain Value: usfs-six  
Domain Value Definition: U.S. Forest Service – Six Rivers NF  
Domain Value: usfs-uma  
Domain Value Definition: U.S. Forest Service - Umatilla NF  
Domain Value: usfs-ump  
Domain Value Definition: U.S. Forest Service - Umpqua NF  
Domain Value: usfs-waw  
Domain Value Definition: U.S. Forest Service - Wallowa-Whitman NF  
Domain Value: usfs-wen  
Domain Value Definition: U.S. Forest Service - Wenatchee NF  
Domain Value: usfs-wil  
Domain Value Definition: U.S. Forest Service - Willamette NF  
Domain Value: usfs-win  
Domain Value Definition: U.S. Forest Service - Winema NF  
Domain Value: usfws  
Domain Value Definition: U.S. Fish and Wildlife Service  
Domain Value: usgs  
Domain Value Definition: U.S. Geological Survey  
Domain Value: usgs-nmd  
Domain Value Definition: U.S. Geological Survey - National Mapping Division  
Domain Value: usnmfs  
Domain Value Definition: U.S.National Marine Fisheries Service  
Domain Value: usnps  
Domain Value Definition: U.S. National Park Service  
Domain Value: usnrns  
Domain Value Definition: Natural Resources Conservation Service  
Domain Value: wadfw  
Domain Value Definition: Washington Department of Fish and Wildlife  
Domain Value: wadnr  
Domain Value Definition: Washington State Department of Natural Resources  
Domain Value: wadot  
Domain Value Definition: Washington Department of Transportation  
Domain Value: waecy  
Domain Value Definition: Washington Department of Ecology  
Domain Value: weyhsr  
Domain Value Definition: Weyerhaeuser Company

#### **5.20.1.42 METADATA\_ID**

Metadata ID is a code that identifies which metadata file applies to the arc. In many cases, there is one metadata file. However, in some cases more than one metadata file may be created to identify different groups and/or procedures used to produce the lines. These separate metadata files may be identified for each separate arc.

Example: Record Sequence Number

**5.20.1.43 ARC COMMENTS**

This item may include any additional information that pertains to the hydrologic unit's history or general characteristics that cannot be adequately described in previous items.

Example: STILL NEEDS VERIFICATION

**5.20.2 SF\_HYDRO\_EDGE Class Notes/Comments****5.20.2.1 FNODE#**

Arc from node internal number

**5.20.2.2 TNODE#**

Arc to node internal number

**5.20.2.3 LPOLY#**

Internal identifier of polygon to left of arc.

**5.20.2.4 RPOLY#**

Internal identifier of polygon to right of arc.

**5.20.2.5 LENGTH**

Arc length, units in decimal degrees.

**5.20.2.6 EDGE #**

Arc internal number, software assigned.

**5.20.2.7 EDGE-ID**

Arc identifier assigned by user. This item is not used nor is it changed. Presence required by the software.

**5.20.2.8 WC\_LLID\_NR**

Watercourse longitude/latitude identifier number. The 13 character longitude/latitude derived unique watercourse route identifier (this is also known as LLID in the federal arena.) All watercourse segments are grouped into watercourse routes. The identifier is based on position of the downstream point (mouth) of the watercourse. The identifier code is composed by concatenating the decimal degree values (to four places of precision) of the coordinates (minus the decimal points). LLID numbers are not unique across the four coverages. There is no valid default value for this field and it must be populated.

**Example: 1215613480987**



**5.20.3 SF\_HYDRO\_EDGE\_SECTION Class Attribute Comments****5.20.3.1 ROUTELINK#**

Route link number. Route internal number from RAT; identifies the route to which the section belongs.

**5.20.3.2 ARCLINK#**

Arc link number. Arc internal number from the AAT; identifies the arc to which the section belongs. It's provided to enable keyfile selections within ARCPLOT. Links with the item WC#.

**5.20.3.3 F-MEAS**

From measure. Measure of start position of section.

**5.20.3.4 T-MEAS**

To measure. Measure of end position of section.

**5.20.3.5 F-POS**

From position. Start position in terms of percentage of existing arc.

**5.20.3.6 T-POS**

To position. End position in terms of percentage of existing arc.

**5.20.3.7 WC#**

Internal sequence number of the sections.

**5.20.3.8 WC-ID**

User assigned section identifier set to equal the interval section identifier. This item is not used nor is it changed. Presence required by the software.

**5.20.4 SF\_SHORELINE Class Comments****5.20.4.1 WS\_DATUM\_CD**

Water shoreline datum code. The character code that describes the type and level that the water body shoreline was mapped at. The framework model is designed to store multiple shorelines; some of them are complete for a state's coastline while others are short segments. Shorelines consist of water body perimeters (lakes, ponds, and reservoirs) as well as linear segments like marine shorelines.

Example: mhw

These codes can be found in the associated lookup table listed in Appendix.

**5.20.4.2 WS\_DFLT\_SHORE\_CD**

Water shoreline default shoreline code. The character code that designates the shoreline that's used to build water body area features. The default shoreline is comprised of the mean-high water line (mh) and the fresh water (fw) shoreline. This field is included to unambiguously designate the default shoreline regardless of the future changes or exceptions to the business rules.

Example: y

These codes can be found in the associated lookup table listed in Appendix.

**5.20.5 SF\_HYDRO\_EDGE\_EVENT Class Attribute Comments.****5.20.5.1 WC\_LLID\_NR**

Watercourse longitude/latitude identifier number. The 13 character longitude/latitude derived unique watercourse route identifier (this is also known as LLID in the federal arena.) All watercourse segments are grouped into watercourse routes. The identifier is based on position of the downstream point (mouth) of the watercourse. The identifier code is composed by concatenating the decimal degree values (to four places of precision) of the coordinates (minus the decimal points). LLID numbers are not unique across the four coverages. There is no valid default value for this field and it must be populated.

Example: 1215613480987

**5.20.5.2 WC\_BEGIN\_AD**

Watercourse begin address. The beginning, or downstream, index of the watercourse segment. The address or index at which an event or attribute can be associated to a route.

Example: 000.000

**5.20.5.3 WC\_END\_AD**

Watercourse end address. The ending, or upstream, index of the watercourse segment. The address or index at which an event or attribute can be associated to a route.

Example: 036.025

**5.20.6 SF\_EVT\_LN\_TYPE Class Attribute Comments****5.20.6.1 WC\_LN\_TYPE\_CD**

Watercourse line type code. The type of watercourse feature that is represented in the database. Code used to differentiate the primary cartographic function of the lines regardless of the hydrographic feature or hydrologic function they represent.

Example: 20

These codes can be found in the associated lookup table listed in Appendix.

**5.20.6.2 WC\_FLOW\_PATH\_CD**

Watercourse flow path code. Defines the flow hierarchy of stream centerline that are within water body features. This code is used to define and segregate out the various flow pathways through water bodies.

These centerlines usually have a WC\_LN\_TYPE\_CD of 20 or 21. For single line watercourses code the event as "not applicable."

Example: Primary

These codes can be found in the associated lookup table listed in Appendix.

**5.20.7 SF\_EVT\_NAME Class Attribute Comments****5.20.7.1 WC\_GNIS\_NM**

Watercourse GNIS name. The name of the feature as represented within the Geographic Names Information System (GNIS). The USGS is the mandated source of this information. Not all features contained within the coverage will have GNIS names.

**Example: Deschutes River**

**5.20.7.2 WC\_GNIS\_NR**

Watercourse GNIS (Geographic Names Information System) number. The unique identifier number assigned to each feature name represented within the GNIS database. This number is used to insert and/or update watercourse names stored in the framework hydrography database. Not all features contained within the coverage will have GNIS number.

**5.20.8 SF\_EVT\_FTR\_TYPE Class Attribute Comments****5.20.8.1 WC\_HYDR\_FTR\_CD**

Watercourse hydrographic feature code. The code used to describe the hydrographic feature type that the watercourse represents.

