GIS Assessment Toolbox and Databases Implementation

Guam Water Resource Master Plan Project – Phase I

Government of Guam,
Guam Waterworks Authority

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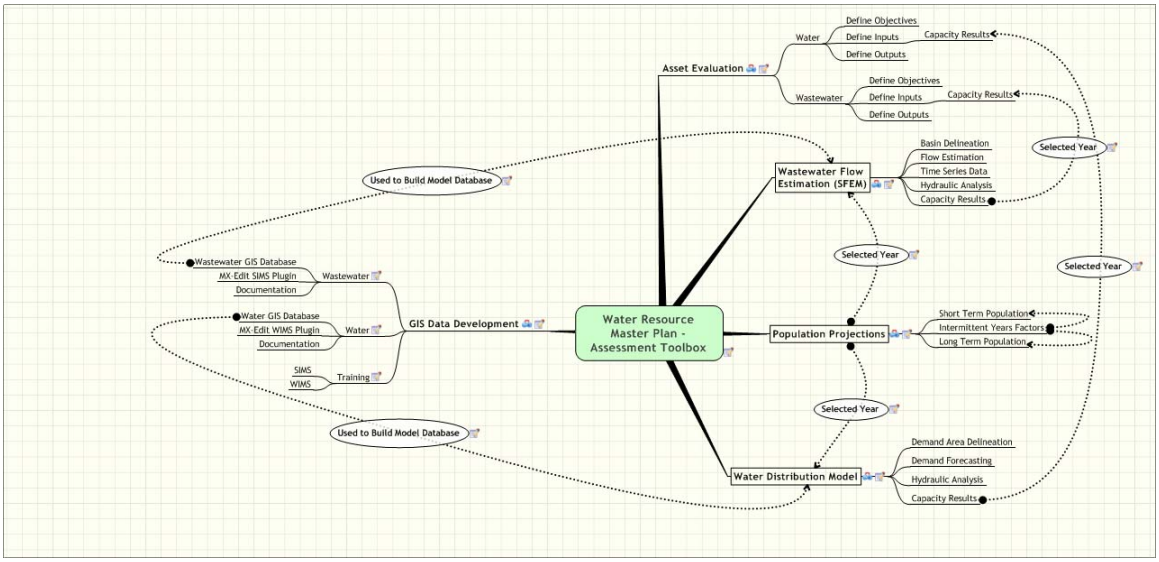
Contents

1. Assessment Tools – Prototype Design

Water Resource Master Plan - Assessment Toolbox

The water resource master plan uses a GIS based approach to system evaluation. This provides a common database between all the project tasks and adds long term value to the data that is collected. The integration of the GIS data are described in general in the follwoing diagram. Each of the major components are documented with more detailed specifications.



Asset Evaluation

See also: Asset Evaluation

The GIS water and wastewater databases are used to support asset evaluations. The GIS data contains the location of features and important attributes and characterization of the system. The GIS contains fields to labeling conditions ranks used to visualize the overall condition of the system.

Wastewater Flow Estimation (SFEM)

See also: Wastewater Flow Estimation (SFEM)

The wastewater flow estimation model is based on the GIS sewer database developed for the project. The objectivies of the flow model is to use automated modeling routines to do flow capacity analysis for multiple short and long term time horizons. The capacity analysis data is created by this model using the sewer network and population projection data. The outputs are projected capacities of the major sewers in the system.

Population Projections

See also: Population Projections
See also: Wastewater Flow Estimation (SFEM), Water Distribution Model

The population projection data is used to support the water and wastewater modeling. The processes and overall integration of the data inputs, outputs and interactions with other processes are defined. The intent of this section is to document the processes at the "big picture" scale. More detailed development plans will be created as part of the development phase.

Water Distribution Model

See also: Water Distribution Model

The water demand forecasting model is based on the GIS water database developed for the project. The objectivies of the demand model is to use automated modeling routines to do capacity analysis for multiple short and long term time horizons. The capacity analysis data is created by this model using the water network and population projection data. The outputs are projected capacities of the major water features in the system.

GIS Data Development

See also: GIS Data Development

The GIS development task includes the database design, data input process and editing tools. The GIS data is developed are the water GIS Geodatabase, wastewater geodatabase, basemap layers and supporting population GIS layers. This section documents the overall process and components of the GIS development task as part of the project GIS integration plan.

Wastewater

The wastewater GIS database was developed as a ESRI geodatabase with a geometric network. The data structure was designed to support sewer flow modeling processes that will be conducted and implemented for this master plan and to support infrastructure management of the sewer assets.

Water

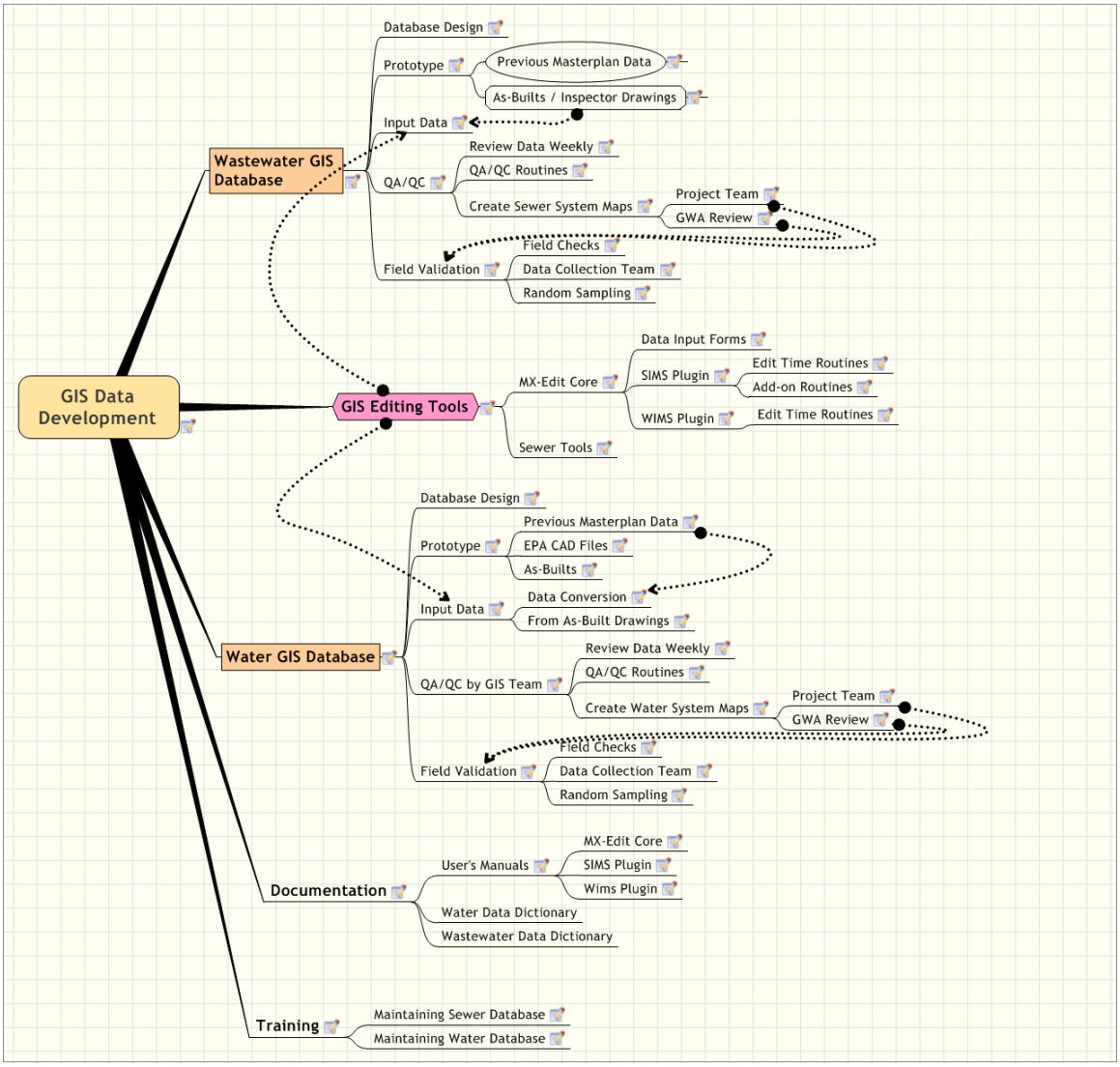
The water GIS database was developed as a ESRI geodatabase with a geometric network. The data structure was designed to support water demand forecasting modeling that will be conducted for this master plan and to support infrastructure management of the water assets.

Training

Training for the internal consultant team in understandin the GIS databases and the editing tools is provided. Training for GWA staff in maintaining these database is part of Phase II work.

GIS Data Development

The GIS development task includes the database design, data input process and editing tools. The GIS data is developed are the water GIS Geodatabase, wastewater geodatabase, basemap layers and supporting population GIS layers. This section documents the overall process and components of the GIS development task as part of the project GIS integration plan.



Wastewater GIS Database

The wastewater GIS database was developed as a ESRI geodatabase with a geometric network. The data structure was designed to support sewer flow modeling processes that will be conducted and implemented for this master plan and to support infrastructure management of the sewer assets.

Database Design

The sewer Geodatabase design was developed primarily to support the needs of the master plan project, but considered future uses of the data. The design was developed using templates

previously used by the consultants with modifications being made for the requirements of GWA. Refer to Sewer Database design document for more details.

The feature layers are:

- Sewer mains
- Sewer laterals
- Manholes
- Treatment plants
- Pump stations
- Fittings
- Service connections
- Discharges

Prototype

A prototype area was used to input sewer data from available data resources. The previous master plan data was evaluated as a source to input into the new geodatabase structure. The "As-Builts" or Inspector drawings were evaluated and determined to be the best source of the data. Since the new data structure is in a Geometric network, the data had to be re- digitized. The shapefiles from the previous master plan data could not be converted because of disconnects in the data, due to their CAD file origin.

Previous Masterplan Data

Shape files developed in the 1993 master plan. This data was only used as mapping data and did not include the attributes required by hydraulic analysis. The data did not have the manholes snapped to the ends of the sewermains as nodes, rather as circles. This data could not be converted to the new structure and is used as reference only.

As-Builts / Inspector Drawings

See also: Input Data

The data determined to be the best source for inputting data into the new structure are the "As-builts" or inspector copies. This data has the necessary attributes needed for modeling (e.g. material types, invert elevations, and lateral pipes) The GIS input team has set up production near the GWA map room for convience.

The attribute data is only available on these maps.

Input Data

The data is input into the wastewater GIS database using the As-Builts and inspector copies. This is done on-site near the GWA maproom.

QA/QC

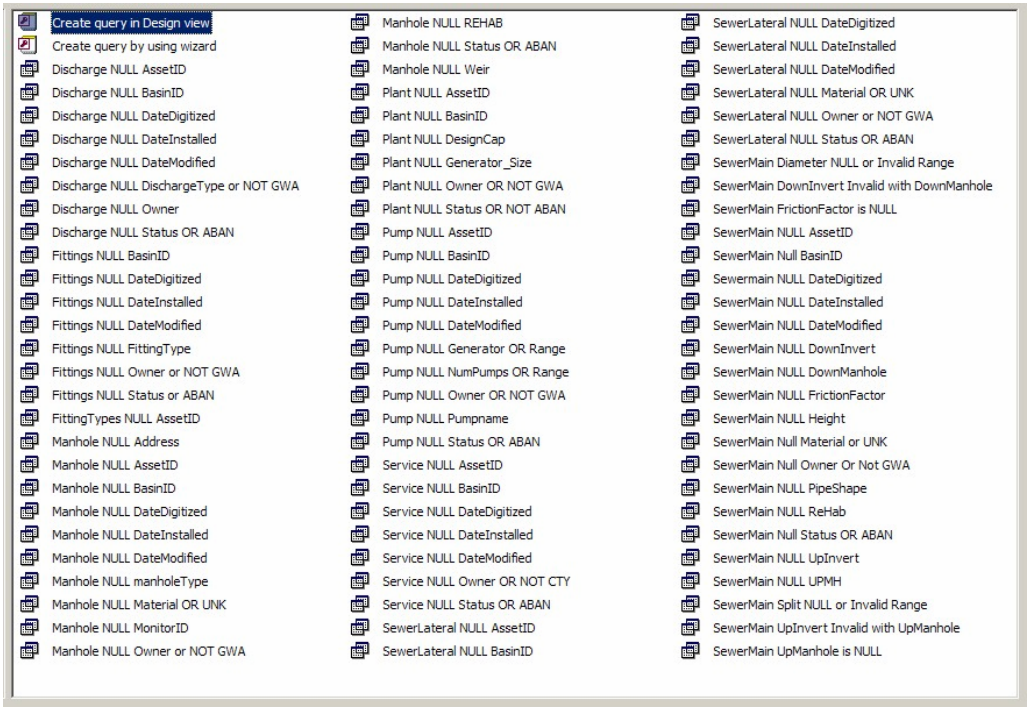
The quality assurance and quality control processes provides review by the GIS team not directly involved with the research and data input. This is important so that an objective review can be done on the data.

Review Data Weekly

The wastewater GIS data is reviewed on a weekly basis by the GIS development team, particularly the database design team. Data is transferred via FTP servers from the GIS team in Guam to the GIS developers in Hawaii.

QA/QC Routines

As part of the overall quality control process, SQL routines were developed to help find missing or invalid data. There are many routines that are run on a regular basis. As missing or invalid data is found it can be corrected during the data collection and not at the end.



Create Sewer System Maps

On a regular basis and as significant progress in the GIS data collection is made, overall system maps are created to be used by the project team. These maps server two purposes, 1.) provide additional review by project members outside of the GIS team, 2.) provide maps as reference for other project tasks.

ArcMap documents with a map layout and map tile system is created. A map tile system was created for the island coded by village. These map tools use the MapBook extension to automatically print map series in batch.

Project Team

See also: Field Validation

The project team can review the GIS sewer system maps and make recommendations for field inspection. The reviewers may include task leaders from the modeling teams, data collection and others.

GWA Review

See also: Field Validation

The GIS sewer system maps should be reviewed by GWA staff familiar with the each system. Many times valuable information about the system only exists by knowledge by staff. This review provides an important screening process to find potential errors in the data that may need field investigation.

Field Validation

In some cases the available resources for building a complete and accurate sewer GIS database is not possible from the source material. Since the sewer database is to be used for hydraulic

analysis, it is essential that the system be as accurate as possible, particularly the connectivity and elevation data.

Based on review by GWA staff and the data collection team, some field investigation is expected. The field investigation will verify existence features, location of features and collect missing data attributes.

Field Checks

Field crews are assigned to missing or suspect data as needed. If needed GPS locations of manholes or other point features will be collected. Field checks should include the verification of all data components of the GIS data.

Data Collection Team

The data collection team are inspecting the features of the major sewers. When available, due to timing of data, the GIS system maps will be used as a reference by the field inspectors. Any inconsistencies found can be reported back to the GIS development team for correction.

Random Sampling

A 10% random field investigation will also be completed and documented as a random sampling of data. Samples should however emphasize the system 10 inches in diameter or bigger.

GIS Editing Tools

See also: Input Data, Input Data

The GIS editing tools used for the development and long term maintenance of the water and wastewater GIS databases is centralized into a common editing interface. This code editing tool is MX-Edit.

The Sewer Information Management System (SIMS) and the Water Information Management System (WIMS) customized routines are developed as plugins to MX- Edit. This provides a single user interface for both water and wastewater.

MX-Edit Core

The MX-Edit program runs under ArcMap as an add-on extension. This program provides a common interface for editing GIS database. Specific QA/QC and automated routines specific to water or wastewater are installed as plugins to MX-Edit.

The major features of MX-Edit are:

- Form based data entry
- Advanced selection and categorization of selection sets.
- Stored Queries
- Bookmark useful for editing
- SIMS plugin routines
- WIMS plugin routines

GWA and the GIS development team receive a Site licenses of MX-Edit and the plugin programs.

Data Input Forms

MX-Edit forms are setup to standardize the way that GIS water or wastewater data is input. Users can customize the entry forms to suite their work flow.