**Example: ST**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.8.2 WC\_CART\_FTR\_CD**

Watercourse cartographic feature code. The code used to describe the cartographic feature type that the watercourse represents. This represents feature codes developed initially by the USGS and used on the DLG's.

**Example: 412**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.9 SF\_EVT\_RRF Class Attribute Comments****5.20.9.1 WC\_RRF\_NR**

Watercourse River Reach File number. This represents the unique identifier used by the USEPA. A unique identifier is carried on individual stream segments, running confluence to confluence.

The identifier is comprised of 3 components – the watercourse hydrographic unit code number, the watercourse river reach file segment number, and the watercourse river reach file mile number. The source of this data will be USGS National Hydrography Database (NHD) once Washington State 100K hydrography is incorporated into that database. Not all stream segments have been assigned a RRF number by the USGS. In some cases this information is not necessarily available.

## **5.20.10 SF\_EVT\_STRM\_FLOW Class Attribute Comments**

### **5.20.10.1 WC\_CONTU\_CD**

Watercourse continuity code. This is the classification of stream flow primarily in relation to its expression at the earth's surface. The most common condition is that a stream is continuous in space. With respect to continuity, streams may be divided into continuous streams and interrupted streams. An interrupted stream is one that contains (a) perennial stretches with intervening intermittent or ephemeral stretches or (b) intermittent stretches with intervening ephemeral stretches. These two classes of interrupted streams are designated respectively, perennial interrupted streams and intermittent interrupted streams. A continuous stream is one that does not have interruptions in space.

#### **Example of use with Periodicity Code:**

You do not need to separate out each small segment of perennial, intermittent or ephemeral stream. If they sporadically exist along a "reach" the hydrologist chooses the dominant periodicity and calls the continuity interrupted. If the reach is not continuously perennial or intermittent we are noting it through the use of the interrupted attribute. It may be a scale issue but it also says a lot about the channel itself. These codes can be found in the associated lookup table in Appendix.

### **5.20.10.2 WC\_PERIOD\_CD**

Watercourse periodicity code. This is a classification for watercourses in terms of the seasonal behavior of the feature over time or in terms of its surface flow.

#### **Example: int**

These codes can be found in the associated lookup table in Appendix.

## **5.20.11 SF\_EVT\_FTR\_HST Class Attribute Comments**

### **5.20.11.1 FTR\_MOD\_CD**

Feature modify code. Identifies the type of change that occurred to hydrography watercourse feature. Tracks the type of modification performed on the database. These codes can be found in the associated lookup table.

Example: add

These codes can be found in the associated lookup table listed in Appendix.

### **5.20.11.2 FTR\_INPUT\_CD**

Feature input code. The manner in which the hydrography watercourse data is entered or updated in the spatial database. These codes can be found in the associated lookup table.

Example: Scan

These codes can be found in the associated lookup table listed in Appendix.

**5.20.11.3 FTR\_INTRP\_CD**

Feature interpretation code. The methodology used to compose the hydrography watercourse information

and how it was derived prior to data entry into the spatial coverage.

Example: 1

These codes can be found in the associated lookup table listed in Appendix.

**5.20.11.4 FTR\_SRC\_CD**

Feature source code. The compilation map or image source used when adding or updating hydrography

watercourse data.

Example: 12

These codes can be found in the associated lookup table listed in Appendix.

**5.20.11.5 FTR\_SRC\_DT**

Feature source date. The compilation map or image source date used for the addition or update of hydrography watercourse data. A default date code should be used when no source date is available for historical information.

Example: 19990515 (CCYYMMDD = May 15, 1999)

Default: 14520101 (CCYYMMDD = January 1, 1452)

**5.20.11.6 FTR\_SRCSCALE\_NR**

Feature source scale number. Describes the scale denominator of the map or image source for the

hydrography watercourse data additions or updates in the database. Exact scale can be input.

The density of hydrography features displayed will vary by the base map scale. A default scale of "0" should be used when the source scale is unknown.

Example: 2400

Default: 0

**5.20.11.7 FTR\_ACCUR\_NR**

Feature accuracy number. Describes the positional accuracy of the hydrography watercourse data being

added or updated in the database. Describes the correctness of the measurement. Use actual value e.g.

.001; 3; 100. All units are entered in meters. A default code of "0.000" should be used when the accuracy is unknown.

Example: 24000

Default: 0.000

**5.20.11.8 FTR\_ORG\_CD**

Feature organization code. The organization that compiled, entered, updated or deleted the hydrography

watercourse data. This list will grow as new organizations begin to add or update information and are

certified by the clearinghouse. The Clearinghouse Manager will maintain the list of organizations authorized to participate in the editing of Hydrography Framework data.

Example: cothurwa

These codes can be found in the associated lookup table listed in Appendix.

**5.20.11.9 FTR\_EDIT\_DT**

Feature edit date. The date the feature was either entered, updated or deleted in the hydrography coverage. Represents the date when the data was incorporated into the database. This item is utilized to track changes in the database.

Example: 19980515 (CCYYMMDD = May 15, 1998)

**5.20.12 SF\_EVT\_SL\_TYPE Class Attribute Comments****5.20.12.1 WS\_TYPE\_CD**

Water shoreline type code. The type of water body shoreline feature that is represented.

**Example: 1**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.13 SF\_EVT\_SL\_FTR\_HST Class Attribute Comments****5.20.13.1 FTR\_MOD\_CD**

Feature modify code. Identifies the type of change that occurred to hydrography water shoreline feature.

Tracks the type of modification performed on the database.

**Example: del**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.13.2 FTR\_INPUT\_CD**

Feature input code. The manner in which the hydrography shoreline data is added or updated in the spatial database.

**Example: 1**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.13.3 FTR\_INTRP\_CD**

Feature interpretation code. The methodology used to compose the hydrography shoreline information and how it was derived prior to data entry into the spatial coverage.

**Example: 6**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.13.4 FTR\_SRC\_CD**

Feature source code. The compilation map or image source used when adding or updating hydrography shoreline data.

**Example: 8**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.13.5 FTR\_SRC\_DT**

Feature source date. The compilation map or image source date used for the addition or update of hydrography shoreline data. A default date code should be used when no source date is available for historical information.

**Example: 19990515 (CCYYMMDD = May 15, 1999)**

**Default: 14520101 (CCYYMMDD = January 1, 1452)**

**5.20.13.6 FTR\_SRCSCALE\_NR**

Feature source scale number. Describes the scale denominator of the map or image source for the hydrography shoreline data additions or updates in the database. Exact scale can be input. The density of hydrography features displayed will vary by the base map scale. A default scale of "0" should be used when the source scale is unknown.

**Example: 24000**

**Default: 0**

**5.20.13.7 FTR\_ACCUR\_NR**

Feature accuracy number. Describes the positional accuracy of the hydrography shoreline data being added or updated in the database. Describes the correctness of the measurement. Refer to USGS map accuracy standards for more information. Use actual value e.g. .001; 3; 100. All units are entered in meters. A default code of "0.000" should be used when the accuracy is unknown.

**Example: 24000**

**Default: 0.000**

**5.20.13.8 FTR\_ORG\_CD**

Feature organization code. The organization that compiled, entered, updated or deleted the hydrography shoreline data. This list will grow as new organizations begin to add or update information and are certified by the clearinghouse. The Clearinghouse Manager will maintain the list of organizations authorized to participate in the editing of Hydrography Framework data.

**Example: ctyolywa**

These codes can be found in the associated lookup table listed in Appendix.

**5.20.13.9 FTR\_EDIT\_DT**

Feature edit date. The date the feature was either entered, updated or deleted in the hydrography coverage. Represents the date when the data was incorporated into the database. This item is utilized to track changes in the database.

**Example: 19980515 (CCYYMMDD = May 15, 1998)**

**5.20.14 SF\_HYDRO\_POINT Class Attribute Comments****5.20.14.1 AREA**

Water point area in decimal degrees.

**5.20.14.2 PERIMETER**

Water point perimeter length in decimal degrees.

**5.20.14.3 WP\_NO**

Arc internal number, software assigned.

**5.20.14.4 WP\_ID**

Water point identifier assigned by user. This item is not used nor is it changed. Presence required by the software.

**5.20.14.5 WP\_LLID\_NR**

Water point longitude/latitude identifier number. The 13-character longitude/latitude derived unique identifier of the water point. All water point features are assigned an identifier. The identifier is based on position of the point feature on the source material. The identifier code is composed by concatenating the decimal degree values (to four places of precision) of the coordinates (minus the decimal points). LLID numbers are not unique across the four coverages. There is no valid default value for this field and it must be populated.

Example: 1215613480987

**5.20.14.6 WP\_HYDR\_FTR\_CD**

Water point hydrographic feature code. The code used to describe the hydrographic feature type that the water point represents.

Example: SP

These codes can be found in the associated lookup table listed in Appendix.

**5.20.14.7 WP\_CART\_FTR\_CD**

Water point cartographic feature code. The code used to describe the cartographic feature type that the water point represents. This represents feature codes developed initially by the USGS and used on the DLG's.

Example: 300

These codes can be found in the associated lookup table listed in Appendix.

**5.20.14.8 WP\_PERIOD\_CD**

Water point periodicity code. This is a classification of a water point in terms of the seasonal behavior of the feature over time or in terms of its surface expression.

Example: int

These codes can be found in the associated lookup table listed in Appendix.

**5.20.15 SF\_POINT\_FTR\_HIST Class Attribute Comments****5.20.15.1 WP\_LLID\_NR**

Water point longitude/latitude identifier number. The 13-character longitude/latitude derived unique identifier of the water point. All water point features are assigned an identifier. The identifier is based on position of the point feature on the source material. The identifier code is composed by concatenating the decimal degree values (to four places of precision) of the coordinates (minus the decimal points). LLID numbers are not unique across the four coverages. There is no valid default value for this field and it must be populated.



Example: 1215613480987

**5.20.15.2 FTR\_MOD\_CD**

Feature modify code. Identifies the type of changes that occurred to hydrography water point feature. Tracks the type of modification performed on the database.

Example: add

These codes can be found in the associated lookup table listed in Appendix.

**5.20.15.3 FTR\_INPUT\_CD**

Feature input code. The manner in which the hydrography water point data is entered or updated in the spatial database.

Example: 3

These codes can be found in the associated lookup table listed in Appendix.

**5.20.15.4 FTR\_INTRP\_CD**

Feature interpretation code. The methodology used to compose the hydrography water point information and how it was derived prior to data entry into the spatial coverage.

Example: 2

These codes can be found in the associated lookup table listed in Appendix.

**5.20.15.5 FTR\_SRC\_CD**

Feature source code. The compilation map or image source used when adding or updating hydrography water point data.

Example: 5

These codes can be found in the associated lookup table listed in Appendix.

**5.20.15.6 FTR\_SRC\_DT**

Feature source date. The compilation map or image source date used for the addition or update of hydrography water point data. A default date code should be used when no source date is available for historical information.

Example: 19990515 (CCYYMMDD = May 15, 1999)

Default: 14520101 (CCYYMMDD = January 1, 1452)

**5.20.15.7 FTR\_SRCSCALE\_NR**

Feature source scale number. Describes the scale denominator of the map or image source for the hydrography water point data addition or update in the database. Exact scale can be input. The density of hydrography features displayed will vary by the base map scale. A default scale of "0" should be used when the source scale is unknown.

Example: 24000

Default: 0

**5.20.15.8 FTR\_ACCUR\_NR**

Feature accuracy number. Describes the positional accuracy of the hydrography water point data being added or updated in the database. Describes the correctness of the measurement. Use actual value e.g. .001; 3; 100. All units are entered in meters. A default code of "0.000" should be used when the accuracy is unknown.

Example: 24000

Default: 0.000

**5.20.15.9 FTR\_ORG\_CD**

Feature organization code. The organization that compiled, entered, updated or deleted the hydrography water point data. This list will grow as new organizations begin to add or update information and are certified by the clearinghouse. The Clearinghouse Manager will maintain the list of organizations authorized to participate in the editing of Hydrography Framework data.

Example: waecy

These codes can be found in the associated lookup table listed in Appendix.

**5.20.15.10 FTR\_EDIT\_DT**

Feature edit date. The date the feature was either entered, updated or deleted in the hydrography coverage. Represents the date when the data was incorporated into the database. This item is utilized to track changes in the database.

Example: 19980515 (CCYYMMDD = May 15, 1998)

**5.20.16 SF\_WATERBODY Class Attribute Comments****5.20.16.1 AREA**

Water body area in decimal degrees.

**5.20.16.2 PERIMETER**

Water body perimeter length in decimal degrees.

**5.20.16.3 WB#**

Water body region internal number; software assigned.

**5.20.16.4 WB-ID**

Water body region user-defined ID. This item is not used nor is it changed. Presence required by the software.

**5.20.16.5 WB\_LLID\_NR**

Water body longitude/latitude identifier number. The 13-character longitude/latitude derived unique identifier of the water body. All water bodies and islands represented as polygonal features are assigned an identifier. The identifier is based on position of the polygon label point. The identifier code is composed by concatenating the decimal degree values (to four places of precision) of the coordinates (minus the decimal points). LLID numbers are not unique across the four coverages. There is no valid default value for this field and it must be populated.

Example: 1234567890987

**5.20.16.6 WB\_HYDR\_FTR\_CD**

Water body hydrographic feature code. The code used to describe the hydrographic feature type that the water body polygon represents.

Example: LA

These codes can be found in the associated lookup table in Appendix.

### **5.20.16.7 WB\_CART\_FTR\_CD**

Water body cartographic feature code. The code used to describe the cartographic feature type that the water body polygon represents. This represents feature codes developed initially by the USGS and used on the DLG's.

Example: 101

These codes can be found in the associated lookup table listed in Appendix.

### **5.20.16.8 WB\_GNIS\_NM**

Water body GNIS name. The name of the water body as contained within the Geographic Names Information System (GNIS) which is maintained by the USGS. Not all features contained within the coverage will have GNIS names.

Example: Ross Lake

Default: blank or null

### **5.20.16.9 WB\_GNIS\_NR**

Water body GNIS (Geographic Names Information System) number. The unique identifier number assigned to each feature name represented within the GNIS database. This number is used to insert and/or update water body names stored in the framework hydrography database. Not all features contained within the coverage will have GNIS number

Example: 12345678

Default: 0

### **5.20.16.10 WB\_PERIOD\_CD**

Water body periodicity code. This is a classification of a water bodies in terms of the seasonal behavior of the feature over time or in terms of its surface flow.

Example: per

These codes can be found in the associated lookup table listed in Appendix.