SIMS Plugin

The Sewer Information Management System (SIMS) routines are developed as MX-Edit plugins. These plugins provide automated routines specific to wastewater GIS features. As attributes are updated, some fields are automatically updated making the data entry fast and more reliable.

Edit Time Routines

The SIMS plugin routines include some processes that are run as certain data fields are modified. After a data modification on these fields, automated routines are run to update other related fields. for example, the upstream and downstream manholes on the sewermains are updated if the manhole AssetID is changed.

The edit-time routines run during an editing session are:

Edit Time Component: Routines			
List of routines that are executed by the SIMS plug in at edit time.			
Functions	FeatureClasss	Fields	Description
Auto AssetID	All featureclasses in the Sewers geometric network except SewerNetwork_Junctions	ASSETID	Assigns a unique Asset ID to all features throughout all featureclasses
Modified Date	All featureclasses in the Sewers geometric network except SewerNetwork_Junctions	DATEMODIFIED	Populates the DATEMODIFIED field with the current system date when any changes are made to the feature.
Calculate Slope	Sewermain	UPINVERT, DOWNINVERT, PIPELENGTH, SLOPE	Calculates the slope of the sewermain pipe using the formula: ***Slope = ((UpInvert - DownInvert) / PipeLength)***
Calculate Water Table	Sewermain	UPINVERT, DOWNINVERT, WATERTABLE	Calculates the slope of the sewermain pipe using the formula: ***WaterTable = (UpInvert + DownInvert) / 2*** If WaterTable > 1 then the pipe is above water. If WaterTable <= 1 then the pipe is below water.
Get Invert Elevation	Sewermain, Manhole	UPMANHOLE (Sewermain), UPINVERT (Sewermain), ASSETID (Manhole), INVERTELEV (Manhole), GROUNDELEV (Manhole), DEPTH (Manhole)	Compares the UpInvert of each Sewermain that has the same Upmanhole and assigns the lowest Sewermain-UpInvert to the Manhole InvertElevation. Calculates the Depth of the Manhole with the new InvertElevation using the formula: ***Depth = GroundElevation - InvertElevation***
Calculate Friction Factor	Sewermain	MATERIAL, DIAMETER, FRICTIONFACTOR	Calculates the Friction Factor of the pipe according the following conditions: If the Material = CIPC, CCP or RCP then FrictionFactor = 0.015. If the Material isn't in the list, then if the pipe Diameter <= 18 inches then FrictionFactor = 0.015 If these conditions are not met then FrictionFactor = 0.013
Up and Down	Sewermain, Manhole	ASSETID (Sewermain, Manhole),	Populates the Sewermain Upmanhole and DownManhole fields with the Asset ID of the

Manhole		UPMANHOLE (Sewermain), DOWNMANHOLE (Sewermain)	corresponding Manhole.
Set Flow Split	Sewermain, Manhole	UPMANHOLE (Sewermain), FLOWSPLIT (Sewermain), ASSETID (Manhole)	Checks the number of Sewermains coming from their UpManhole and calculates the FlowSplit of the Sewermain pipe using the formula: ***FlowSplit = 100 / (Number of Sewermains)***
Calculate Invert Elevation	Manhole	INVERTELEV, GROUNDELEV, DEPTH	Calculates the Invert Elevation of the Manhole using the formula: ***Depth = GroundElevation– InvertElevation*** If Depth > 999 then Depth = 999. If Depth < 0 then Depth = 0.

Add-on Routines

Additional data processing routines that are run in batch or separate from attribute edits are in "Add-on" routines within the SIMS plugin. These are often run at the end of an edit session or on a regular basis. The routines developed are:

- Flipping of linear features when digitized the wrong direction
- Merging of database when multiple copies of the database are being used. This allows more than one editor to input data.
- Updating to upstream and downstream IDs on sewermains.

WIMS Plugin

The Water Information Management System (WIMS) routines are developed as MX-Edit plugins. These plugins provide automated routines specific to water GIS features. As attributes are updated, some fields are automatically updated making the data entry fast and more reliable.

Edit Time Routines

The WIMS edit time plugin routines are automatically assign unique AssetIDs to GIS water features. Other routines will be developed as needed.

Sewer Tools

A collection of useful sewer tools are also provided to supplement the MX-Edit program. These tools are helpful for anyone using the sewer GIS data. The tools include several tracing routines for connectivity and tributary analysis. Tracing the sewer lines both upstream and downstream help the users and administrators of the data to understand the system and data better.

The GIS development team and GWA will receive installation programs for these tools.

Water GIS Database

The water GIS database was developed as a ESRI geodatabase with a geometric network. The data structure was designed to support water demand forecasting modeling that will be conducted for this master plan and to support infrastructure management of the water assets.

Database Design

The water GIS database design was developed to support the modeling and infrastructure evaluation processes of the project. The database design was based on the ESRI water models

and then modified for the needs of the project GWA. The design may be simplified as data is inputted and its use is better defined.

The water distribution feature layers are:

- Clear Wells
- Control Valves
- Fittings
- Gravity Main
- Hydrants
- Lateral Lines
- Lateral Points
- Manholes
- Meters
- Network Structure
- Pressure mains
- Pump stations
- Sampling station
- System Valves

The water distribution feature layers are:

- Anodes
- Casings
- Reservoirs
- ScadaSensors
- Thrust Protection
- Water Structures

Prototype

An evaluation of the data sources and input methods is analyzed. This is used to help determine the best source and method of input before embarking on the water GIS data collection.

Previous Masterplan Data

See also: Data Conversion

In a previous masterplan project conducted in 1993, some water data was collected and stored in GIS shapefiles. This data is outdated in some places and also does not include all the attribute data needed. This data however was evaluated as a data source.

It was determined that this data could be converted into the new GIS water database as a staring point. All the major lines and features were imported into the new GIS database, but still requires research to complete the effort. This previous data provides the location and line work of the features, but the attributes are incomplete and still need to be researched and entered using thee resources available.

EPA CAD Files

The water drawings exist in CAD files and are evaluated as a possible source of data. This data is considered and resource for the research, but probably not adequate for data conversion.

Note: This evaluation is not complete, pending delivery of sample files.

As-Builts

The As-Built or inspector copies are considered the best source of information for the water GIS database. These maps will be used to update data converted from the previous master plan data and to update areas developed since this last master plan.

The attribute data is only available on these maps.

Input Data

Data is researched and input by the GIS development team using the GIS editing Tools developed and the As-Built and inspector drawings. The GIS database is originally seeded from the converted data in the previous master plan GIS layers. This is done on-site near the GWA maproom.

Data Conversion

The data from the previous master plan layers were converted and inserted into the installed water GIS database. This data will need to be confirmed and additional attribute data added from the As-Built and inspector drawings.

From As-Built Drawings

The As-Built and inspector drawings are used as the primary reference for checking the previous master plan data and to add more detailed attributes to the GIS database.

QA/QC by GIS Team

QA/QC routines are developed and used to query for missing or invalid data. These should be run on a regular basis during the edit process.

Review Data Weekly

The water GIS data is reviewed on a weekly basis by the GIS development team, particularly the database design team. Data is transferred via FTP servers from the GIS team in Guam to the GIS developers in Hawaii.

QA/QC Routines

As part of the overall quality control process, SQL routines were developed to help find missing or invalid data.

Create Water System Maps

On a regular basis and as significant progress in the GIS data collection is made, overall system maps are created to be used by the project team. These maps server two purposes, 1.) provide additional review by project members outside of the GIS team, 2.) provide maps as reference for other project tasks.

ArcMap documents with a map layout and map tile system is created. A map tile system was created for the island coded by village. These map tools use the MapBook extension to automatically print map series in batch.

Project Team
See also: Field Validation

The project team can review the GIS water system maps and make recommendations for field inspection. The reviewers may include task leaders from the modeling teams, data collection and others.

GWA Review
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Based on review by GWA staff and the data collection team, some field investigation is expected. The field investigation will verify existence features, location of features and collect missing data attributes.

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Field Checks

Field crews are assigned to missing or suspect data as needed. If needed GPS locations of point features will be collected. Field checks should include the varification of all data components of the GIS data.

Data Collection Team

The data collection team are inspecting the major features of water system . When available, due to timing of data, the GIS system maps will be used as a reference by the field inspectors. Any inconsistencies found can be reported back to the GIS development team for correction.

Random Sampling

A 10% random field investigation will also be completed and documented as a random sampling of data. Samples should however emphasize the system 10 inches in diameter or bigger.

Documentation

The tools and processes used to develop the water and wastewater GIS databases is documented in the form of design specifications and user's manuals. Phase II of the Guam Master Plan project includes more complete user's manuals in conjunction with the GWA training tasks.

User's Manuals

User's manuals to support the Phase I work and the GIS developement team are developed. More deatiled documentation will be developed as needed during the Phase II training tasks.

MX-Edit Core

Provide a complete user's manual for using the MX-Edit core product. This is available in printed, PDF file and Windows Help file formats.

SIMS Plugin

Provide a complete user's manual for using the SIMS plugin tools for internal use by the GIS development team. A more detailed version is developed as part of Phase II training tasks. This is available in printed, PDF file and Windows Help file formats.

Wims Plugin

Provide a complete user's manual for using the WIMS plugin tools for internal use by the GIS development team. A more detailed version is developed as part of Phase II training tasks. This is available in printed, PDF file and Windows Help file formats.

Water Data Dictionary

Database dictionary defining all the feature, tables, fields and domins designed in the database structure.

Wastewater Data Dictionary

Database dictionary defining all the feature, tables, fields and domins designed in the database structure.

Training

Training for the internal consultant team in understandin the GIS databases and the editing tools is provided. Training for GWA staff in maintaining these database is part of Phase II work.

Maintaining Sewer Database

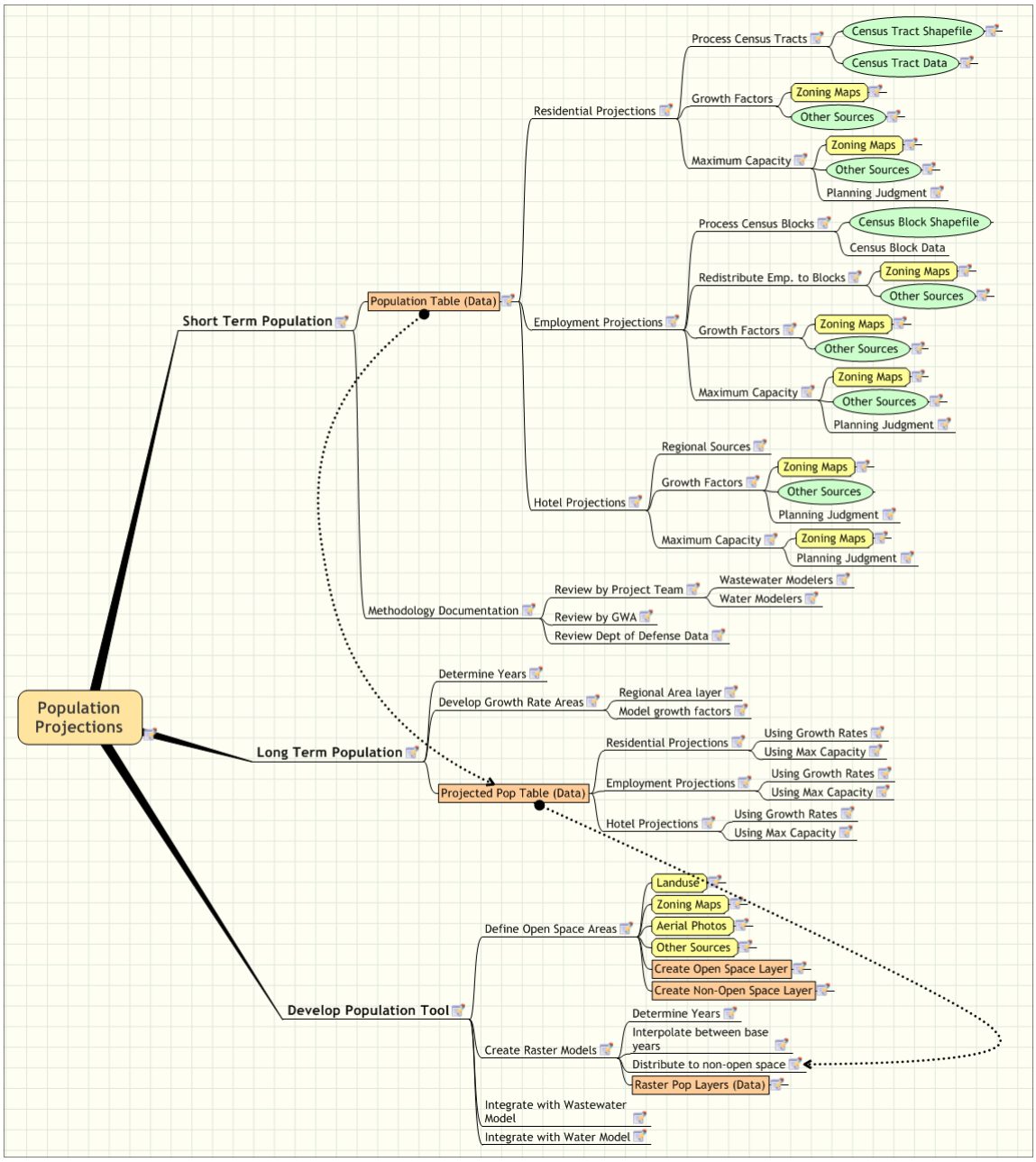
The sewer database basics and database design are documented as part of the Database Implementation document. This included information that the project team needs to complete the tasks in Phase I. A simplified user's manual for SIMS is developed and used by the GIS data team. This manual will be expanded as part of the Phase II training task.

Maintaining Water Database

The water database basics and database design are documented as part of the Database Implementation document. This included information that the project team needs to complete the tasks in Phase I. A simplified user's manual for WIMS is developed and used by the GIS data team. This manual will be expanded as part of the Phase II training task.

Population Projections

The population projection data is used to support the water and wastewater modeling. The processes and overall integration of the data inputs, outputs and interactions with other processes are defined. The intent of this section is to document the processes at the "big picture" scale. More detailed development plans will be created as part of the development phase.



Short Term Population

The short term population data is being developed using the US census data as a basis. All population projections will be tied to the census block group polygons via the Blockgrp field in this population table. This table is used to project long term population using growth rate and

maximum capacity factors. The resulting population table is used to create raster models for all years of interest.

Population Table (Data)

See also: Projected Pop Table (Data)

The population table contains population for residential, employment and hotels and all growth rate and maximum capacity factors. The data is at the block group level that can be linked to the Census block GIS layer.

Residential Projections

The residential data is based on the US census block level data. The base year is 2000 and the short term population projections are for the years 2005,2010, 2015, and 2020. Projections are applied using growth rate and maximum capacity factors.

Process Census Tracts

Census tract GIS layer is processed and projected into the GWA standard coordinate system. The original data is from the tr66_00d shape file.

Census Tract Shapefile

GIS shape file from US Census Bureau for the census tracts (tr66_00d) Data is projected to the Guam 1993 Datum.

Census Tract Data

GIS shape file from US Census Bureau for the census block groups (bg66_00d) Data is projected to the Guam 1993 Datum.

Growth Factors

Growth Rate factors are determined at the block level to distribute residential population to the areas that have commercially or employment landuse activities. The projected data considers the census blocks that are likely to have employment growth in the future. Future projections are based on the zoning maps and other available planning resources.

Zoning Maps

Guam Government zoning maps are available in hardcopy only. They are used as reference to help determine the zoned landuse for distributing population and defining growth rate and maximum capacity factors.

Other Sources

Other resources within the Guam government agencies are investigated and used as appropriate.

Maximum Capacity

Residential population cannot grow indefinitely so the population projection factors must include a limit to the maximum capacity of an area. This will prevent the numerical projection process to not allow an area grow beyond the intended use of and area. These maximum limits are set at the block level using available resources, such as landuse, zoning maps and other planning information that is made available to the project.

Zoning Maps

Guam Government zoning maps are available in hardcopy only. They are used as reference to help determine the zoned landuse for distributing population and defining growth rate and maximum capacity factors.