## **5.21 ARCGIS Hydro Data Model Mappings**

### **5.21.1 Drainage**

#### **5.21.1.1 DrainageLine Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_DRAINAGE_LINE.objectid            |
| Shape                | SF_DRAINAGE_LINE.coordinates         |
| HydroID              | SF_DRAINAGE_LINE.hydroid             |
| HydroCode            | SF_DRAINAGE_LINE.hydrocode           |
| DrainID              | SF_DRAINAGE_LINE.drained             |
| JunctionID           | SF_DRAINAGE_LINE.junctionid          |

**5.21.1.2 DrainagePoint Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_DRAINAGE_POINT.objectid           |
| Shape                | SF_DRAINAGE_POINT.coordinates        |
| HydroID              | SF_DRAINAGE_POINT.hydroid            |
| HydroCode            | SF_DRAINAGE_POINT.hydrocode          |
| DrainID              | SF_DRAINAGE_POINT.drainid            |
| JunctionID           | SF_DRAINAGE_POINT.junctionid         |

**5.21.1.3 Watershed Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_DRAINAGE_AREA.objectid            |
| Shape                | SF_DRAINAGE_AREA.coordinates         |
| HydroID              | SF_DRAINAGE_AREA.hydroid             |
| HydroCode            | SF_DRAINAGE_AREA.hydrocode           |
| DrainID              | SF_DRAINAGE_AREA.drainid             |
| AreaSqKm             | SF_DRAINAGE_AREA.areasqkm            |
| JunctionID           | SF_DRAINAGE_AREA.junctionid          |
| NextDownID           | SF_DRAINAGE_AREA.nextdownid          |
| Shape_Length         | SF_DRAINAGE_AREA.shapelength         |
| Shape_Area           | SF_DRAINAGE_AREA.shapearea           |
| BasinID              | SF_PATHUC6.basinid                   |

**5.21.1.4 Basin Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_DRAINAGE_AREA.objectid            |
| Shape                | SF_DRAINAGE_AREA.coordinates         |
| HydroID              | SF_DRAINAGE_AREA.hydroid             |
| HydroCode            | SF_DRAINAGE_AREA.hydrocode           |
| DrainID              | SF_DRAINAGE_AREA.drainid             |
| AreaSqKm             | SF_DRAINAGE_AREA.areasqkm            |
| JunctionID           | SF_DRAINAGE_AREA.junctionid          |
| NextDownID           | SF_DRAINAGE_AREA.nextdownid          |
| Shape_Length         | SF_DRAINAGE_AREA.shapelength         |
| Shape_Area           | SF_DRAINAGE_AREA.shapearea           |

**5.21.1.5 Catchment Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_DRAINAGE_AREA.objectid            |
| Shape                | SF_DRAINAGE_AREA.coordinates         |
| HydroID              | SF_DRAINAGE_AREA.hydroid             |
| HydroCode            | SF_DRAINAGE_AREA.hydrocode           |
| DrainID              | SF_DRAINAGE_AREA.drainid             |

|               |                              |
|---------------|------------------------------|
| AreaSqKm      | SF_DRAINAGE_AREA.areasqkm    |
| JunctionID    | SF_DRAINAGE_AREA.junctionid  |
| NextDownID    | SF_DRAINAGE_AREA.nextdownid  |
| Shape_Length  | SF_DRAINAGE_AREA.shapelength |
| Shape_Area    | SF_DRAINAGE_AREA.shapearea   |
| Name          | SF_PATHUC7.name              |
| DischargeType | SF_PATHUC7.dischargetype     |
| ModelType     | SF_PATHUC7.modeltype         |
| AssignedArea  | SF_PATHUC7.assignedarea      |
| WShedID       | SF_PATHUC7.wshedid           |

**5.21.2 Network**

**5.21.2.1 HydroJunction Table**

| <b>ARC Attribute</b> | <b>Table.Attribute</b>          |
|----------------------|---------------------------------|
| OBJECTID             | SF_HYDRO_JUNCTION.objectid      |
| Shape                | SF_HYDRO_JUNCTION.coordinates   |
| AncillaryRole        | SF_HYDRO_JUNCTION.ancillaryrole |
| Enabled              | SF_HYDRO_JUNCTION.enabled       |
| HydroID              | SF_HYDRO_JUNCTION.hydroid       |
| HydroCode            | SF_HYDRO_JUNCTION.hydrocode     |
| NextDownID           | SF_HYDRO_JUNCTION.nextdownid    |
| LengthDown           | SF_HYDRO_JUNCTION.lengthdown    |
| DrainArea            | SF_HYDRO_JUNCTION.drainarea     |
| Ftype                | SF_HYDRO_JUNCTION.ftype         |
| DHINodeType          | SF_HYDRO_JUNCTION.dhinodetype   |

**5.21.2.2 HydroEdge Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_EDGE.objectid               |
| Shape                | SF_HYDRO_EDGE.shape                  |
| Enabled              | SF_HYDRO_EDGE.enabled                |
| HydroID              | SF_HYDRO_EDGE.hydroid                |
| HydroCode            | SF_HYDRO_EDGE.hydrocode              |
| ReachCode            | SF_HYDRO_EDGE.reachcode              |
| Name                 | SF_HYDRO_EDGE.name                   |
| LengthKm             | SF_HYDRO_EDGE.lengthkm               |
| LengthDown           | SF_HYDRO_EDGE.lengthdown             |
| FlowDir              | SF_HYDRO_EDGE.flowdir                |
| Ftype                | SF_HYDRO_EDGE.ftype                  |
| EdgeType             | SF_HYDRO_EDGE.edgetype               |
| Shape_Length         | SF_HYDRO_EDGE.shape_length           |
| DHIBranchType        | SF_HYDRO_JUNCTION.dhibranchtype      |

**5.21.2.3 HydroNetwork\_Junctions Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b>  |
|----------------------|---------------------------------------|
| OBJECTID             | SF_HYDRO_NETWORK_JUNCTION.objectid    |
| Shape                | SF_HYDRO_NETWORK_JUNCTION.coordinates |
| Enabled              | SF_HYDRO_NETWORK_JUNCTION.enabled     |

**5.21.2.4 SchematicLink Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_SCHEMATIC_LINK.objectid     |
| Shape                | SF_HYDRO_SCHEMATIC_LINK.coordinates  |
| HydroID              | SF_HYDRO_SCHEMATIC_LINK.hydroid      |
| HydroCode            | SF_HYDRO_SCHEMATIC_LINK.hydrocode    |
| FromNodeID           | SF_HYDRO_SCHEMATIC_LINK.fromnodeid   |
| ToNodeID             | SF_HYDRO_SCHEMATIC_LINK.tonodeid     |
| Shape_length         | SF_HYDRO_SCHEMATIC_LINK.shape_length |

**5.21.2.5 SchematicNode Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_SCHEMATIC_NODE.objectid     |
| Shape                | SF_HYDRO_SCHEMATIC_NODE.coordinates  |
| HydroID              | SF_HYDRO_SCHEMATIC_NODE.hydroid      |
| HydroCode            | SF_HYDRO_SCHEMATIC_NODE.hydrocode    |
| FeatureID            | SF_HYDRO_SCHEMATIC_NODE.featureid    |

**5.21.2.6 HydroLineEvent Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_EDGE_EVENT.objectid         |
| ReachCode            | SF_HYDRO_EDGE_EVENT.reachcode        |
| FMeasure             | SF_HYDRO_EDGE_EVENT.fmeasure         |
| TMeasure             | SF_HYDRO_EDGE_EVENT.tmeasure         |
| Offset               | SF_HYDRO_EDGE_EVENT.offset           |

**5.21.2.7 HydroPointEvent Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT_EVENT.objectid        |
| ReachCode            | SF_HYDRO_POINT_EVENT.reachcode       |
| Measure              | SF_HYDRO_POINT_EVENT.measure         |

**5.21.3 Hydrography Features**

**5.21.3.1 HydroLine Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_LINE.objectid               |
| Shape                | SF_HYDRO_LINE.coordinates            |
| HydroID              | SF_HYDRO_LINE.hydroid                |
| HydroCode            | SF_HYDRO_LINE.hydrocode              |
| FType                | SF_HYDRO_LINE.ftype                  |
| Name                 | SF_HYDRO_LINE.name                   |
| Shape_length         | SF_HYDRO_LINE.shape_length           |

**5.21.3.2 Dam Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |
| Shape                | SF_HYDRO_POINT.coordinates           |
| HydroID              | SF_HYDRO_POINT.hydroid               |
| HydroCode            | SF_HYDRO_POINT.hydrocode             |
| FType                | SF_HYDRO_POINT.ftype                 |
| Name                 | SF_HYDRO_POINT.name                  |
| JunctionID           | SF_HYDRO_POINT.junctionid            |

**5.21.3.3 Bridge Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |
| Shape                | SF_HYDRO_POINT.coordinates           |
| HydroID              | SF_HYDRO_POINT.hydroid               |
| HydroCode            | SF_HYDRO_POINT.hydrocode             |
| FType                | SF_HYDRO_POINT.ftype                 |
| Name                 | SF_HYDRO_POINT.name                  |
| JunctionID           | SF_HYDRO_POINT.junctionid            |

**5.21.3.4 Structure Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |
| Shape                | SF_HYDRO_POINT.coordinates           |
| HydroID              | SF_HYDRO_POINT.hydroid               |
| HydroCode            | SF_HYDRO_POINT.hydrocode             |
| FType                | SF_HYDRO_POINT.ftype                 |
| Name                 | SF_HYDRO_POINT.name                  |
| JunctionID           | SF_HYDRO_POINT.junctionid            |

**5.21.3.5 Monitoring Point Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |

|            |                            |
|------------|----------------------------|
| Shape      | SF_HYDRO_POINT.coordinates |
| HydroID    | SF_HYDRO_POINT.hydroid     |
| HydroCode  | SF_HYDRO_POINT.hydrocode   |
| FType      | SF_HYDRO_POINT.ftype       |
| Name       | SF_HYDRO_POINT.name        |
| JunctionID | SF_HYDRO_POINT.junctionid  |

**5.21.3.6 WaterWithdrawal Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |
| Shape                | SF_HYDRO_POINT.coordinates           |
| HydroID              | SF_HYDRO_POINT.hydroid               |
| HydroCode            | SF_HYDRO_POINT.hydrocode             |
| FType                | SF_HYDRO_POINT.ftype                 |
| Name                 | SF_HYDRO_POINT.name                  |
| JunctionID           | SF_HYDRO_POINT.junctionid            |

**5.21.3.7 WaterDischarge Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |
| Shape                | SF_HYDRO_POINT.coordinates           |
| HydroID              | SF_HYDRO_POINT.hydroid               |
| HydroCode            | SF_HYDRO_POINT.hydrocode             |
| FType                | SF_HYDRO_POINT.ftype                 |
| Name                 | SF_HYDRO_POINT.name                  |
| JunctionID           | SF_HYDRO_POINT.junctionid            |

**5.21.3.8 UserPoint Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |
| Shape                | SF_HYDRO_POINT.coordinates           |
| HydroID              | SF_HYDRO_POINT.hydroid               |
| HydroCode            | SF_HYDRO_POINT.hydrocode             |
| FType                | SF_HYDRO_POINT.ftype                 |
| Name                 | SF_HYDRO_POINT.name                  |
| JunctionID           | SF_HYDRO_POINT.junctionid            |

**5.21.3.9 HydroPoint Table**

| <b>ARC Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_POINT.objectid              |
| Shape                | SF_HYDRO_POINT.coordinates           |
| HydroID              | SF_HYDRO_POINT.hydroid               |



|            |                           |
|------------|---------------------------|
| HydroCode  | SF_HYDRO_POINT.hydrocode  |
| FType      | SF_HYDRO_POINT.ftype      |
| Name       | SF_HYDRO_POINT.name       |
| JunctionID | SF_HYDRO_POINT.junctionid |

**5.21.3.10 HydroArea Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_AREA.objectid               |
| Shape                | SF_HYDRO_AREA.coordinates            |
| HydroID              | SF_HYDRO_AREA.hydroid                |
| HydroCode            | SF_HYDRO_AREA.hydrocode              |
| FType                | SF_HYDRO_AREA.ftype                  |
| Name                 | SF_HYDRO_AREA.name                   |
| Shape_Length         | SF_HYDRO_AREA.shape_length           |
| Shape_Area           | SF_HYDRO_AREA.shape_area             |

**5.21.3.11 HydroResponseUnit Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_RESPONSE_UNIT.objectid            |
| Shape                | SF_RESPONSE_UNIT.coordinates         |
| HydroID              | SF_RESPONSE_UNIT.hydroid             |
| HydroCode            | SF_RESPONSE_UNIT.hydrocode           |
| FType                | SF_RESPONSE_UNIT.ftype               |
| Name                 | SF_RESPONSE_UNIT.name                |
| Shape_Length         | SF_RESPONSE_UNIT.shape_length        |
| Shape_Area           | SF_RESPONSE_UNIT.shape_area          |
| AreaSqKm             | SF_RESPONSE_UNIT.areasqkm            |

**5.21.3.12 Waterbody Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_HYDRO_AREA.objectid               |
| Shape                | SF_HYDRO_AREA.coordinates            |
| HydroID              | SF_HYDRO_AREA.hydroid                |
| HydroCode            | SF_HYDRO_AREA.hydrocode              |
| FType                | SF_HYDRO_AREA.ftype                  |
| Name                 | SF_HYDRO_AREA.name                   |
| Shape_Length         | SF_HYDRO_AREA.shape_length           |
| Shape_Area           | SF_HYDRO_AREA.shape_area             |
| AreaSqKm             | SF_WATERBODY.areasqkm                |
| JunctionID           | SF_WATERBODY.junctionid              |

**5.21.4 Time Series**

**5.21.4.1 TimeSeries Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_TIME_SERIES.objectid              |
| FeatureID            | SF_TIME_SERIES.featureid             |
| TSTypeID             | SF_TIME_SERIES.tstypeid              |
| TSDateTime           | SF_TIME_SERIES.tsdatetime            |
| TSValue              | SF_TIME_SERIES.tsvalue               |
| TSName               | SF_TIME_SERIES.tsname                |
| TableName            | SF_TIME_SERIES.tablename             |
| TSGroupID            | SF_TIME_SERIES.tsgroupid             |
| ItemIndex            | SF_TIME_SERIES.itemindex             |
| TimeType             | SF_TIME_SERIES.timetype              |
| ValueType            | SF_TIME_SERIES.valuetype             |
| ValueUnits           | SF_TIME_SERIES.valueunits            |
| XAxisType            | SF_TIME_SERIES.xaxistype             |
| StartTime            | SF_TIME_SERIES.starttime             |
| EndTime              | SF_TIME_SERIES.endtime               |
| Location             | SF_TIME_SERIES.location              |

**5.21.4.2 TSType Table**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_TS_TYPE.objectid                  |
| TSTypeID             | SF_TS_TYPE.tstypeid                  |
| Variable             | SF_TS_TYPE.variable                  |
| Units                | SF_TS_TYPE.units                     |
| IsRegular            | SF_TS_TYPE.isregular                 |
| TSInterval           | SF_TS_TYPE.tsinterval                |
| Data Type            | SF_TS_TYPE.datatype                  |
| Origin               | SF_TS_TYPE.origin                    |

**5.21.4.3 DHI\_Sensor**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_SENSOR.objectid                   |
| TimeSeriesID         | SF_SENSOR.timeseriesid               |
| FeatureID            | SF_SENSOR.featureid                  |
| FeatureClass         | SF_SENSOR.featureclass               |
| SensorName           | SF_SENSOR.sensorname                 |
| MeasureID            | SF_SENSOR.measureid                  |

**5.21.4.4 DHI\_TimeSeriesRemote**

| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
|----------------------|--------------------------------------|
| OBJECTID             | SF_TS_REMOTE.objectid                |
| TimeSeriesID         | SF_TS_REMOTE.timeseriesid            |
| TSItemNum            | SF_TS_REMOTE.tsitemnum               |

|                 |                              |
|-----------------|------------------------------|
| TSBridge        | SF_TS_REMOTE.tsbridge        |
| TSSpecification | SF_TS_REMOTE.tsspecification |
| TSUserName      | SF_TS_REMOTE.tsusername      |
| TSUserPassword  | SF_TS_REMOTE.tsuserpassword  |