Other Sources

Other resources within the Guam government agencies are investigated and used as appropriate.

Planning Judgment

Professional judgement as a planner and analyst are used to set reasonable maximum capacity factors. Any available resources will be used as appropriate.

Employment Projections

The employment data is based on the US census tract level data. The base year is 2000 and the short term population projections are for the years 2005,2010, 2015, and 2020. These numbers are adjusted based on regional employment population data. Projections are applied using growth rate and maximum capacity factors.

Process Census Blocks

Census Block GIS layer is processed and projected into the GWA standard coordinate system. The original data is from the bg66_00d shape file.

Census Block Shapefile

Census Block Data

Redistribute Emp. to Blocks

Since employment data is only available from the census data at the tract level. The employment population needs to be refined and redistributed to the block level. Tract level data is inadequate for modeling since large undeveloped areas are also included in the tracts.

Using planning judgement and available resources employment will be pushed into the blocks. Each block will be processed independently so that employment population, growth rate and maximum capacity factors are considered at the block level.

Zoning Maps

Guam Government zoning maps are available in hardcopy only. They are used as reference to help determine the zoned landuse for distributing population and defining growth rate and maximum capacity factors.

Other Sources

Other resources within the Guam government agencies are investigated and used as appropriate.

Growth Factors

Growth Rate factors are determined at the tract level to distribute employment population to the areas that have commercially or employment landuse activities. The projected data considers the census blocks that are likely to have employment growth in the future. Future projections are based on the zoning maps and other available planning resources.

Zoning Maps

Guam Government zoning maps are available in hardcopy only. They are used as reference to help determine the zoned landuse for distributing population and defining growth rate and maximum capacity factors.

Other Sources

Other resources within the Guam government agencies are investigated and used as appropriate.

Maximum Capacity

Employment population cannot grow indefinitely so the population projection factors must include a limit to the maximum capacity of an area. This will prevent the numerical projection process to not allow an area grow beyond the intended use of and area. These maximum limits are set at the block level using available resources, such as landuse, zoning maps and other planning information that is made available to the project.

Zoning Maps

Guam Government zoning maps are available in hardcopy only. They are used as reference to help determine the zoned landuse for distributing population and defining growth rate and maximum capacity factors.

Other Sources

Other resources within the Guam government agencies are investigated and used as appropriate.

Planning Judgment

Professional judgement as a planner and analyst are used to set reasonable maximum capacity factors. Any available resources will be used as appropriate.

Hotel Projections

The hotel data is based on regional data sources and projections are applied using growth rate and maximum capacity factors.

Regional Sources

Hotel population uses existing visitor count and hotel data available through Guam Government.

Growth Factors

Growth Rate factors are determined at the block level to distribute hotel population to the areas that have hotels or are likely to have hotels in the future. Future projections are based on the zoning maps and other available planning resources.

Zoning Maps

Guam Government zoning maps are available in hardcopy only. They are used as reference to help determine the zoned landuse for distributing population and defining growth rate and maximum capacity factors.

Other Sources

Planning Judgment

Professional judgement as a planner and analyst are used to set reasonable maximum capacity factors. Any available resources will be used as appropriate.

Maximum Capacity

Hotel and other visitor accommodations cannot grow indefinitely so the population projection factors must include a limit to the maximum capacity of an area. This will prevent the numerical projection process to not allow an area grow beyond the intended use of and area. These maximum limits are set at the block level using available resources, such as landuse, zoning maps and other planning information that is made available to the project.

Zoning Maps

Guam Government zoning maps are available in hardcopy only. They are used as reference to help determine the zoned landuse for distributing population and defining growth rate and maximum capacity factors.

Planning Judgment

Professional judgement as a planner and analyst are used to set reasonable maximum capacity factors. Any available resources will be used as appropriate.

Methodology Documentation

The population projection methodology is documented as supporting information about the population data. This document will used by the water and wastewater models and will be included in the project documentation.

Review by Project Team

It is critical that the project team, especially those involved with the water and wastewater modeling review and provide comments to the methodology used to generate the population data. The population projections are one of the most important inputs to the models and buy-in from the modelers is critical.

The recommended reviewers are:

- Project Management
- Wastewater Modeler
- Water Modeler
- Certified planner
- GIS team

Wastewater Modelers

The wastewater modeling team is to review the population projections to ensure understanding and to get buy-in on the input data to the models.

Water Modelers

The water modeling team is to review the population projections to ensure understanding and to get buy-in on the input data to the models.

Review by GWA

The methodology used to process and project future population should be reviewed by GWA. It is critical that the process is understood and is consistent with methods used within Guam Government to provide a legitimate modeling process. Buy-in on this methodology will help the modeling team know that the processes are approved and in line Guam government planning practices.

The recommended reviews are:

- Water Resource Master Plan project management
- Department of Planning
- Guam Bureau of Statistics and Plans

Review Dept of Defense Data

The Federal Department of Defense has some population projections for the island of Guam as related to their purposes. In processing the population table, this data could be used to compare results and provide guidance.

Long Term Population

Long term population is projected basin on growth rates and other factors used to project beyond the near term time horizon. The master plan long term horizon is for 100 years.

Determine Years

The short term population is created for predefined years up to the year 2020. Water and wastewater utility planning require a longer range projection. The short term population is used as a base. The 2020 year can be projected numerically using the growth rate factors provided at each census block.

The long range population will allow projections to be made to the year 2100. Intermittent years between the the base 2020 data and the 2100 can be interpolated.

Develop Growth Rate Areas

The growth rate factors used for the population distribution are used to process data at the block level based on localized information. The growth rate areas is a modeling concept to be able to apply additional growth factors at a much larger scale. For example, suppose the modeler wants

to apply a heavier growth to a specific area to do what-if scenarios, this growth rate area could be applied. The areas and the weighting factors can be adjusted by the modeler as needed since they are a simple shapefile.

Regional Area layer

An initial growth rate layer will be created to be used by the modelers. This initial layer could be created at the village level or at a grosser scale. More than one growth area layers can be created to support different what-if scenarios.

Model growth factors

Initial growth rates will be assigned to the initial growth area layer. This will be based on long range planning judgments.

Projected Pop Table (Data)

See also: Distribute to non-open space

Residential Projections

Additional residential population years will be created for the years required. This data is stored in additional data fields in the population table.

Using Growth Rates

Growth rates developed at the block level are used to project the long term population. Maximum capacity is considered. Rates are for estimated annual growth.

Using Max Capacity

The maximum capacity factor is applied to ensure that long term population does not exceed unreasonable levels.

Employment Projections

Additional employment population years will be created for the years required. This data is stored in additional data fields in the population table.

Using Growth Rates

Growth rates developed at the block level are used to project the long term population. Maximum capacity is considered. Rates are for estimated annual growth.

Using Max Capacity

The maximum capacity factor is applied to ensure that long term population does not exceed unreasonable levels.

Hotel Projections

Additional hotel population years will be created for the years required. This data is stored in additional data fields in the population table.

Using Growth Rates

Growth rates developed at the block level are used to project the long term population. Maximum capacity is considered. Rates are for estimated annual growth.

Using Max Capacity

The maximum capacity factor is applied to ensure that long term population does not exceed unreasonable levels.

Develop Population Tool

The population projection tool is a common program used to generate population GIS data used for both the water and wastewater modeling programs. The GIS processing is done using raster processing techniques.

Define Open Space Areas

An open space layer is needed in the population distribution to the spatial data. Population at the block level may still include some open space areas that are not typically wastewater flow generators or water consumers. These areas will help push the population data into areas of development. Some examples of open space areas might include water bodies, undeveloped parks and large undeveloped land. This data can be developed using zoning maps, aerial photos and local knowledge.

Landuse

If available, existing landuse information can be used in any form.

Zoning Maps

The zoning maps developed by the Guam Planning Department can be used to define open space areas

Aerial Photos

If available, aerial photos can help define the open space areas.

Other Sources

Other sources that may help to define open space will be researched and used as appropriate.

Create Open Space Layer

The open space layer developed will be in he form of a GIS shapefile. There maybe different version of this layer since water and wastewater may have different needs. The shape file will be converted to a raster dataset used in creating the raster population data.

Create Non-Open Space Layer

The reverse image of the of the open space layer will be created. This will be done within the program as a raster dataset.

Create Raster Models

A GIS program will be developed that will do the spatial and raster processing of the population projection data and the census block shapes. This data will be processed into raster datasets, one for each year required for modeling. The program will run as an ArcGIS extension and be integrated with the water and wastewater modeling programs.

Determine Years

The user can determine the required years needed to support water and wastewater modeling. A raster population dataset will generated for he years selected. Any year between the census base year (2000) and the ultimate long term year (2100) can be selected.

Interpolate between base years

The interpolation and distribution of the selected model years between predefined years can be generated using a straight line interpolation.

Distribute to non-open space

All population will be distributed within the raster population dataset to non-open space areas only. This process will move the people closer to where they actual are and out of the undeveloped and open space areas. This refines the model since population is used to estimate wastewater flow or water demand so the actual population needs to be as close to the pipes as possible.

Raster Pop Layers (Data)

For each of the selected model years a raster population dataset is created. This raster data can be displayed and analyzed within the ArcGIS programs. Change of population patterns can be determined spatially and provide a good visual of the population data.

These raster datasets are used as inputs to the water and wastewater models.

Integrate with Wastewater Model

The integration of the raster population datasets for the selected model years is integrated with the wastewater flow model.

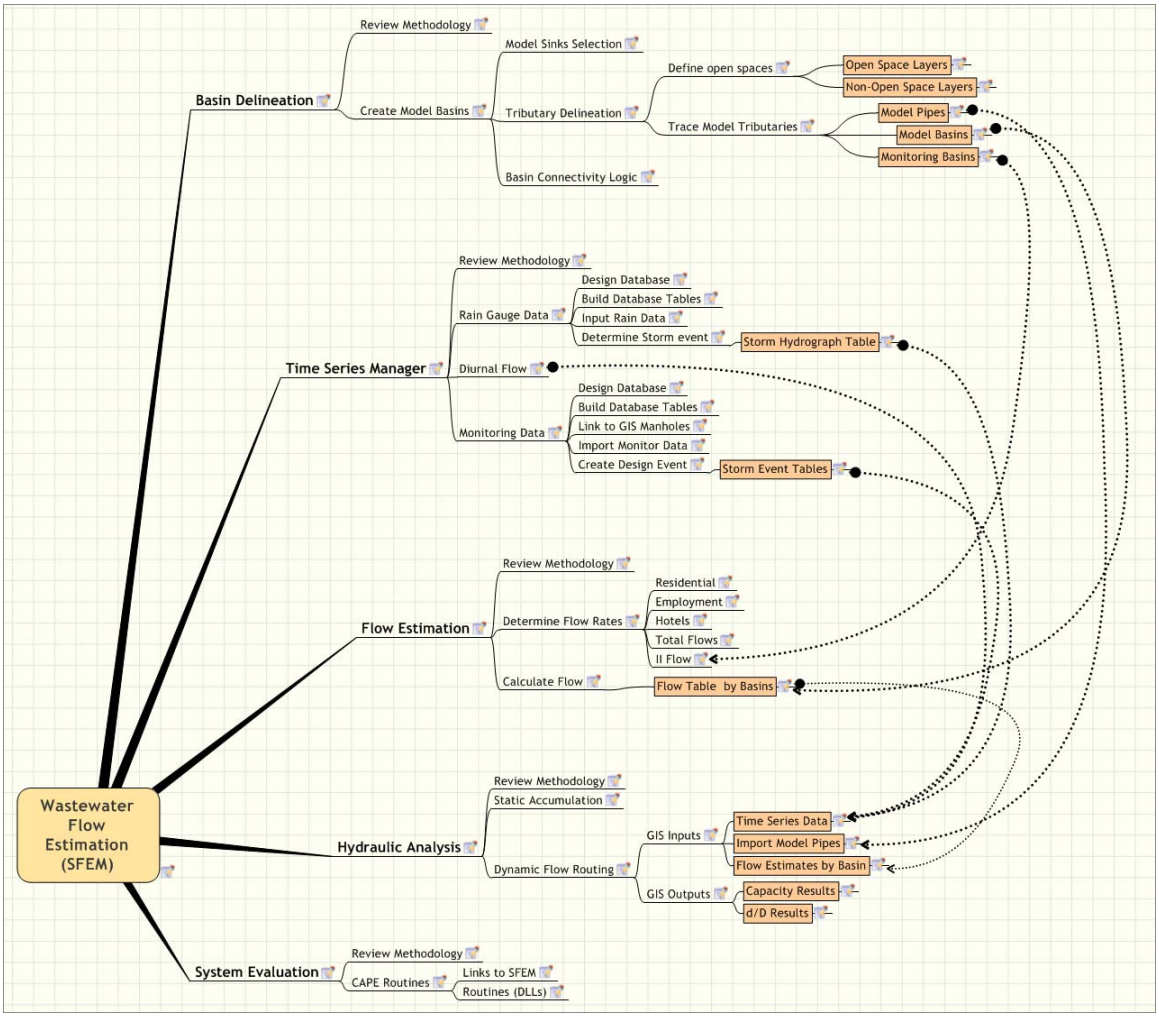
Integrate with Water Model

The integration of the raster population datasets for the selected model years is integrated with the water demand forecasting model.

Wastewater Flow Estimation (SFEM)

The Sewer Flow Estimating Model (SFEM) prototype is based on processes previously used. SFEM is the GIS application that runs as an ArcMap extension. This program automates the process of flow estimation and flow analysis suitable for capacity analysis in a master plan. The automated processes provide consistence between model scenarios. Scenarios can be run for any short or long term years generated by the population model or for alternative evaluations in the sewer network.

The major components in SFEM are the model basin delineation, processing of time series data, calculation of flow estimation, links to hydraulic analysis and capacity evaluation software.



Basin Delineation

The basin delineation process is a module within the SFEM program to used to define the model basins. Model basins are the tributary areas of selected model sinks. These model sinks are the inputs to the hydraulic analysis. The model basins are the areas where flow estimation are calculated using population and per capita flow rates.

This process is automated so that many scenarios of the model tributary basins can be generated to support the master planning process.

Review Methodology

The methodology of the basin delineation process is reviewed by the project team, particularly those involved with the wastewater flow modeling. Based on comments recipe this prototype design can be modified.

Create Model Basins

Using GIS spatial processing and existing basin generation routines, the process will is modified as needed to support the needs of the project. The output of this process are basin areas that define model tributaries. These basin are stored in a GIS feature layer.

Model Sinks Selection

Automated routines to query model sinks from a GIS geometric network.

Tributary Delineation

Wastewater tributary basins are automatically delineated using various methods depending on the underlying base maps (parcel, landuse, zoning).

Define open spaces

The open space areas help to define the basin tributary more accurately. Open space areas such as water bodies or large undeveloped areas should not be included in the tributary areas.

These open space areas are the same used in the population projection process defined by landuse, zoning and other available planning information.

Open Space Layers

The open space are used to help to define the basin tributary more accurately. Open space areas such as water bodies or large undeveloped areas should not be included in the tributary areas.

These open space areas are the same used in the population projection process defined by landuse, zoning and other available planning information.

This data is stored in Raster format.

Non-Open Space Layers

The non-open space areas are the reverse image of open space areas. These are the areas that will accept population projections and generate flow estimates.

These non-open space areas are the same used in the population projection process defined by landuse, zoning and other available planning information.

This data is stored in Raster format.

Trace Model Tributaries

The sewer network is traced to identify the model sink that each sewermain is tributary to. This data is used to generate the polygonal area for the model basins.

Model Pipes

See also: Import Model Pipes

The pipes downstream of the defined model sinks are considered the model network or the skeleton. These are the pipes that will be modeled in the hydraulic analysis process. These are automatically identified by the program and exported for hydraulic modeling.

Model Basins

See also: Flow Table by Basins

The polygonal area of the model basins that represent the tributary areas of the selected model sinks is generated. This is the GIS feature layer that is used to estimate wastewater flow.