**5.21.4.5 DHI\_TSGroups**

|                      |                                      |
|----------------------|--------------------------------------|
| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
| OBJECTID             | SF_TS_GROUPS.objectid                |
| TSGroupName          | SF_TS_GROUPS.tsgroupname             |

**5.21.5 Channel**

**5.21.5.1 CrossSection Table**

|                      |                                      |
|----------------------|--------------------------------------|
| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
| OBJECTID             | SF_CROSS_SECTION.objectid            |
| Shape                | SF_CROSS_SECTION.coordinates         |
| HydroID              | SF_CROSS_SECTION.hydroid             |
| HydroCode            | SF_CROSS_SECTION.hydrocode           |
| ReachCode            | SF_CROSS_SECTION.reachcode           |
| RiverCode            | SF_CROSS_SECTION.rivercode           |
| CSCode               | SF_CROSS_SECTION.cscore              |
| JunctionID           | SF_CROSS_SECTION.junctionid          |
| CSOrigin             | SF_CROSS_SECTION.csorigin            |
| ProfileM             | SF_CROSS_SECTION.profilem            |
| Shape_length         | SF_CROSS_SECTION.shape_length        |
| RiverName            | SF_CROSS_SECTION.rivername           |
| TopoID               | SF_CROSS_SECTION.topoid              |
| CSName               | SF_CROSS_SECTION.csname              |

**5.21.5.2 CrossSectionPoint Table**

|                      |                                      |
|----------------------|--------------------------------------|
| <b>ARC Attribute</b> | <b>OS_Env_Portal_Table.Attribute</b> |
| OBJECTID             | SF_CROSS_SECTION_POINT.objectid      |
| CSCode               | SF_CROSS_SECTION_POINT.cscore        |
| CrossM               | SF_CROSS_SECTION_POINT.crossm        |
| Elevation            | SF_CROSS_SECTION_POINT.elevation     |
| Resistance           | SF_CROSS_SECTION_POINT.resistance    |
| MarkType             | SF_CROSS_SECTION_POINT.marktype      |
| UserMarker           | SF_CROSS_SECTION_POINT.usermarker    |
| SegmentType          | SF_CROSS_SECTION_POINT.segmenttype   |
| VegDepth             | SF_CROSS_SECTION_POINT.vegdepth      |

**5.21.5.3 ProfileLine Table**

| ARC Attribute | OS_Env_Portal_Table.Attribute |
|---------------|-------------------------------|
| OBJECTID      | SF_PROFILE_LINE.objectid      |
| Shape         | SF_PROFILE_LINE.coordinates   |
| HydroID       | SF_PROFILE_LINE.hydroid       |
| HydroCode     | SF_PROFILE_LINE.hydrocode     |
| ReachCode     | SF_PROFILE_LINE.reachcode     |
| RiverCode     | SF_PROFILE_LINE.rivercode     |
| FType         | SF_PROFILE_LINE.ftype         |
| ProfOrigin    | SF_PROFILE_LINE.proforigin    |
| Shape_length  | SF_PROFILE_LINE.shape_length  |

**5.22 PNW Mappings**

**5.22.1 Hydrologic Unit Boundaries**

**5.22.1.1 HU\_BOUNDARY.PAT**

| PNW Attribute  | OS_Env_Portal_Table.Attribute   |
|----------------|---------------------------------|
| AREA           | SF_DRAINAGE_AREA.AreaSqKm       |
| PERIMETER      | SF_DRAINAGE_AREA.PERIMETER      |
| HU_BOUNDARY#   | SF_DRAINAGE_AREA.HU_BOUNDARY_NO |
| HU_BOUNDARY-ID | SF_DRAINAGE_AREA.HU_BOUNDARY_ID |
| ACRES          | SF_DRAINAGE_AREA.ACRES          |
| HUC_NUM        | SF_DRAINAGE_AREA.HUC_NUM        |
| REGION_NAME    | SF_DRAINAGE_AREA.REGION_NAME    |
| SUBREGION_NAME | SF_DRAINAGE_AREA.SUBREGION_NAME |
| BASIN_NAME     | SF_DRAINAGE_AREA.BASIN_NAME     |
| SUBBASIN_NAME  | SF_DRAINAGE_AREA.SUBBASIN_NAME  |
| WATERSHED_NAME | SF_DRAINAGE_AREA.WATERSHED_NAME |
| SUBWAT_NAME    | SF_DRAINAGE_AREA.SUBWAT_NAME    |
| CATCHMENT_NAME | SF_DRAINAGE_AREA.CATCHMENT_NAME |
| SUBCATCH_NAME  | SF_DRAINAGE_AREA.SUBCATCH_NAME  |
| OLD_HUCNUM     | SF_DRAINAGE_AREA.OLD_HUCNUM     |
| STATES         | SF_DRAINAGE_AREA.STATES         |
| NCONTRIB_DA    | SF_DRAINAGE_AREA.NCONTRIB_DA    |
| DS_HUC5        | SF_DRAINAGE_AREA.DS_HUC5        |
| DS_HUC6        | SF_DRAINAGE_AREA.DS_HUC6        |
| HUC_MOD        | SF_DRAINAGE_AREA.HUC_MOD        |
| COMMENTS       | SF_DRAINAGE_AREA.COMMENTS       |

**5.22.1.2 HU\_BOUNDARY.PATHUC1**

| PNW Attribute | OS_Env_Portal_Table.Attribute |
|---------------|-------------------------------|
|---------------|-------------------------------|

|             |                                 |
|-------------|---------------------------------|
| AREA        | SF_DRAINAGE_AREA.AreaSqKm       |
| PERIMETER   | SF_DRAINAGE_AREA.PERIMETER      |
| HUC1#       | SF_DRAINAGE_AREA.HU_BOUNDARY_NO |
| HUC1-ID     | SF_DRAINAGE_AREA.HU_BOUNDARY_ID |
| ACRES       | SF_DRAINAGE_AREA.ACRES          |
| REGION      | SF_DRAINAGE_AREA.REGION         |
| REGION_NAME | SF_DRAINAGE_AREA.REGION_NAME    |

**5.22.1.3 HU\_BOUNDARY.PATHUC2**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_DRAINAGE_AREA.AreaSqKm            |
| PERIMETER            | SF_DRAINAGE_AREA.PERIMETER           |
| HUC2#                | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HUC2-ID              | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| ACRES                | SF_DRAINAGE_AREA.ACRES               |
| SUBREGION            | SF_DRAINAGE_AREA.SUBREGION           |
| SUBREGION_NAME       | SF_DRAINAGE_AREA.SUBREGION_NAME      |

**5.22.1.4 HU\_BOUNDARY.PATHUC3**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_DRAINAGE_AREA.AreaSqKm            |
| PERIMETER            | SF_DRAINAGE_AREA.PERIMETER           |
| HUC3#                | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HUC3-ID              | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| ACRES                | SF_DRAINAGE_AREA.ACRES               |
| BASIN                | SF_DRAINAGE_AREA.BASIN               |
| BASIN_NAME           | SF_DRAINAGE_AREA.BASIN_NAME          |

**5.22.1.5 HU\_BOUNDARY.PATHUC4**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_DRAINAGE_AREA.AreaSqKm            |
| PERIMETER            | SF_DRAINAGE_AREA.PERIMETER           |
| HUC4#                | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HUC4-ID              | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| ACRES                | SF_DRAINAGE_AREA.ACRES               |
| SUBBASIN             | SF_DRAINAGE_AREA.SUBBASIN            |
| SUBBASIN_NAME        | SF_DRAINAGE_AREA.SUBBASIN_NAME       |

**5.22.1.6 HU\_BOUNDARY.PATHUC5**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_DRAINAGE_AREA.AreaSqKm            |
| PERIMETER            | SF_DRAINAGE_AREA.PERIMETER           |
| HUC5#                | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HUC5-ID              | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| ACRES                | SF_DRAINAGE_AREA.ACRES               |
| WATERSHED            | SF_DRAINAGE_AREA.WATERSHED           |
| WATERSHED_NAME       | SF_DRAINAGE_AREA.WATERSHED_NAME      |
| DS_HUC5              | SF_DRAINAGE_AREA.DS_HUC5             |