Monitoring Basins

See also: II Flow

Monitoring basins are created to define the tributary areas of the monitoring basins. These are defined using the model basin tools, using the flow gauges as the tributary sinks. The basin areas are used to distribute the II flow to the model.

Basin Connectivity Logic

The basin connectivity logic is generated that describes the basin inter- connectivity. This is needed for data reporting and flow accumulation routines. The logic is displayed in graphical tree diagrams.

Time Series Manager

The time series data manager is a module in the SFEM program used to store and process flow monitoring and rain gauge data.

Review Methodology

The methodology of the processing of the time series data is reviewed by the project team, particularly those involved with the wastewater flow modeling. Based on comments received this prototype design can be modify.

Rain Gauge Data

The rain gauge data is used to help define storms event hydrographs used as input to the hydraulic analysis.

Design Database

The database structure of the rain gauge data is to be defined considering local conditions and availability of data. This database design will be incorporated in the overall system design of the master plan.

Build Database Tables

The input of rain gauge data is imported into the database tables that store this data. This data input should be easily be repeatable through routines or defined procedures.

Input Rain Data

The rain gauge data is imported into the time series database. The source data is evaluated for typical conditions suitable for modeling.

Determine Storm event

The CAPE routines are incorporated into SFEM to process the rain gauge data and allow the user to select storm events that characterize the II flow conditions.

Storm Hydrograph Table

See also: Time Series Data

The storm hydrograph table is the input to the hydraulic analysis that adds the wet weather component to the flow analysis. This component accounts for the II flow in the system.

Diurnal Flow

See also: Time Series Data

The diurnal flow pattern for residential, employment and hotel flow is defined in a hydrograph. Diurnal patterns can be applied uniformly across the system or geographically by flow monitor basin.

Monitoring Data

The flow monitoring data is used to help calibrate the model and is used as input data to help the modeler select and build storm event hydrographs.

Design Database

The database structure of the monitoring data is to be defined considering flow data collected for this project and other available data. This database design will be incorporated in the overall system design of the master plan.

Build Database Tables

The input of flow monitoring data is imported into the database tables that store this data. This data input should be easily be repeatable through routines or defined procedures.

Link to GIS Manholes

Monitoring data is linked to the GIS manhole features through the AssetID field. The GIS database is the central repository of the sewer features, all data related to sewer features in the GIS should be linked using this AssetID field.

Import Monitor Data

The flow monitoring data to be used for flow analysis is loaded into the tables designed for the Time Series data manager tools. This data is linked to the GIS with the AssetID field.

Create Design Event

Using the flow monitoring and rain gauge data, design flow hydrographs are processed and created using the tools in the Time Series Manager. These design flow hydrographs are used as input data to the Hydraulic Analysis process that represent the II flow component of the model.

Storm Event Tables

See also: Time Series Data

The storm event tables represent the wet weather hydrograph and the wet weather II flow. The storm event tables are linked to monitoring basins and used to process the II flow component and to provide time series data to the hydraulic modeling.

Flow Estimation

The flow estimation is a module within the SFEM used to process wastewater flow at the model basin level. This process allows the modeler to make changes to the flow scenarios using different population years, different flow rates and II flow tables.

Review Methodology

The methodology of the processing of the flow estimation is reviewed by the project team, particularly those involved with the wastewater flow modeling. Based on comments received this prototype design can be modified.

Determine Flow Rates

The flow rates are used to estimate wastewater use per capita. These are developed for each flow component (residential, employment, and hotels) and can be used uniformly for the entire system or varied geographically. The flow rates are the parameters used to help tweek and calibrate the model.

Residential

The residential flow rate is the average daily flow per person. It is used to calculate the residential flow estimate. This rate can be a standard rate applied to all areas or be defined geographically.

Employment

The employment flow rate is the average daily flow per person. It is used to calculate the employment flow estimate. This rate can be a standard rate applied to all areas or be defined geographically.

Hotels

The hotel flow rate is the average daily flow per person. The is for occupied persons only, not the employees or the operation of the hotel since this is picked up with the employment estimate. This rate can be a standard rate applied to all areas or be defined geographically.

Total Flows

The total average dry weather flows are calculated by adding the residential, employment and hotel flow components.

Calculation

TotalFlow = ResFlow + EmpFlow + HotelFlow

II Flow

Standard average daily II flow rates can be applied to the total average dry weather flow. This accounts for average II flow in typical dry weather conditions. The wet weather flow component is applied using the time series

Calculate Flow

Residential Flow

The residential flow is calculated by the estimated or projected population from the population projection process and the per capita flow rate. This represents the average dry weather flow for residential use.

The flow is calculated using:

ResFlow = ResPop * ResFlowRate

Employment Flow

The employment flow is calculated by the estimated or projected population from the population projection process and the per capita flow rate. This represents the average dry weather flow for employment use.

The flow is calculated using:

EmpFlow = EmpPop * EmpFlowRate

Hotel Flow

The hotel flow is calculated by the estimated or projected population from the population projection process and the per capita flow rate (visitors only). This represents the average dry weather flow for hotel use.

The flow is calculated using:

HotelFlow = HotelPop * HotelFlowRate

Flow Table by Basins

See also: Flow Estimates by Basin

The flow table contains the dry weather flow components and totals linked to the GIS modeling basins. This flow can be analyzed spatially within GIS using maps, exported to other programs for analysis and used as input to the hydraulic modeling process. The table is stored in MS Access format within the GIS geodatabase.

Hydraulic Analysis

The hydraulic analysis of the wastewater collection system is modeled using data processed by the flow estimation, the sewer network data and the hydraulic modeling software used. This will provide the tools to do system evaluation and capacity analysis of the system. Only the major lines will be hydraulically modeled.

Review Methodology

The methodology of the hydraulic modeling process is reviewed by the project team, particularly those involved with the wastewater flow modeling. Based on comments received this prototype design can be modified.

The software to be used for modeling is to be evaluated and selected. The links to this software will be defined at that time.

Static Accumulation

A static accumulation of the flow estimates are run to give an initial screening of the flow modeling. This does not account for the time component of the flow or the hydraulic head and routing. Average dry weather flow is added up to downstream basin sinks.

Dynamic Flow Routing

Dynamic flow routing is done on the major feature of the system (e.g. lines 10" or greater). The output of this process will produce flow capacities for model pipes, d/D results and other flow summary data needed.

GIS Inputs

The data inputs of the Hydraulic modeling software are defined and the import of this data is automated where feasible.

Time Series Data

Time series data representing the wet weather and diurnal flow for each model basin sink. This flow is used as input to the hydraulic modeling software. This data is linked by the nodes that were used as the model basin sinks.

Import Model Pipes

The model network is created from the GIS data as import data into the hydraulic modeling software. The pipes and nodes exported are the feature downstream of model basin sinks and will represent the major pipes in the system.

Flow Estimates by Basin

The total average dry weather flow is imported into the hydraulic model linked to the nodes used as model basin sinks.

GIS Outputs

The data outputs of the Hydraulic modeling software are defined and the export of this data is automated where feasible.

Capacity Results

Capacity and freeboard thresholds are calculated for each pipe segment in the model network pipes. This data can be used to identify areas under capacity as data for the master planning process.

d/D Results

The d/D for each pipe segment in the model network can be computed and used for master planning.

System Evaluation

The system evaluation module is a set of tools that uses the outputs and data in the SFEM program and GIS to do data processing and screening of the system. These tools are currently in the "Capacity Assurance Planning Environment" (CAPE) routines that are to be integrated within the SFEM program. These automated routines will help process data in support of the master planning tasks.

Review Methodology

The methodology and integration of the CAPE routines into the SFEM program will be further defined in detail. This methodology should be defined by those involved with the wastewater flow modeling.

CAPE Routines

The CAPE routines are used in the master planning tasks. Some of the capabilities of CAPE are:

- How will a new development impact my collection system?
- How much infiltration and inflow do I have in my system?
- How will sewering a residential neighborhood impact my system?
- How will BOD loads change at the treatment plant as a large industrial user scales back production over time?
- If the population grows at 1.5 percent when will I run out of capacity? What if the population grows at 3.0 percent?
- How much revenue can I expect over the next 20-years from rates and connection fees?
- What are the impacts of delaying a Capital Improvement Project?
- How effective would water conservation programs be for my system?

Links to SFEM

The CAPE data is linked back to the GIS data through the AssetID for spatial analysis and display of results. These links will be defined in more detail during the development phase.

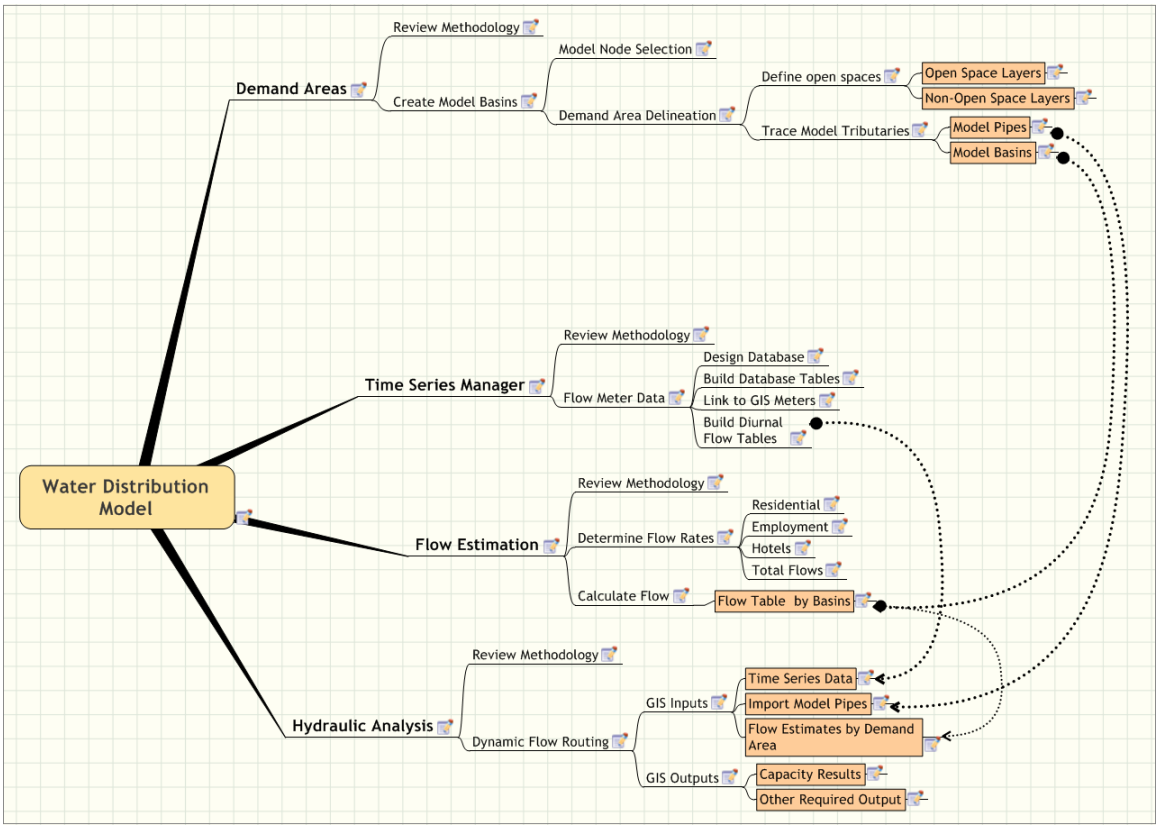
Routines (DLLs)

The CAPE routines are to be integrated with in the GIS and SFEM programs. The programming logic and DLLs will be defined in more detail during the development phase.

Water Distribution Model

The Water Distribution Model prototype is based on processes previously used. The GIS application that runs as an ArcMap extension. This program automates the process of water demand forecasting and flow analysis suitable for capacity analysis in a master plan.
The automated processes provide consistence between model scenarios. Scenarios can be run for any short or long term years generated by the population model or for alternative evaluations in the water distribution network.

The major components in the model are demand area delineation, processing of time series data, calculation of demand estimation, links to hydraulic analysis and capacity evaluation software.



Demand Areas

The demand area delineation process is a module within the water distribution program. Demand areas are the areas that server a defined demand area. These areas idenfinted by performing isolation valve tracing. The demand areas is where demand forecasts are estimated using population and per capita flow rates.

This process is automated so that many scenarios of the model tributary basins can be generated to support the master planning process.

Review Methodology

The methodology of the basin delineation process is reviewed by the project team, particularly those involved with the wastewater flow modeling. Based on comments recipe this prototype design can be modified.

Create Model Basins

Using GIS spatial processing and existing basin generation routines, the process will is modified as needed to support the needs of the project. The output of this process are basin areas that define model tributaries. These basin are stored in a GIS feature layer.

Model Node Selection

Automated routines to query model nodes from a GIS geometric network. These nodes define the demand areas through network tracing and demand area association.

Demand Area Delineation

Water demand areas are automatically delineated using various methods depending on the underlying base maps (parcel, landuse, zoning).

Define open spaces

The open space areas help to define the demand areas more accurately. Open space areas such as water bodies or large undeveloped areas should not be included in the demand areas.

These open space areas are the same used in the population projection process defined by landuse, zoning and other available planning information.

Open Space Layers

The open space are used to help to define the basin tributary more accurately. Open space areas such as water bodies or large undeveloped areas should not be included in the tributary areas.

These open space areas are the same used in the population projection process defined by landuse, zoning and other available planning information.

This data is stored in Raster format.

Non-Open Space Layers

The non-open space areas are the reverse image of open space areas. These are the areas that will accept population projections and generate flow estimates.

These non-open space areas are the same used in the population projection process defined by landuse, zoning and other available planning information.

This data is stored in Raster format.

Trace Model Tributaries

The water network is traced to identify the isolated demand areas that each water line is associated to. This data is used to generate the polygonal area for the demand areas.

Model Pipes

See also: Import Model Pipes

The major lines to be used in the hydraulic modeling software. These are the major lines in the system and are the pipes that will be modeled in the hydraulic analysis process. These are automatically identified by the program and exported for hydraulic modeling.

Model Basins

See also: Flow Table by Basins

The polygonal area of the areas that represent the demand areas. This is the GIS feature layer that is used to estimate water use based on projected population and captia consumption rates.

Time Series Manager

The time series data manager is a module in the SFEM program used to store and process flow monitoring and rain gauge data.

Review Methodology

The methodology of the processing of the time series data is reviewed by the project team, particularly those involved with the wastewater flow modeling. Based on comments received this prototype design can be modify.

Flow Meter Data

The flow monitoring data is used to help calibrate the model and is used as input data to help the modeler select and build storm event hydrographs.

Design Database

The database structure of the meter data is to be defined considering meter data collected for this project and other available data. This database design will be incorporated in the overall system design of the master plan.

Build Database Tables

The input of flow meter data is imported into the database tables that store this data. This data input should be easily be repeatable through routines or defined procedures.

Link to GIS Meters

Water meter data useful for modeling is linked to the GIS meter features through the AssetID field.

Build Diurnal Flow Tables

See also: Time Series Data

The diurnal flow pattern for residential, employment and hotel flow is defined in a hydrograph from flow meter data. Diurnal patterns can be applied uniformly across the system or geographically by flow meter basins.

Flow Estimation

The flow estimation is a module within the SFEM used to process wastewater flow at the model basin level. This process allows the modeler to make changes to the flow scenarios using different population years, different flow rates and II flow tables.

Review Methodology

The methodology of the processing of the flow estimation is reviewed by the project team, particularly those involved with the water demand forecast modeling. Based on comments received this prototype design can be modified.

Determine Flow Rates

The flow rates are used to estimate water use per capita. These are developed for each flow component (residential, employment, and hotels) and can be used uniformly for the entire system or varied geographically. The flow rates are the parameters used to help tweek and calibrate the model.

Residential

The residential flow rate is the average daily flow per person. It is used to calculate the residential demand estimate. This rate can be a standard rate applied to all areas or be defined geographically.

Employment

The employment flow rate is the average daily flow per person. It is used to calculate the employment demand estimate. This rate can be a standard rate applied to all areas or be defined geographically.

Hotels

The hotel flow rate is the average daily flow per person. The is for occupied persons only, not the employees or the operation of the hotel since this is picked up with the employment demand estimate. This rate can be a standard rate applied to all areas or be defined geographically.

Total Flows

The total average water demand is calculated by adding the residential, employment and hotel demand components.

Calculation

TotalDemand = ResDemand + EmpDemand + HotelDemand

Calculate Flow

Residential Demand

The residential water demand is calculated by the estimated or projected population from the population projection process and the per capita flow rate. This represents the average daily water demand for residential use.

The flow is calculated using:

ResDemand = ResPop * ResDemandRate

Employment Demand

The employment water demand is calculated by the estimated or projected population from the population projection process and the per capita flow rate. This represents the average daily water demand for employment use.

The flow is calculated using:

EmpDemand = EmpPop * EmpDemandRate

Hotel Demand

The hotel flow is calculated by the estimated or projected population from the population projection process and the per capita flow rate (visitors only). This represents the average daily water demand for hotel use.

The flow is calculated using:

HotelDemand = HotelPop * HotelDemandRate

Flow Table by Basins

See also: Flow Estimates by Demand Area

The flow table contains the daily water demand components and totals linked to the GIS modeling demand areas. This water demand can be analyzed spatially within GIS using maps, exported to

other programs for analysis and used as input to the hydraulic modeling process. The table is stored in MS Access format within the GIS geodatabase.

Hydraulic Analysis

The hydraulic analysis of the wastewater collection system is modeled using data processed by the flow estimation, the sewer network data and the hydraulic modeling software used. This will provide the tools to do system evaluation and capacity analysis of the system. Only the major lines will be hydraulically modeled.

Review Methodology

The methodology of the hydraulic modeling process is reviewed by the project team, particularly those involved with the water flow modeling. Based on comments received this prototype design can be modified.

The software to be used for modeling is to be evaluated and selected. The links to this software will be defined at that time.

Dynamic Flow Routing

Dynamic flow routing is done on the major feature of the system (e.g. lines 10" or greater). The output of this process will produce flow capacities for model pipes.

GIS Inputs

The data inputs of the Hydraulic modeling software are defined and the import of this data is automated where feasible.

Time Series Data

Time series data representing the diurnal pattern for water demand for each model demand area. This flow is used as input to the hydraulic modeling software. This data is linked by the nodes that were used as the model demand area isolation valves.

Import Model Pipes

The model network is created from the GIS data as import data into the hydraulic modeling software. The pipes and nodes exported are the major features of the system, connecting the demand areas.

Flow Estimates by Demand Area

The total average daily water demand is imported into the hydraulic model linked to the nodes on the major model features.

GIS Outputs

The data outputs of the Hydraulic modeling software are defined and the export of this data is automated where feasible.

Capacity Results

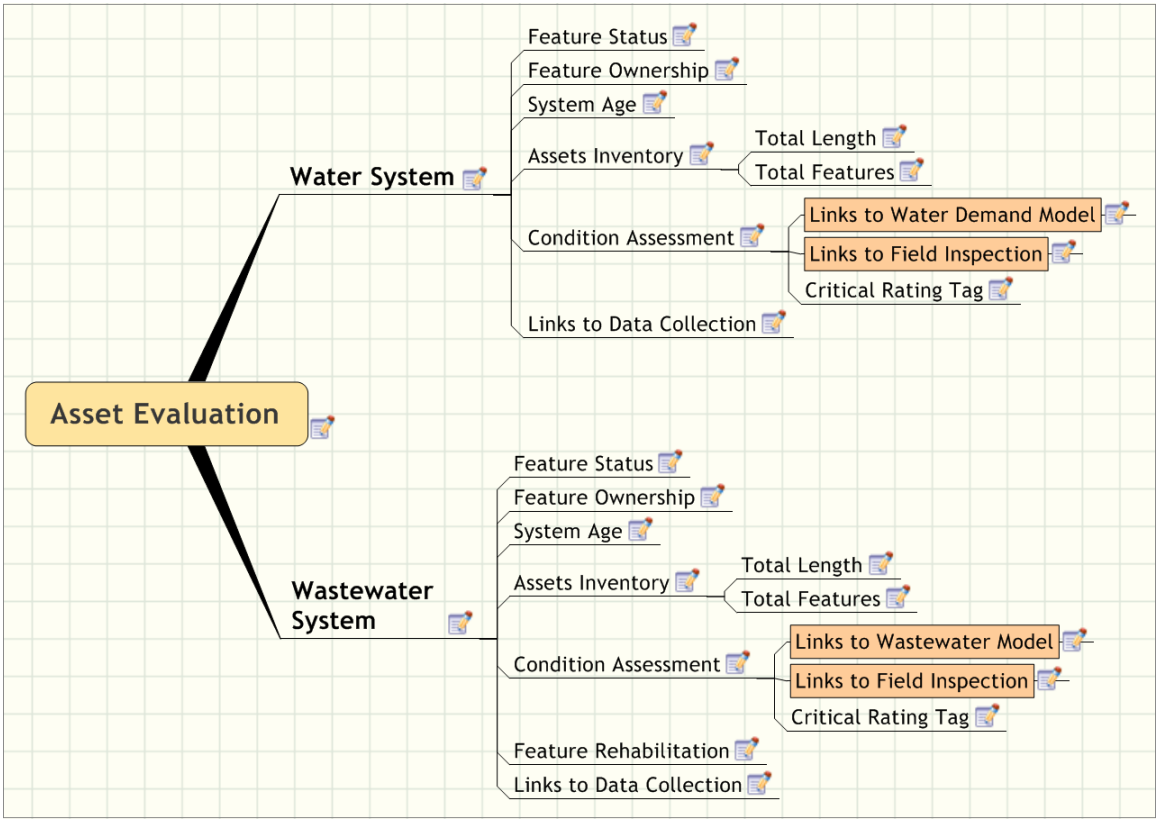
Required capacity to meet the water demands are calculated for each pipe segment and junction feature in the model network pipes. This data can be used to identify areas under capacity as data for the master planning process.

Other Required Output

Other required output to be determined and exported from the hydraulic model, including pumping station capacity and treatment facilities.

Asset Evaluation

The GWA water and wastewater system can be evaluated using data stored in GIS and links to other data sources. The GIS based asset evaluation provides a centralized database, linked by a unique AssetID field, that can be used for queries, reports, spatial analysis and maps.



Water System

The GWA water system assets stored in GIS and other linked data sources provide a basis for performing system evaluation. System maps and reports are used to support the master planning process.

Feature Status

Using a "Status" field on each GIS feature (pipe, valve, pumps, etc.), maps and reports can be created using this field. The status values are:

- Active
- Inactive
- Abandoned
- Proposed

Feature Ownership

Using a "Owner" field on each GIS feature (pipe, valve, pumps, etc.), maps and reports can be created using this field. The owner values are:

- GWA
- Private
- Military
- Unknown

System Age

Using a "DateInstalled" field on each GIS feature (pipe, valve, pumps, etc.), maps and reports can be created using this field. The "DateInstalled" date is the date the feature was constructed as shown on the inspector and As-Built drawings.

Maps showing the age of the system can be created or data exported to other programs for analysis.

Assets Inventory

The overall inventory of the water system can be evaluated using the data in the GIS database. Maps and reports can be created to support the master plan process.

Total Length

The total length of water feature and attributes from those features can be queried and reported. The feature layers are:

- Gravity Main (Total Length)
    - Carrier
    - Inline Storage
    - Transport Pipe
- Pressure mains (Total Length)
    - Air Release
    - Blowoff
    - Bypass
    - Chemical Injection
    - Distribution Main
    - Interconnect
    - Pipe Bridge
    - Sampling Station
    - Transmission Main

Total Features

The total number of feature on the water system and attributes from those features can be queried and reported. The feature layers are:

- Clear Wells
- Control Valves
- Fittings
- Hydrants

- Lateral Lines
- Lateral Points
- Manholes
- Meters
- Network Structure
- Pump stations
- Sampling station
- System Valves

The water distribution feature layers are:

- Anodes
- Casings
- Reservoirs
- ScadaSensors
- Thrust Protection
- Water Structures

Condition Assessment

The overall condition of the water system is estimated and displayed using the GIS based approach. This provides a way to create system maps showing the condition of the system.

Links to Water Demand Model

The GIS features and data are linked to the water demand forecast model results. The results are used for further spatial analysis, query, maps and reports. The links are through the unique AssetID field.

Example:

Water lines that are modeled to be under capacity can be shown on a map and used for further analysis.

Links to Field Inspection

Data collected through the data collection process can be linked back to the GIS features for spatial analysis and mapping.

Example:

A visual summary of field inspection findings can be displayed on a water system map.

Critical Rating Tag

A field set aside on the GIS water database to store a critical rating. This rating is used to categorize each feature to a rating factor identifying its overall condition and critical value to the system. This field can be used to create maps and to export other feature attributes in the GIS to other programs.

The values on the CriticalRating are:

- A - Good

- B - Average
- C - Poor
- None

Links to Data Collection

Any other data collected during the project is linked back to the GIS features through the AssetID field. This enables any data collected on a feature to be displayed in the GIS maps and reports.

Wastewater System

The GWA wastewater system assets stored in GIS and other linked data sources provide a basis for performing system evaluation. System maps and reports are used to support the master planning process.

Feature Status

Using a "Status" field on each GIS feature (pipe, manholes, pumps, etc.), maps and reports can be created using this field. The status values are:

- Active
- Inactive
- Abandoned
- Proposed

Feature Ownership

Using a "Owner" field on each GIS feature (pipe, valve, pumps, etc.), maps and reports can be created using this field. The owner values are:

- GWA
- Private
- Military

Unknown

System Age

Using a "DateInstalled" field on each GIS feature (pipe, manholes, pumps, etc.), maps and reports can be created using this field. The "DateInstalled" date is the date the feature was constructed as shown on the inspector and As-Built drawings.

Maps showing the age of the system can be created or data exported to other programs for analysis.

Assets Inventory

The overall inventory of the wastewater system can be evaluated using the data in the GIS database. Maps and reports can be created to support the master plan process.

Total Length

The total length of wastewater feature and attributes from those features can be queried and reported. The feature layers are:

- Sewer mains (Total Length)

- ForceMains
- Gravity
- Model Links
- Outfalls
- Siphons
- Treatment Lines

Sewer laterals (Total Length)

Total Features

The total number of wastewater feature and attributes from those features can be queried and reported. The feature layers are:

- Manholes
  - Plain
  - Pressure
  - Drop
  - Shallow Box
  - Junction Box
  - Terminal
  - Injection
- Treatment plants
- Pump stations
- Fittings
  - Cleanout
  - General Fitting
  - Lateral Fitting
  - Plugged End
- Service connections
- Discharges
  - Outfall
  - Injection Well
  - Reclaimation Facility
  - Manhole
- Cess Pool

Condition Assessment

The overall condition of the wastewater system is estimated and displayed using the GIS based approach. This provides a way to create system maps showing the condition of the system.

Links to Wastewater Model

The GIS features and data are linked to the wastewater flow estimation model results. The results are used for further spatial analysis, query, maps and reports. The links are through the unique AssetID field.

Example:

Sewer lines that are modeled to be under capacity can be shown on a map and used for further analysis.

Links to Field Inspection

Data collected through the data collection process can be linked back to the GIS features for spatial analysis and mapping.

Example:

A visual summary of field inspection findings can be displayed on a water system map.

Critical Rating Tag

A field set aside on the GIS wastewater database to store a critical rating. This rating is used to categorize each feature to a rating factor identifying its overall condition and critical value to the system. This field can be used to create maps and to export other feature attributes in the GIS to other programs.

The values on the CriticalRating are:

- A - Good
- B - Average
- C - Poor
- None

Feature Rehabilitation

The sewer main feature in GIS has a field set aside to store the type of rehabilitation on the sewer main. The rehab values identify the type of pipe lining used:

- Grouted
- CIPP
- Fold and Form
- Slip-Lined
- Link Sleeve
- 8" Slip High Density Polyethene
- Unknown
- None
- Others as needed

Links to Data Collection

Any other data collected during the project is linked back to the GIS features through the AssetID field. This enables any data collected on a feature to be displayed in the GIS maps and reports.

2. GIS Sewer Database

The sewer GIS database is stored in an ESRI geodatabase structure made up of classes and subclasses. It is not the intent of this document to describe how geodatabases work or how they are designed; however it is important to have a general understanding of how the sewer database is organized. For more complete explanation of geodatabases, please refer to ESRI documentation that comes with ArcInfo ("Modeling Our World", pg 75). The major terms important to understand how the sewer GIS database is designed are explained below:

GeoDatabase: Top level unit of geographic data containing dataset, feature classes, object classes and relationship classes. The sewer GIS database is stored within this package of data. The geodatabase is stored in a personal geodatabase in MS Access format.

Feature Dataset: Feature Datasets are collections of spatial data within a geodatabase. Attribute tables are the other common types of data stored within a geodatabase but typically are outside of the feature dataset.

Feature Class: Feature classes are the spatial entities or layers within the spatial database. These are the major classes, at the top level, of graphical features. These will be described in more detailed later.

Subtypes: Subtypes are the minor classes under each of the features classes. For example, a manhole feature class breaks down the manholes into sub-categories, plain, pressured, junction box, etc.

Domains: Domains are valid values and ranges for feature class attributes. The database stores and only allows data in attributes that meet the valid domains defined in the database. These domains can be added upon as needed.

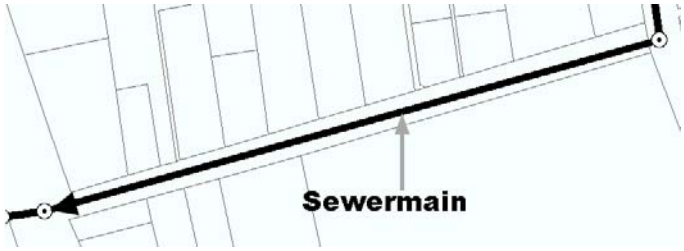
Attributes: Each feature class can have attribute data stored with each feature class object, adhering to the defined domains.

Database Feature Classes

The feature classes defined in the sewer GIS database are explain in general terms. For more information on the definitions of each feature class refer to the Data Dictionary in this section.

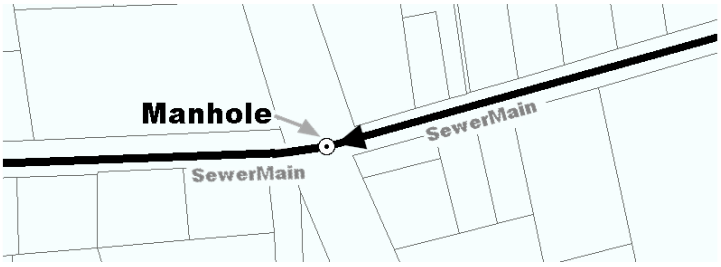
SewerMain

Sewer mains are pipe segments defined between manholes. The entire reach, from manhole to manhole is considered a sewer main reach. The direction of flow is stored within the sewer main reach. The subtypes are gravity, force mains, outfalls, siphon, modelLinks and treatmentLinks.



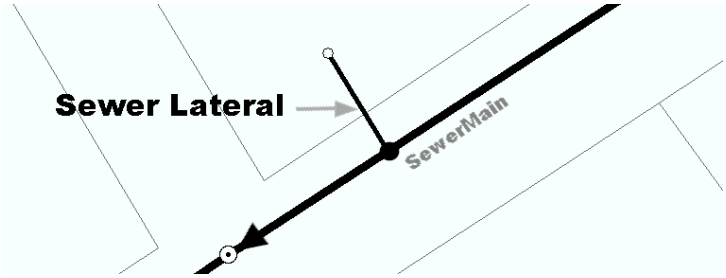
Manhole

Manholes are the junctions between sewer mains and represent the physical location of manhole. The subtypes of manholes are plain, pressure, drop, shallow box and junction box types.