**5.22.1.7 HU\_BOUNDARY.PATHUC6**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_DRAINAGE_AREA.AreaSqKm            |
| PERIMETER            | SF_DRAINAGE_AREA.PERIMETER           |
| HUC6#                | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HUC6-ID              | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| ACRES                | SF_DRAINAGE_AREA.ACRES               |
| SUBWAT               | SF_DRAINAGE_AREA.SUBWAT              |
| SUBWAT_NAME          | SF_DRAINAGE_AREA.SUBWAT_NAME         |
| DS_HUC6              | SF_DRAINAGE_AREA.DS_HUC5             |

**5.22.1.8 HU\_BOUNDARY.PATHUC7**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_DRAINAGE_AREA.AreaSqKm            |
| PERIMETER            | SF_DRAINAGE_AREA.PERIMETER           |
| HUC7#                | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HUC7-ID              | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| ACRES                | SF_DRAINAGE_AREA.ACRES               |
| CATCHMENT            | SF_DRAINAGE_AREA.CATCHMENT           |
| CATCHMENT_NAME       | SF_DRAINAGE_AREA.CATCHMENT_NAME      |

**5.22.1.9 HU\_BOUNDARY.PATHUC8**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_DRAINAGE_AREA.AreaSqKm            |
| PERIMETER            | SF_DRAINAGE_AREA.PERIMETER           |
| HUC8#                | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HUC8-ID              | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| ACRES                | SF_DRAINAGE_AREA.ACRES               |
| SUBCATCH             | SF_DRAINAGE_AREA.SUBCATCH            |
| SUBCATCH_NAME        | SF_DRAINAGE_AREA.SUBCATCH_NAME       |

**5.22.1.10 HU\_BOUNDARY.AAT**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| FNODE#               | SF_DRAINAGE_AREA.FNODE_NO            |
| TNODE#               | SF_DRAINAGE_AREA.TNODE_NO            |
| LPOLY#               | SF_DRAINAGE_AREA.LPOLY_NO            |
| RPOLY#               | SF_DRAINAGE_AREA.RPOLY_ID            |
| LENGTH               | SF_DRAINAGE_AREA.LENGTH              |
| HU_BOUNDARY#         | SF_DRAINAGE_AREA.HU_BOUNDARY_NO      |
| HU_BOUNDARY-ID       | SF_DRAINAGE_AREA.HU_BOUNDARY_ID      |
| HUC_LEVEL            | SF_DRAINAGE_AREA.HUC_LEVEL           |
| LINESOURCE           | SF_DRAINAGE_AREA.LINESOURCE          |
| LINEVER              | SF_DRAINAGE_AREA.LINEVER             |
| LINEDATE             | SF_DRAINAGE_AREA.LINEDATE            |
| LINEORG              | SF_DRAINAGE_AREA.LINEORG             |
| METADATA             | SF_DRAINAGE_AREA.METADATA            |

|          |                           |
|----------|---------------------------|
| COMMENTS | SF_DRAINAGE_AREA.COMMENTS |
|----------|---------------------------|

**5.22.2 Water Course Mappings**

**5.22.2.1 WC.ATT**

| PNW Attribute | OS Env Portal Table.Attribute |
|---------------|-------------------------------|
| FNODE#        | SF_HYDRO_EDGE.FNODE_NO        |
| TNODE#        | SF_HYDRO_EDGE.TNODE_NO        |
| LPOLY#        | SF_HYDRO_EDGE.LPOLY_NO        |
| RPOLY#        | SF_HYDRO_EDGE.RPOLY_ID        |
| LENGTH        | SF_HYDRO_EDGE.LENGTH          |
| WC#           | SF_HYDRO_EDGE.EDGE_NO         |
| WC-ID         | SF_HYDRO_EDGE.EDGE_ID         |

**5.22.2.2 WC.SECWC**

| PNW Attribute | OS Env Portal Table.Attribute      |
|---------------|------------------------------------|
| ROUTELINK#    | SF_HYDRO_EDGE_SECTION.ROUTELINK_NO |
| ARCLINK#      | SF_HYDRO_EDGE_SECTION.ARCLINK_NO   |
| F-MEAS        | SF_HYDRO_EDGE_SECTION.F_MEAS       |
| T-MEAS        | SF_HYDRO_EDGE_SECTION.T_MEAS       |
| F-POS         | SF_HYDRO_EDGE_SECTION.F_POS        |
| T-POS         | SF_HYDRO_EDGE_SECTION.T_POS        |
| WC#           | SF_HYDRO_EDGE_SECTION.EDGE_NO      |
| WC-ID         | SF_HYDRO_EDGE_SECTION.EDGE_ID      |

**5.22.2.3 WC.RATWC**

| PNW Attribute | OS Env Portal Table.Attribute |
|---------------|-------------------------------|
| WC_LLID_NR    | SF_HYDRO_EDGE.EDGE_LLID_NR    |
| WC#           | SF_HYDRO_EDGE.EDGE_NO         |
| WC-ID         | SF_HYDRO_EDGE.EDGE_ID         |

**5.22.2.4 WC.EVT\_LN\_TYPE**

| PNW Attribute   | OS Env Portal Table.Attribute     |
|-----------------|-----------------------------------|
| WC_LLID_NR      | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR  |
| WC_BEGIN_AD     | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD |
| WC_END_AD       | SF_HYDRO_EDGE_EVENT.EDGE_END_AD   |
| WC_LN_TYPE_CD   | SF_EVT_LN_TYPE.WC_LN_TYPE_CD      |
| WC_FLOW_PATH_CD | SF_EVT_LN_TYPE.WC_FLOW_PATH_CD    |

**5.22.2.5 WC.EVT\_NAME**

| PNW Attribute | OS Env Portal Table.Attribute    |
|---------------|----------------------------------|
| WC_LLID_NR    | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR |

|             |                                   |
|-------------|-----------------------------------|
| WC_BEGIN_AD | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD |
| WC_END_AD   | SF_HYDRO_EDGE_EVENT.EDGE_END_AD   |
| WC_GNIS_NM  | SF_EVT_NAME.WC_GNIS_NM            |
| WC_GNIS_NR  | SF_EVT_NAME.WC_GNIS_NR            |

**5.22.2.6 WC.EVT\_FTR\_TYPE**

| PNW Attribute  | OS Env Portal Table.Attribute     |
|----------------|-----------------------------------|
| WC_LLID_NR     | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR  |
| WC_BEGIN_AD    | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD |
| WC_END_AD      | SF_HYDRO_EDGE_EVENT.EDGE_END_AD   |
| WC_HYDR_FTR_CD | SF_EVT_FTR_TYPE.WC_HYDR_FTR_CD    |
| WC_CART_FTR_CD | SF_EVT_FTR_TYPE.WC_CART_FTR_CD    |

**5.22.2.7 WC.EVT\_RRF**

| PNW Attribute | OS Env Portal Table.Attribute     |
|---------------|-----------------------------------|
| WC_LLID_NR    | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR  |
| WC_BEGIN_AD   | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD |
| WC_END_AD     | SF_HYDRO_EDGE_EVENT.EDGE_END_AD   |
| WC_RRF_NO     | SF_EVT_RRF.WC_RRF_NO              |

**5.22.2.8 WC.EVT\_STRM\_FLOW**

| PNW Attribute | OS Env Portal Table.Attribute     |
|---------------|-----------------------------------|
| WC_LLID_NR    | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR  |
| WC_BEGIN_AD   | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD |
| WC_END_AD     | SF_HYDRO_EDGE_EVENT.EDGE_END_AD   |
| WC_CONTU_CD   | SF_EVT_STRM_FLOW.WC_CONTU_CD      |
| WC_PERIOD_CD  | SF_EVT_STRM_FLOW.WC_PERIOD_CD     |