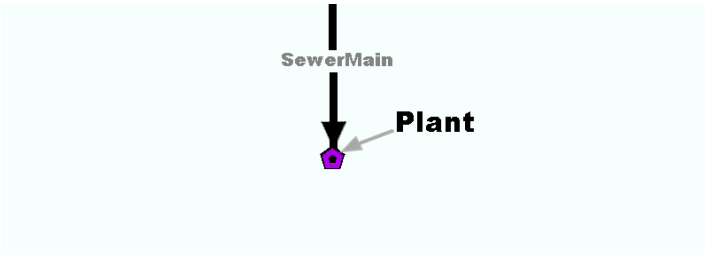
Lateral

Sewer lateral in the GIS database represent the connection between the sewer mains and the parcels. Laterals must feed into gravity mains. Laterals are graphical representation and general do not represent the actual lengths. The AUDL field stores the actual length from the design drawings. Laterals must extend into the parcel in order for the sewer database to stay be automatically be updated by the parcel layer and parcel data. There are no lateral subtypes.



Plant

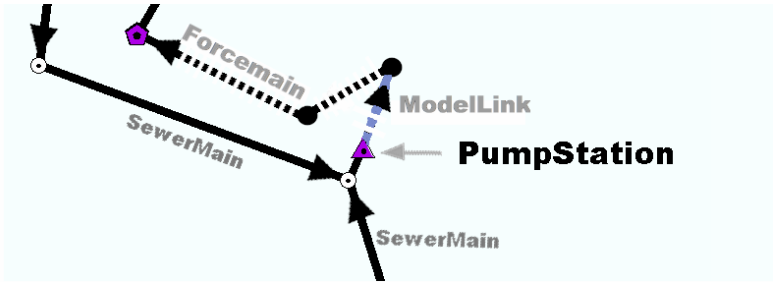
Treatment plants are summarized down to one connection; typically this is the location of the point of influent. The pipes within the treatment plant are not general digitized in the GIS database, but can be using the treatmentLink subtype of the sewer mains feature class.



Pumpstation

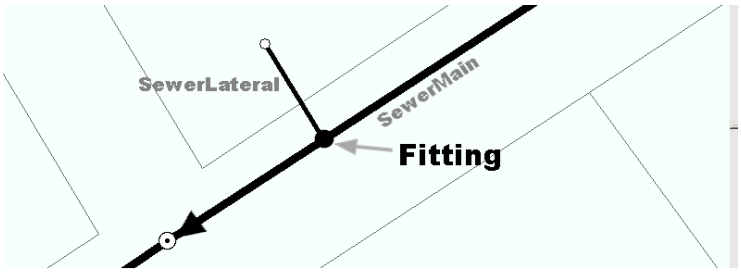
Pump plants are summarized down to one point. A model link should be connected to the immediate reach downstream of a pump plant. Force mains must be connected to the downstream reach of a modelLink node and reach. This format will maintain

compatibility with future uses of the data with hydraulic modeling software. There are no subtypes for pumps.



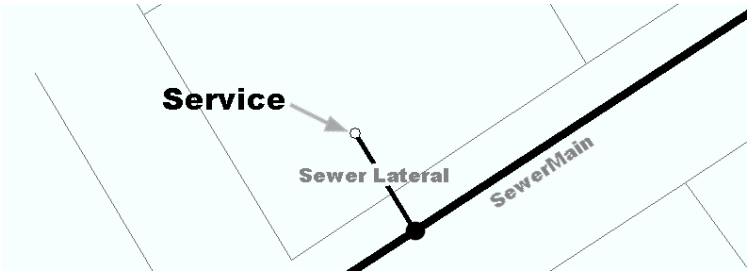
Fitting

The miscellaneous other junction types are usually defined as fittings. The most common are the junctions between sewer laterals and sewer mains. The fitting sub-types are lateral fitting, plugged end, valve, test site, coupling, boundary, and cleanout.



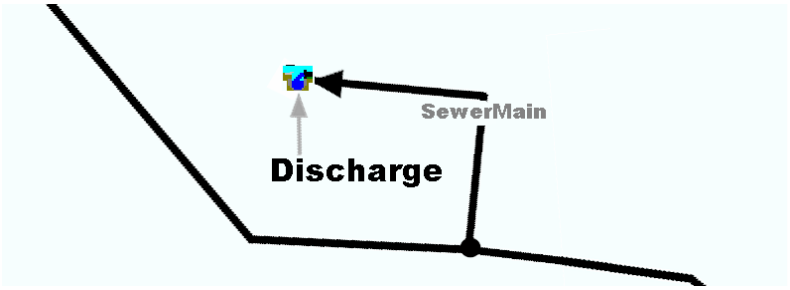
Service

The end of a sewer lateral feature class must have a service junction. This is a special junction type that can only be on the end of laterals. The database connection rules and SIMSLE ensure that services are only entered at these ends. The service junction is important because it stores the connection information about the lateral, (e.g. connection date, Property_ID, etc.)



Discharge

Discharge locations are special locations at the outflow of a collection system, usually at the end of outfall subtypes, but maybe at injection wells.


SewerMain
Discharge

Database Dictionary

The database dictionary for the sewer GIS database was generated by a utility called "Geodatabase Reporter" that can be downloaded for free from the ESRI ArcScripts site. The data dictionary generated by this utility is shown below. This is a HTML document so it is easier to read and navigate using the hypertext in the HTML version.

The report shows all field definitions, valid domains, default values, connectivity rules and other geodatabase definitions. If modifications are made to the database design, this Geodatabase Report should be regenerated.

Geodatabase Summary				
FeatureDataset	Object Name (Alias)	Type	Geometry	Subtypes
Sewers (S)	Discharge (Discharge) (C)	Simple Junction	Point	DischargePointST
	Fittings (Fittings) (C)	Simple Junction	Point	CleanOutST GeneralFittingST LateralFittingST PluggedEndST
	guam_final_poly (guam_final_poly) (C)	Simple Feature	Polygon	None
	Manhole (Manhole) (C)	Simple Junction	Point	ManholeST
	Plant (Plant) (C)	Simple Junction	Point	TreatmentPlantST
	PumpStation (PumpStation) (C)	Simple Junction	Point	StationST
	Service (Service) (C)	Simple Junction	Point	ServicePointST
	SewerLateral (SewerLateral) (C)	Complex Edge	Polyline	LateralST
	SewerMain (SewerMain) (C)	Complex Edge	Polyline	ForceST GravityST ModelLinkST OutfallST SiphonST TreatmentST
	SewerNetwork_Junctions (SewerNetwork_Junctions) (C)	Simple Junction	Point	None
	SewerNetwork	GeometricNetwork		
None	UNIQUE_ASSETID (UNIQUE_ASSETID) (C)	Table	None	None
	AncillaryRoleDomain	Domain	Coded Value	
	D_BarrelDiameter	Domain	Range	
	D_Basin	Domain	Coded Value	
	D_CoverDiameter	Domain	Range	
	D_CriticalRating	Domain	Coded Value	
	D_Discharge	Domain	Coded Value	
	D_Elevation	Domain	Range	
	D_FittingMaterial	Domain	Coded Value	
	D_FittingType	Domain	Coded Value	
	D_FlowSplit	Domain	Range	
	D_Friction	Domain	Coded Value	
	D_GeneratorSize	Domain	Range	
	D_LateralDiameter	Domain	Range	
	D_LineMaterial	Domain	Coded Value	

	D_MainDiameter	Domain	Range
	D_Manhole	Domain	Coded Value
	D_ManholeLining	Domain	Coded Value
	D_ManholeMaterial	Domain	Coded Value
	D_Owner	Domain	Coded Value
	D_PipeLength	Domain	Range
	D_PipeLining	Domain	Coded Value
	D_PipeShape	Domain	Coded Value
	D_PlantType	Domain	Coded Value
	D_ServiceCleanOut	Domain	Coded Value
	D_Status	Domain	Coded Value
	D_WaterTable	Domain	Coded Value
	D_YesNoUnknown	Domain	Coded Value
	EnabledDomain	Domain	Coded Value

Geometric Network Summary			
Geometric Newtork Name	Role	FeatureClass Name	Links
SewerNetwork	Simple Junction	Discharge	
		Fittings	
		Manhole	
		Plant	
		PumpStation	
		Service	
		SewerNetwork_Junctions	
	Complex Junction	None	
	Simple Edge	None	
	Complex Edge	SewerLateral	EJ Rules EE Rules
		SewerMain	EJ Rules EE Rules

Edge-Junction-Edge Geometric Network Connectivity Rules				
SewerNetwork				
From		To		Via
Edge	Subtype	Edge	Subtype	Junction::Subtype
SewerLateral	LateralST	SewerLateral	LateralST	Fittings::LateralFittingST [Default]
				Manhole::ManholeST
		SewerMain	ForceST	Manhole::ManholeST [Default]
			GravityST	Fittings::LateralFittingST [Default]
				Manhole::ManholeST
			ModelLinkST	Manhole::ManholeST [Default]
			SiphonST	Manhole::ManholeST [Default]
SewerMain	ForceST	SewerLateral	LateralST	Manhole::ManholeST [Default]
		SewerMain	ForceST	Fittings::GeneralFittingST
				Manhole::ManholeST [Default]
				Plant::TreatmentPlantST
			ModelLinkST	PumpStation::StationST [Default]
			TreatmentST	Plant::TreatmentPlantST [Default]
	GravityST	SewerLateral	LateralST	Fittings::LateralFittingST [Default]
				Manhole::ManholeST

		SewerMain	ForceST	Manhole::ManholeST [Default]
				Plant::TreatmentPlantST
				PumpStation::StationST
			GravityST	Fittings::LateralFittingST
				Manhole::ManholeST [Default]
				Plant::TreatmentPlantST
				PumpStation::StationST
			ModelLinkST	Manhole::ManholeST [Default]
			OutfallST	Plant::TreatmentPlantST [Default]
			SiphonST	Manhole::ManholeST [Default]
	ModelLinkST	SewerLateral	LateralST	Manhole::ManholeST [Default]
		SewerMain	ModelLinkST	Fittings::GeneralFittingST [Default]
	SiphonST	SewerLateral	LateralST	Manhole::ManholeST [Default]
		SewerMain	SiphonST	Fittings::GeneralFittingST
				Manhole::ManholeST [Default]
	TreatmentST	SewerMain	OutfallST	Fittings::GeneralFittingST [Default]
				Manhole::ManholeST
			TreatmentST	Fittings::GeneralFittingST [Default]

Edge-Junction Geometric Network Connectivity Rules

SewerNetwork

From		To		No. of Edges		No. of Junctions	
Edge	Subtype	Junction	Subtype	Min	Max	Min	Max
SewerLateral	LateralST	Fittings	LateralFittingST	1	10	0	99
		Manhole	ManholeST	0	10	0	1
		Service	ServicePointST [Default]	-1	-1	-1	-1
SewerMain	ForceST	Fittings	GeneralFittingST	0	6	0	99
		Manhole	ManholeST	0	4	0	1
		Plant	TreatmentPlantST	0	10	0	1
		PumpStation	StationST	1	2	1	2
	GravityST	Fittings	GeneralFittingST	0	2	0	99
			LateralFittingST	0	2	0	99
			PluggedEndST	1	1	0	1
		Manhole	ManholeST [Default]	-1	-1	-1	-1
		Plant	TreatmentPlantST	0	4	0	1
		PumpStation	StationST	0	4	0	1
	ModelLinkST	Fittings	GeneralFittingST	-1	-1	-1	-1
		Manhole	ManholeST	0	1	0	1
		PumpStation	StationST	0	1	0	1
	OutfallST	Discharge	DischargePointST	0	1	0	1
		Fittings	GeneralFittingST	0	2	0	99
		Manhole	ManholeST	0	2	0	2
		Plant	TreatmentPlantST	0	1	0	1
	SiphonST	Fittings	GeneralFittingST	0	2	0	10
		Manhole	ManholeST	0	3	0	2
	TreatmentST	Discharge	DischargePointST	0	10	0	10
		Fittings	GeneralFittingST	0	10	0	99
		Manhole	ManholeST	0	10	0	10
		Plant	TreatmentPlantST	0	10	0	1

		PumpStation	StationST	0	10	0	10

Domain Information

AncillaryRoleDomain

Field Type	Small Integer	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
0	None
1	Source
2	Sink

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Discharge	DischargePointST	ANCILLARYROLE
FeatureClass	Fittings	CleanOutST	ANCILLARYROLE
FeatureClass	Fittings	GeneralFittingST	ANCILLARYROLE
FeatureClass	Fittings	LateralFittingST	ANCILLARYROLE
FeatureClass	Fittings	PluggedEndST	ANCILLARYROLE
FeatureClass	Manhole	ManholeST	ANCILLARYROLE
FeatureClass	Plant	TreatmentPlantST	ANCILLARYROLE
FeatureClass	PumpStation	StationST	ANCILLARYROLE
FeatureClass	Service	ServicePointST	ANCILLARYROLE

D_BarrelDiameter

Field Type	Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
1	Minimum
100	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Manhole	ManholeST	BARRELDIAM

D_Basin

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
NorthDist	Northern District STP
Agana	Agana STP
Pago	Pago Socio STP
Agat	Agat STP
Umatac	Umatac/Merizo STP
Inarajan	Inarajan STP
Baza	Baza Gardens STP
Comm	Commercial Port STP

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Discharge	DischargePointST	BASINID
FeatureClass	Fittings	CleanOutST	BASINID
FeatureClass	Fittings	GeneralFittingST	BASINID
FeatureClass	Fittings	LateralFittingST	BASINID
FeatureClass	Fittings	PluggedEndST	BASINID
FeatureClass	Manhole	ManholeST	BASINID
FeatureClass	Plant	TreatmentPlantST	BASINID
FeatureClass	PumpStation	StationST	BASINID
FeatureClass	Service	ServicePointST	BASINID
FeatureClass	SewerLateral	LateralST	BASINID
FeatureClass	SewerMain	ForceST	BASINID

FeatureClass	SewerMain	GravityST	BASINID
FeatureClass	SewerMain	ModelLinkST	BASINID
FeatureClass	SewerMain	OutfallST	BASINID
FeatureClass	SewerMain	SiphonST	BASINID
FeatureClass	SewerMain	TreatmentST	BASINID

D_CoverDiameter

Field Type	Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
1	Minimum
100	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Manhole	ManholeST	COVERDIAM

D_CriticalRating

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
NONE	None
A	Good
B	Average
C	Poor

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	CRITICALRATING
FeatureClass	SewerMain	GravityST	CRITICALRATING
FeatureClass	SewerMain	ModelLinkST	CRITICALRATING
FeatureClass	SewerMain	OutfallST	CRITICALRATING
FeatureClass	SewerMain	SiphonST	CRITICALRATING
FeatureClass	SewerMain	TreatmentST	CRITICALRATING

D_Discharge

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
OUTF	Outfall
IWELL	Injection Well
RECL	Reclamation Facility
MANH	Manhole
CESS	Community CessPool

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Discharge	DischargePointST	DISCHARGETYPE

D_Elevation

Field Type	Double	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
-400	Minimum
2000	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Discharge	DischargePointST	GROUNDELEV
FeatureClass	Fittings	GeneralFittingST	GROUNDELEV

FeatureClass	Fittings	LateralFittingST	GROUNDELEV
FeatureClass	Fittings	PluggedEndST	GROUNDELEV
FeatureClass	Manhole	ManholeST	INVERTELEV
FeatureClass	Plant	TreatmentPlantST	GROUNDELEV
FeatureClass	PumpStation	StationST	GROUNDELEV
FeatureClass	Service	ServicePointST	GROUNDELEV
FeatureClass	SewerMain	ForceST	DOWNINVERT
FeatureClass	SewerMain	ForceST	UPINVERT
FeatureClass	SewerMain	GravityST	DOWNINVERT
FeatureClass	SewerMain	GravityST	UPINVERT
FeatureClass	SewerMain	ModelLinkST	DOWNINVERT
FeatureClass	SewerMain	ModelLinkST	UPINVERT
FeatureClass	SewerMain	OutfallST	DOWNINVERT
FeatureClass	SewerMain	OutfallST	UPINVERT
FeatureClass	SewerMain	SiphonST	DOWNINVERT
FeatureClass	SewerMain	SiphonST	UPINVERT
FeatureClass	SewerMain	TreatmentST	DOWNINVERT
FeatureClass	SewerMain	TreatmentST	UPINVERT

D_FittingMaterial

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
BRASS	Brass
PLAST	Plastic

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Fittings	GeneralFittingST	MATERIAL

D_FittingType

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
LATF	LateralFitting
PLUG	Plugged End
VALV	Valve
TEST	Test Site
COUP	Coupling
BC	Boundary
COUT	Clean Out

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Fittings	CleanOutST	FITTINGTYPE
FeatureClass	Fittings	GeneralFittingST	FITTINGTYPE
FeatureClass	Fittings	LateralFittingST	FITTINGTYPE
FeatureClass	Fittings	PluggedEndST	FITTINGTYPE

D_FlowSplit

Field Type	Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
0	Minimum
100	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	FLOWSPLIT
FeatureClass	SewerMain	GravityST	FLOWSPLIT
FeatureClass	SewerMain	ModelLinkST	FLOWSPLIT

FeatureClass	SewerMain	OutfallST	FLOWSPLIT
FeatureClass	SewerMain	SiphonST	FLOWSPLIT
FeatureClass	SewerMain	TreatmentST	FLOWSPLIT

D_Friction

Field Type	Double	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
0.013	0.013
0.015	0.015
-1	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	FRICTIONFACTOR
FeatureClass	SewerMain	GravityST	FRICTIONFACTOR
FeatureClass	SewerMain	ModelLinkST	FRICTIONFACTOR
FeatureClass	SewerMain	OutfallST	FRICTIONFACTOR
FeatureClass	SewerMain	SiphonST	FRICTIONFACTOR
FeatureClass	SewerMain	TreatmentST	FRICTIONFACTOR

D_GeneratorSize

Field Type	Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
0	Minimum
1500	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Plant	TreatmentPlantST	GENERATOR_SIZE
FeatureClass	PumpStation	StationST	GENERATOR_SIZE

D_LateralDiameter

Field Type	Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
1	Minimum
12	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerLateral	LateralST	DIAMETER

D_LineMaterial

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
VCP	Vitrified Clay Pipe
RCP	Reinforced Concrete Pipe
RCPL	Lined Reinforced Concrete Pipe
CIP	Cast Iron
DIP	Ductile Iron Pipe
CIPC	Cast In Place Concrete
PVC	PVC
HDPE	High Density Polyethylene
GFR	Glass-Fiber Reinforced
PCP	Polymer Concrete Pipe
UNK	Unknown

TCP	Terra Cotta Pipe
ACP	Asbetos Cement Pipe
STL	Steel
PEP	Polyethylene Pipe

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerLateral	LateralST	MATERIAL
FeatureClass	SewerMain	ForceST	MATERIAL
FeatureClass	SewerMain	ModelLinkST	MATERIAL
FeatureClass	SewerMain	OutfallST	MATERIAL
FeatureClass	SewerMain	SiphonST	MATERIAL
FeatureClass	SewerMain	TreatmentST	MATERIAL

D_MainDiameter

Field Type	Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
1	Minimum
200	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	DIAMETER
FeatureClass	SewerMain	GravityST	DIAMETER
FeatureClass	SewerMain	ModelLinkST	DIAMETER
FeatureClass	SewerMain	OutfallST	DIAMETER
FeatureClass	SewerMain	SiphonST	DIAMETER
FeatureClass	SewerMain	TreatmentST	DIAMETER

D_Manhole

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
PLN	Plain
PRES	Pressure
DROP	Drop
SHDP	Shallow Drop
JBOX	Junction Box
CHIM	Chimney
TERM	Terminal
INJECT	Injector Manhole

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Manhole	ManholeST	MANHOLETYPE

D_ManholeLining

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
PLAS	Plastic Liner
EPOX	Cementious Epoxy
FIBG	Fiberglass
NONE	None
UNK	Unknown
PUT	Polyurethane Coating
PUE	Polyurea Coating
EPX	Epoxy Mortar Coating
LIN	Pre-formed liner
CIP	Cured-in-Place liner

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Manhole	ManholeST	REHAB

D_ManholeMaterial

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
BRIC	Brick
CONC	Concrete
CONL	Concrete With Liner
FIBG	Fibgerglass
UNK	Unknown
CIPC	Cast In Place Concrete

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Manhole	ManholeST	MATERIAL

D_Owner

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
PVT	Private
MIL	Military
UNK	Unknown
GWA	Guam Waterworks

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Discharge	DischargePointST	OWNER
FeatureClass	Fittings	CleanOutST	OWNER
FeatureClass	Fittings	GeneralFittingST	OWNER
FeatureClass	Fittings	LateralFittingST	OWNER
FeatureClass	Fittings	PluggedEndST	OWNER
FeatureClass	Manhole	ManholeST	OWNER
FeatureClass	Plant	TreatmentPlantST	OWNER
FeatureClass	PumpStation	StationST	OWNER
FeatureClass	Service	ServicePointST	OWNER
FeatureClass	SewerLateral	LateralST	OWNER
FeatureClass	SewerMain	ForceST	OWNER
FeatureClass	SewerMain	GravityST	OWNER
FeatureClass	SewerMain	ModelLinkST	OWNER
FeatureClass	SewerMain	OutfallST	OWNER
FeatureClass	SewerMain	SiphonST	OWNER
FeatureClass	SewerMain	TreatmentST	OWNER

D_PipeLength

Field Type	Double	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
0	Minimum
10000	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	PIPELENGTH
FeatureClass	SewerMain	GravityST	PIPELENGTH
FeatureClass	SewerMain	ModelLinkST	PIPELENGTH
FeatureClass	SewerMain	OutfallST	PIPELENGTH

FeatureClass	SewerMain	SiphonST	PIPELENGTH
FeatureClass	SewerMain	TreatmentST	PIPELENGTH

D_PipeLining

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
NONE	None
GRT	Grouted
CIPP	CIPP
FLFR	Fold & Form
SLIP	Slip-lined
UNK	Unknown
LNK	Link Sleeve
HDP8	8" Slip High Density Polyethene

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	REHAB
FeatureClass	SewerMain	GravityST	REHAB
FeatureClass	SewerMain	ModelLinkST	REHAB
FeatureClass	SewerMain	OutfallST	REHAB
FeatureClass	SewerMain	SiphonST	REHAB
FeatureClass	SewerMain	TreatmentST	REHAB

D_PipeShape

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
CIRC	Circular
RECT	Rectangular
UNK	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	PIPESHAPE
FeatureClass	SewerMain	GravityST	PIPESHAPE
FeatureClass	SewerMain	ModelLinkST	PIPESHAPE
FeatureClass	SewerMain	OutfallST	PIPESHAPE
FeatureClass	SewerMain	SiphonST	PIPESHAPE
FeatureClass	SewerMain	TreatmentST	PIPESHAPE

D_PlantType

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
AS	Activated Sludge
OTHER	Other
TFSC	Trickling Filter, Solid Contact
AL	Aerated Lagoons

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Plant	TreatmentPlantST	PLANTTYPE

D_ServiceCleanOut

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description

NONE	No Cleanout
UNK	Unknown
PARC	Within Parcel
ROW	Within ROW

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Service	ServicePointST	CLEANOUT

D_Status

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
ACT	Active
INAC	Inactive
ABAN	Abandoned
PROP	Proposed

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Discharge	DischargePointST	STATUS
FeatureClass	Fittings	CleanOutST	STATUS
FeatureClass	Fittings	GeneralFittingST	STATUS
FeatureClass	Fittings	LateralFittingST	STATUS
FeatureClass	Fittings	PluggedEndST	STATUS
FeatureClass	Manhole	ManholeST	STATUS
FeatureClass	Plant	TreatmentPlantST	STATUS
FeatureClass	PumpStation	StationST	STATUS
FeatureClass	Service	ServicePointST	STATUS
FeatureClass	SewerLateral	LateralST	STATUS
FeatureClass	SewerMain	ForceST	STATUS
FeatureClass	SewerMain	GravityST	STATUS
FeatureClass	SewerMain	ModelLinkST	STATUS
FeatureClass	SewerMain	OutfallST	STATUS
FeatureClass	SewerMain	SiphonST	STATUS
FeatureClass	SewerMain	TreatmentST	STATUS

D_WaterTable

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
ABV	Above Groundwater
BLW	Below Groundwater

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	SewerMain	ForceST	WATERTABLE
FeatureClass	SewerMain	GravityST	WATERTABLE
FeatureClass	SewerMain	ModelLinkST	WATERTABLE
FeatureClass	SewerMain	OutfallST	WATERTABLE
FeatureClass	SewerMain	SiphonST	WATERTABLE
FeatureClass	SewerMain	TreatmentST	WATERTABLE

D_YesNoUnknown

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
YES	Yes
NO	No
UNK	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Manhole	ManholeST	WEIR

EnabledDomain

Field Type	Small Integer	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
0	False
1	True

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	Discharge	DischargePointST	ENABLED
FeatureClass	Fittings	CleanOutST	ENABLED
FeatureClass	Fittings	GeneralFittingST	ENABLED
FeatureClass	Fittings	LateralFittingST	ENABLED
FeatureClass	Fittings	PluggedEndST	ENABLED
FeatureClass	Manhole	ManholeST	ENABLED
FeatureClass	Plant	TreatmentPlantST	ENABLED
FeatureClass	PumpStation	StationST	ENABLED
FeatureClass	Service	ServicePointST	ENABLED
FeatureClass	SewerLateral	LateralST	ENABLED
FeatureClass	SewerMain	ForceST	ENABLED
FeatureClass	SewerMain	GravityST	ENABLED
FeatureClass	SewerMain	ModelLinkST	ENABLED
FeatureClass	SewerMain	OutfallST	ENABLED
FeatureClass	SewerMain	SiphonST	ENABLED
FeatureClass	SewerMain	TreatmentST	ENABLED
FeatureClass	SewerNetwork_Junctions	None	Enabled

Spatial Reference Information

Sewers (FeatureDataset)

Spatial Domain

	Minimum	Maximum	Precision
X	-40000	2159023.254528	} 976.562499090505
Y	-830000	1369023.254528	
M	0	21474.83645	100000
Z	0	21474.83645	100000

Projection System

PROJCS["1993 Guam Geodetic Network"
PROJECTION["Transverse_Mercator"]
PARAMETER["False_Easting",100000.0]
PARAMETER["False_Northing",200000.0]
PARAMETER["Central_Meridian",144.75]
PARAMETER["Scale_Factor",1.0]
PARAMETER["Latitude_Of_Origin",13.5]
UNIT["Meter",1.0]]

Geographic Coordinate System

GEOGCS["GCS_North_American_1983"
DATUM["D_North_American_1983"
SPHEROID["GRS_1980",6378137.0,298.257222101]]
PRIMEM["Greenwich",0.0]
UNIT["Degree",0.0174532925199433]]

GIS Sewer Database Attributes

The GIS attributes that are to be collected and entered in support of the master plan project are identified in table1. The sewer GIS database is designed to store additional information in support of future uses of the GIS data. These uses may include an Asset Management system, Construction, Maintenance and Management system (CMS) , Work Order Management system and others. The database fields will be populated to support the modeling requirement of the master plan and as data is readily available the additional (future) fields will be populated as permitted.

In the table, the fields listed as priority 1 are required for the flow modeling ad master plan functions. Priority 2 fields can be deferred for future uses. If data is readily available for priority 2 fields it should be entered for efficiency.

Table 1: GIS Sewer Database Attributes – Priority List

Feature Class	Attribute Field	Priority	Notes
SewerMain	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	Treatment service area ID
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP database**
	Status	1	
	Owner	1	
	Material	2	Material type (if known)
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	Auto-Created by SIMSLE
	Diameter	1	
	Upmanhole ID	1	Auto-Created by SIMSLE
	DownManhole ID	1	Auto-Created by SIMSLE
	FrictionFactor	2	Auto-Created by SIMSLE
	FlowSplit	2	Auto-Created by SIMSLE
	PipeShape	1	
	Rehab	2	
	Height	1	When shape is non-circular
	SewerMainSubType	1	
SewerLateral	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP database**
	Status	1	
	Owner	1	
	Material	2	Material type (if known)
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	Auto-Created by SIMSLE
	SewerLateralSubType	1	
Manhole	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP database**
	Status	1	
	Owner	1	
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	Auto-Created by SIMSLE
	ManholeType	1	
	Weir	1	
	MonitorID	1	
	Material	2	
	Rehab	2	
	ManholeSubType	1	
	Address	2	Nearest Parcel Address, Auto-Created by SIMSLE
Service	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	Auto-Created by SIMSLE
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP**

			database
	Status	1	
	Owner	1	
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	Auto-Created by SIMSLE
	Property_ID	1	Can mass calculate at end
	ServiceSubType	1	
Plant	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP database**
	Status	1	
	Owner	1	
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	Auto-Created by SIMSLE
	PlantName	1	
	Property_ID	1	Can mass calculate
	PlantSubType	1	
	DesignCap	1	
	Generator_size	1	
PumpStation			
	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	Auto-Created by SIMSLE
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP database**
	Status	1	
	Owner	1	
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	
	PumpName	1	
	Property_ID	1	
	PlantSubType	1	
	NumPumps	1	
	Generator_size	1	
	PumpStaSubType	1	
Discharge	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	Auto-Created by SIMSLE
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP database**
	Status	1	
	Owner	1	
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	Auto-Created by SIMSLE
	DischargeType	1	
	DischargeSubType	1	
Fittings	AssetID	1	Unique ID, Auto-Created by SIMSLE
	BasinID	1	Auto-Created by SIMSLE
	ProjectID	2	CIP project ID (if known) – **REMOVED, added to CIP database**
	Status	1	
	Owner	1	
	DateInstalled	2	Date the feature was constructed (if known)
	DateDigitized	1	Auto-Created by SIMSLE
	FittingType	1	
	FittingSubtype	1	

Quality Control Processes

As part of the overall quality control and the GIS features (graphical features) are to be researched and entered using as-built drawings and other sources. A data entry checklist can be created for each of the as-built drawings in the GWA map room. This will help ensure that all maps are processed and inputted into the GIS. An additional checklist of connected property Ids, available from billing records could be used to verify that all parcels are connected having sewer connections. This checklist will help ensure that all sewered areas are entered into the GIS database. The checklist is shown in table 2.

The feature and attribute quality control process should included 3 steps to ensure that the data was entered correctly as listed in table 2. As data is evaluated and entered by each of the connected parcels the status of four QA/QC steps should be run.

Feature Checks

The feature column is marked if the GIS attribute (graphical feature) was entered. The feature was digitized into the GIS from the As-Built drawings provides and in some cases clarification from Wastewater staff. If all attributes were entered using these data sources, the connected parcel, on this table was checked. If data was not available, the issue was documented in this Status Reports checklist.

Attribute Checks

The attribute column is marked if the data associated to the GIS features was entered for all attributes entered into the GIS. In a few cases some data was not available so comments are provides at the connected zone, section plat level.

QA/QC Checks

The QA/QC step is an additional process where SQL database queries were run to look for missing or invalid database attributes. These queries were run repetitively until data was inputted correctly or the issue was documented. Another important QA/QC was to ensure that the sewer network had the proper connectivity including direction of flow. This was tested using the tracing tools provided the SIMSLE and the Sewer Tools applications provided. Table 5 shows an example QA/QC checklist with example SQL scripts.

Pump Stations and Treatment Plants

Using the data and information provided for the pump station and treatment plant, the GIS feature attributes are entered. Comments are provided on the status of the data on these features in Tables 3 and 4.