**5.22.2.9 WC.EVT\_FTR\_HST**

| PNW Attribute   | OS Env Portal Table.Attribute     |
|-----------------|-----------------------------------|
| WC_LLID_NR      | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR  |
| WC_BEGIN_AD     | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD |
| WC_END_AD       | SF_HYDRO_EDGE_EVENT.EDGE_END_AD   |
| FTR_MOD_CD      | SF_EVT_FTR_HST.FTR_MOD_CD         |
| FTR_INTRP_CD    | SF_EVT_FTR_HST.FTR_INTRP_CD       |
| FTR_SRC_CD      | SF_EVT_FTR_HST.FTR_SRC_CD         |
| FTR_SRC_DT      | SF_EVT_FTR_HST.FTR_SRC_DT         |
| FTR_SRCSCALE_NR | SF_EVT_FTR_HST.FTR_SRCSCALE_NR    |
| FTR_ACCUR_NR    | SF_EVT_FTR_HST.FTR_ACCUR_NR       |
| FTR_ORG_CD      | SF_EVT_FTR_HST.FTR_ORG_CD         |
| FTR_EDIT_DT     | SF_EVT_FTR_HST.FTR_EDIT_DT        |



**5.22.3 Water Shoreline Mappings**

**5.22.3.1 WS.ATT**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| FNODE#               | SF_HYDRO_EDGE.FNODE_NO               |
| TNODE#               | SF_HYDRO_EDGE.TNODE_NO               |
| LPOLY#               | SF_HYDRO_EDGE.LPOLY_NO               |
| RPOLY#               | SF_HYDRO_EDGE.RPOLY_ID               |
| LENGTH               | SF_HYDRO_EDGE.LENGTH                 |
| WS#                  | SF_HYDRO_EDGE.EDGE_NO                |
| WS-ID                | SF_HYDRO_EDGE.EDGE_ID                |

**5.22.3.2 WS.SECWS**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| ROUTELINK#           | SF_HYDRO_EDGE_SECTION.ROUTELINK_NO   |
| ARCLINK#             | SF_HYDRO_EDGE_SECTION.ARCLINK_NO     |
| F-MEAS               | SF_HYDRO_EDGE_SECTION.F_MEAS         |
| T-MEAS               | SF_HYDRO_EDGE_SECTION.T_MEAS         |
| F-POS                | SF_HYDRO_EDGE_SECTION.F_POS          |
| T-POS                | SF_HYDRO_EDGE_SECTION.T_POS          |
| WS#                  | SF_HYDRO_EDGE_SECTION.EDGE_NO        |
| WS-ID                | SF_HYDRO_EDGE_SECTION.EDGE_ID        |

**5.22.3.3 WS.RATWS**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| WS_LLID_NR           | SF_HYDRO_EDGE.EDGE_LLID_NR           |
| WS#                  | SF_HYDRO_EDGE.EDGE_NO                |
| WS-ID                | SF_HYDRO_EDGE.EDGE_ID                |
| WS_DATUM_CD          | SF_HYDRO_EDGE.WS_DATUM_CD            |
| WS_DFLT_SHORE_CD     | SF_HYDRO_EDGE.WS_DFLT_SHORE_CD       |

**5.22.3.4 WS.EVT\_SL\_TYPE**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| WS_LLID_NR           | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR     |
| WS_BEGIN_AD          | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD    |
| WS_END_AD            | SF_HYDRO_EDGE_EVENT.EDGE_END_AD      |
| WS_TYPE_CD           | SF_EVT_SL_TYPE.WS_TYPE_CD            |

**5.22.3.5 WS.EVT\_FTR\_HST**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| WS_LLID_NR           | SF_HYDRO_EDGE_EVENT.EDGE_LLID_NR     |
| WS_BEGIN_AD          | SF_HYDRO_EDGE_EVENT.EDGE_BEGIN_AD    |

|                 |                                   |
|-----------------|-----------------------------------|
| WS_END_AD       | SF_HYDRO_EDGE_EVENT.EDGE_END_AD   |
| FTR_MOD_CD      | SF_EVT_SL_FTR_HST.FTR_MOD_CD      |
| FTR_INTRP_CD    | SF_EVT_SL_FTR_HST.FTR_INTRP_CD    |
| FTR_SRC_CD      | SF_EVT_SL_FTR_HST.FTR_SRC_CD      |
| FTR_SRC_DT      | SF_EVT_SL_FTR_HST.FTR_SRC_DT      |
| FTR_SRCSCALE_NR | SF_EVT_SL_FTR_HST.FTR_SRCSCALE_NR |
| FTR_ACCUR_NR    | SF_EVT_SL_FTR_HST.FTR_ACCUR_NR    |
| FTR_ORG_CD      | SF_EVT_SL_FTR_HST.FTR_ORG_CD      |
| FTR_EDIT_DT     | SF_EVT_SL_FTR_HST.FTR_EDIT_DT     |

**5.22.4 Water Point Mappings**

**5.22.4.1 WP.PAT**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_HYDRO_POINT.AREA                  |
| PERIMETER            | SF_HYDRO_POINT.PERIMETER             |
| WP#                  | SF_HYDRO_POINT.WP_NO                 |
| WP-ID                | SF_HYDRO_POINT.WP_ID                 |
| WP_LLID_NR           | SF_HYDRO_POINT.WP_LLID_NR            |
| WP_HYDR_FTR_CD       | SF_HYDRO_POINT.WP_HYDR_FTR_CD        |
| WP_CART_FTR_CD       | SF_HYDRO_POINT.WP_CART_FTR_CD        |
| WP_PERIOD_CD         | SF_HYDRO_POINT.WP_PERIOD_CD          |

**5.22.4.2 WP.REL\_FTR\_HST**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| WP_LLID_NR           | SF_POINT_FTR_HST.WP_LLID_NR          |
| FTR_MOD_CD           | SF_POINT_FTR_HST.FTR_MOD_CD          |
| FTR_INTRP_CD         | SF_POINT_FTR_HST.FTR_INTRP_CD        |
| FTR_SRC_CD           | SF_POINT_FTR_HST.FTR_SRC_CD          |
| FTR_SRC_DT           | SF_POINT_FTR_HST.FTR_SRC_DT          |
| FTR_SRCSCALE_NR      | SF_POINT_FTR_HST.FTR_SRCSCALE_NR     |
| FTR_ACCUR_NR         | SF_POINT_FTR_HST.FTR_ACCUR_NR        |
| FTR_ORG_CD           | SF_POINT_FTR_HST.FTR_ORG_CD          |
| FTR_EDIT_DT          | SF_POINT_FTR_HST.FTR_EDIT_DT         |

**5.22.5 Water Body Mappings**

**5.22.5.1 WB.PATWB**

| <b>PNW Attribute</b> | <b>OS Env Portal Table.Attribute</b> |
|----------------------|--------------------------------------|
| AREA                 | SF_WATERBODY.AREA                    |
| PERIMETER            | SF_WATERBODY.PERIMETER               |
| WB#                  | SF_WATERBODY.WB_NO                   |
| WB-ID                | SF_WATERBODY.WB_ID                   |
| WB_LLID_NR           | SF_WATERBODY.WB_LLID_NR              |
| WB_HYDR_FTR_CD       | SF_WATERBODY.WB_HYDR_FTR_CD          |

|                |                             |
|----------------|-----------------------------|
| WB_CART_FTR_CD | SF_WATERBODY.WB_CART_FTR_CD |
| WB_GNIS_NM     | SF_WATERBODY.WB_GNIS_NM     |
| WB_GNIS_NR     | SF_WATERBODY.WB_GNIS_NR     |
| WB_PERIOD_CD   | SF_WATERBODY.WB_PERIOD_CD   |