Table 1: Example - Status of GIS Sewer Data

Village	Drawing Set	Bookmark Name	Feature	Attributes	QA/QC	Complete	Comments

Table 2: : Example - Pump Stations

Name	Village	Drawing Set	Bookmark Name	Feature	Attributes	QA/QC	Complete	Comments

Table 3: : Example - Treatment Plants

Name	Village	Drawing Set	Bookmark Name	Feature	Attributes	QA/QC	Complete	Comments

Table 4: Example - Data Quality Checks

Query Name	SQL Run	Data Needing Verification?	Comments
Sewer Mains			
SewerMain Diameter NULL or Invalid Range			
SewerMain NULL AssetID			
SewerMain Null BasinID			
SewerMain NULL DateDigitized			
SewerMain NULL DateInstalled			
SewerMain NULL DateModified			
SewerMain NULL DWNMH			
SewerMain NULL FrictionFactor			
SewerMain NULL Height			
SewerMain Null Material or UNK			
SewerMain Null Owner Or Not CTY			
SewerMain NULL PipeShape			
SewerMain NULL ReHab			
SewerMain Null Status OR ABAN			
SewerMain NULL UPMH			
SewerMain Split NULL or Invalid Range			
Sewer Laterals			
SewerLateral NULL AssetID			
SewerLateral NULL BasinID			
SewerLateral NULL DateDigitized			
SewerLateral NULL DateInstalled			
SewerLateral NULL DateModified			
SewerLateral NULL Material OR UNK			
SewerLateral NULL Owner or NOT CTY			
SewerLateral NULL Status OR ABAN			
Manhole Junctions			
Manhole NULL Address			
Manhole NULL AssestID			
Manhole NULL BasinID			
Manhole NULL DateDigitized			
Manhole NULL DateInstalled			
Manhole NULL DateModified			
Manhole NULL manholeType			
Manhole NULL Material OR UNK			
Manhole NULL MonitorID			
Manhole NULL Owner or NOT CTY			
Manhole NULL REHAB			
Manhole NULL Status OR ABAN			
Manhole NULL Weir			

Treatment Plant Junctions
Plant NULL AssetID
Plant NULL BasinID
Plant NULL DesignCap
Plant NULL Generator_Size
Plant NULL Owner OR NOT CTY
Plant NULL Status OR NOT ABAN
Plant NULL Property_ID

Pump Station Junctions
Pump NULL AssetID
Pump NULL BasinID
Pump NULL DateDigitized
Pump NULL DateInstalled
Pump NULL DateModified
Pump NULL Generator OR Range
Pump NULL NumPumps OR Range
Pump NULL Owner OR NOT CTY
Pump NULL Pumpname
Pump NULL Status OR ABAN
Pump NULL Property_ID

Fittings Junctions
Fittings NULL BasinID
Fittings NULL DateDigitized
Fittings NULL DateInstalled
Fittings NULL DateModified
Fittings NULL FittingType
Fittings NULL Owner or NOT CTY
Fittings NULL Status or ABAN
FittingTypes NULL AssestID

Discharge Junctions
Discharge NULL AssestID
Discharge NULL BasinID
Discharge NULL DateDigitized
Discharge NULL DateInstalled
Discharge NULL DateModified
Discharge NULL DischargeType
Discharge NULL Owner OR NOT CTY
Discharge NULL Status OR ABAN

Service Junctions
Service NULL AssetID
Service NULL BasinID
Service NULL DateDigitized
Service NULL DateInstalled
Service NULL DateModified
Service NULL Owner OR NOT CTY
Service NULL Status OR ABAN

Service NULL Property_ID

Sewer Information Management System

SIMS Plugin

The SIMS Plug in enhances the MxEdit2 editing by allowing functions and other operations to be available at edit time or as an add-on application. The two types of components, which make up the plug in, are the 'Edit Time' and the 'Add-On' components. The Edit Time component is activated during edit time, usually unseen by the editor, and offers functions to the editor to make editing data easier and more efficient. The Add-On component offers customized applications that an editor needs to ensure data integrity and also provides tools that will help in data processing or in other areas pertaining to the geodatabase as a whole.

Installation and Setup

The SIMS plug in is installed as an MxEdit2 Plug in. The computer must already have ArcGIS software installed, the MxEdit2 extension installed and proper database access components normally loaded with ArcGIS.

Database Connection

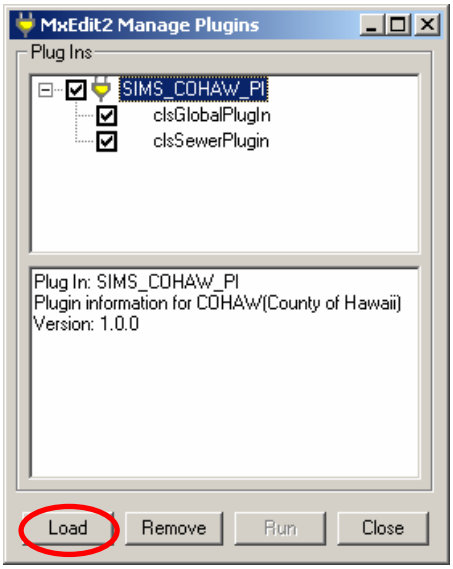
There must be a valid Personal Geodatabase designed specifically for the GWA in order to use the SIMS plug in.

Installing SIMS Plug in

If a previous version of SIMS Plug in is installed, uninstall it first (step 4). Then load the plug in through the 'MxEdit2 Manage Plug in' form by clicking the 'Load' button and locating the SIMS_COHAW_PI.ini file and choosing it. This will create a SIMS plug in folder in the MxEdit2 application folder and install all the files required to run the SIMS plug in. An entry in the MxEdit2 plug in manager will be listed. The plug in DLL will be registered in the Microsoft Registry. The following is a list of files that will be installed in the plug in directory:

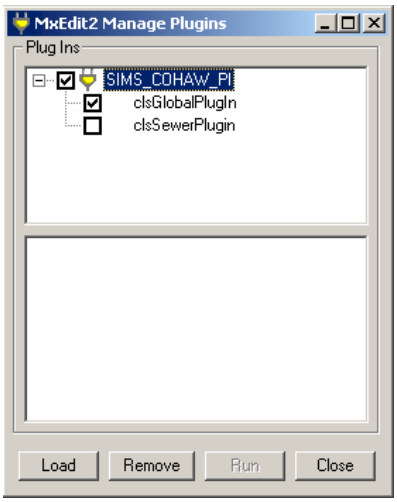
- SIMS_COHAW_PI.dll
- SIMS_COHAW_PI.ini

The plug in manager with the SIMS plug is successfully loaded if they show up under the MX-Edit Plugin Manager.



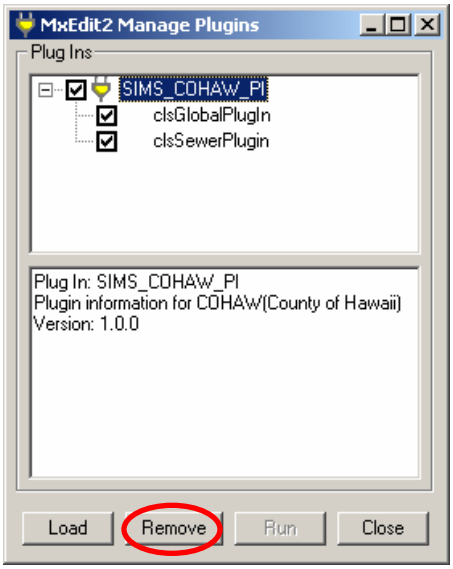
Enabling the Plug in

Within the plug in manager, the SIMS plug in components can be disabled or enabled by checking the component in the plug in tree. By disabling a plug in component, the functions of the component will not execute.



Uninstalling SIMS Plug in

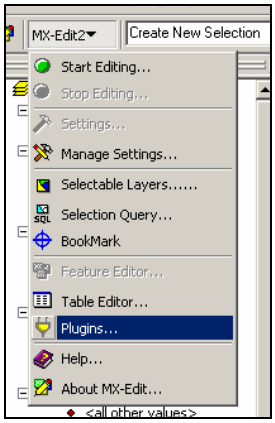
The SIMS plug in can be uninstalled selecting the plug in located in the tree and clicking the 'Remove' button on the plug in manager form. All SIMS plug in related files will be removed and not affect the common libraries and DLLs or ArcGIS files.



Using SIMS Plugin

The Edit Time component is used only with MxEdit and in an edit session in ArcMap. The geodatabase editor usually will not see the Edit Time functions take place so it is recommended to check any Edit Time functions that have taken place.

The SIMS plug in manager can be accessed through the MxEdit2 menu. This will bring up the 'MxEdit2 Manage Plugins' form. This plug in manager is also where the plug in components can be loaded or removed and enabled or disabled.



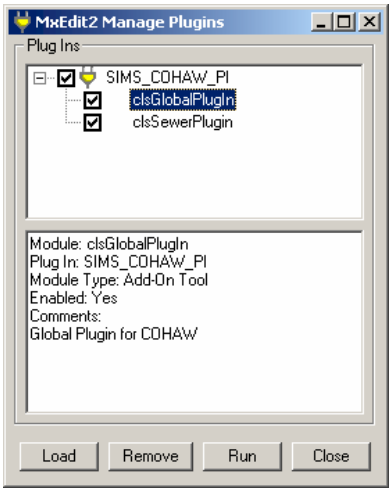
Edit Time Routines

Below is a table of Edit Time routines with it's associated feature classes, fields and descriptions.

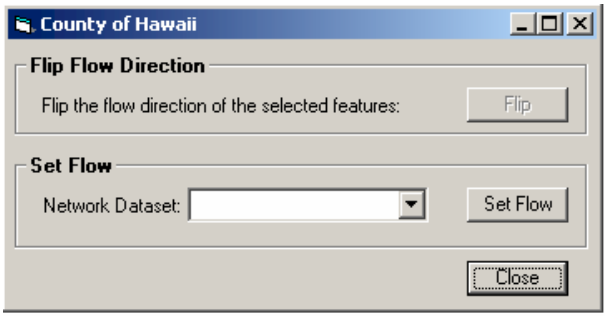
Edit Time Component: Routines			
List of routines that are executed by the SIMS plug in at edit time.			
Functions	FeatureClasss	Fields	Description
Auto AssetID	All featureclasses in the Sewers geometric network except SewerNetwork_Junctions	ASSETID	Assigns a unique Asset ID to all features throughout all featureclasses
Modified Date	All featureclasses in the Sewers geometric network except SewerNetwork_Junctions	DATEMODIFIED	Populates the DATEMODIFIED field with the current system date when any changes are made to the feature.
Calculate Slope	Sewermain	UPINVERT, DOWNINVERT, PIPELENGTH, SLOPE	Calculates the slope of the sewermain pipe using the formula: ***Slope = ((UpInvert - DownInvert) / PipeLength)***
Calculate Water Table	Sewermain	UPINVERT, DOWNINVERT, WATERTABLE	Calculates the slope of the sewermain pipe using the formula: ***WaterTable = (UpInvert + DownInvert) / 2*** If WaterTable > 1 then the pipe is above water. If WaterTable <= 1 then the pipe is below water.
Get Invert Elevation	Sewermain, Manhole	UPMANHOLE (Sewermain), UPINVERT (Sewermain), ASSETID (Manhole), INVERTELEV (Manhole), GROUNDELEV (Manhole), DEPTH (Manhole)	Compares the UpInvert of each Sewermain that has the same Upmanhole and assigns the lowest Sewermain-UpIncert to the Manhole InvertElevation. Calculates the Depth of the Manhole with the new InvertElevation using the formula: ***Depth = GroundElevation - InvertElevation***
Calculate Friction Factor	Sewermain	MATERIAL, DIAMETER, FRICTIONFACTOR	Calculates the Friction Factor of the pipe according the following conditions: If the Material = CIPC, CCP or RCP then FrictionFactor = 0.015. If the Material isn't in the list, then if the pipe Diameter <= 18 inches then FrictionFactor = 0.015 If these conditions are not met then FrictionFactor = 0.013
Up and Down Manhole	Sewermain, Manhole	ASSETID (Sewermain, Manhole), UPMANHOLE (Sewermain), DOWNMANHOLE (Sewermain)	Populates the Sewermain Upmanhole and DownManhole fields with the Asset ID of the corresponding Manhole.
Set Flow Split	Sewermain, Manhole	UPMANHOLE (Sewermain), FLOWSPLIT (Sewermain), ASSETID (Manhole)	Checks the number of Sewermains coming from their UpManhole and calculates the FlowSplit of the Sewermain pipe using the formula: ***FlowSplit = 100 / (Number of Sewermains)***
Calculate Invert Elevation	Manhole	INVERTELEV, GROUNDELEV, DEPTH	Calculates the Invert Elevation of the Manhole using the formula: ***Depth = GroundElevation– InvertElevation*** If Depth > 999 then Depth = 999. If Depth < 0 then Depth = 0.

Add-on Applications

The Add-On applications for the SIMS plug in can be accessed by selecting the Add-On plug in located in the plug in tree and clicking the ‘Run’ button.



Two applications are currently included in the Add-On plug in, ‘Flip Flow Direction’ and ‘Set Flow’. An edit session must be open to use these applications.



Flip Flow Direction

This application was developed to flip the flow direction of Sewermain and SewerLateral features that were drawn in the wrong direction.

1. Open an edit session on the Sewers geodatabase.
2. Select all the Sewermains and Sewrlaterals that need to flipped.
3. Click the ‘Flip’ button and save edits to save the new flow direction of the pipes.

Set Flow

When the flow of the Sewers geometric network needs to be reset for any reason, the user may need to set the flow of the geometric network. The flow of the geometric network allows tracing on then geometric network.

1. Open an edit session on the Sewers geodatabase.
2. Select the Sewers feature dataset in from the Network Dataset combo box.
3. Click the ‘Set Flow’ button to set the flow and save edits to save the flow of the geometric network.

Editing the Sewer Network

It is assumed that the basic editing functionalities are understood. Refer to the ESRI ArcGIS documentation that comes with the software for editing GIS features. This document provides the editing procedures related specifically to the Sewer GIS database designed and is not intended to replace the documentation that comes with ArcGIS software.

Although each user will probably discover tricks and techniques that work for them, often depending on the data sources, this section will address the important steps in editing the GIS sewer network database designed for the GWA.

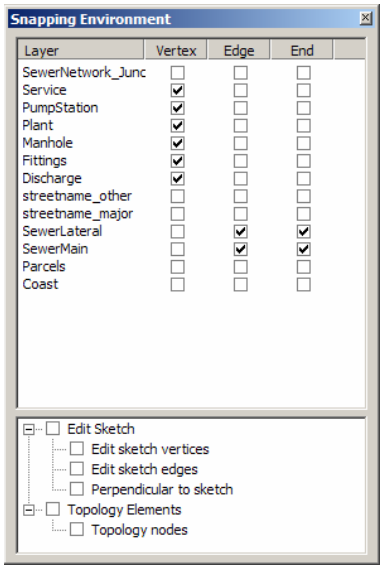
The SIMS plugin that was developed specifically for the GWA sewer database should be loaded and turned on within MX-Edit to provide automated QA/QC routines that are run as features are edited. Refer to the section “SIMS Plugin” for more information on how to use MX-Edit.

Adding New Features

New sewer feature are entered into the GIS using the standard ArcMap Editor tools. Load the editor toolbar from the ArcMap “Customize… menu item under “Tools”. Users that will be editing the sewer GIS database should be very familiar with the Editor Toolbar, refer to the ESRI ArcGIS documentation for help on using the Editor Toolbar. As the graphical features are added to the GIS, the attributes will need to be entered using the MX-Edit and SIMS plug-in routines.

Feature Snapping

One of the most important steps in setting up an editing environment is the snapping of features. This will help ensure that dependant features that are associated are connected as they are entered. It is more difficult to debug disconnected features later as they discovered by the users of the data. The snapping settings are located under the standard Editor Toolbar. The snapping of associated sewer features may change depending on the task at hand. Generally the linear feature ends and edges should snap to the vertecies of the junction features. The default settings should be set as shown below:



Order of Operation

The order of operation when adding GIS sewer features will help structure how data is created in the geometric network. Following the recommended order of operation will help to ensure that GIS features are created properly with some operations automatically performed by the database. The recommended order of operation is:

Order of Operation when Digitizing			
Order	**Feature**	**Editor Action**	**Database Action**
1.	Plant	Add new plant junction at the location of the headworks of the treatment plant	None
2.	SewerMain	Digitize sewermain feature in the direction of flow starting from the upstream point to the downstream point. Snap to existing manholes if they already exist.	Manholes at the ends of sewermains are automatically created, if not snapping to existing manholes.
3.	Manhole	a.) Enter new manhole along an existing sewermain if sewermain is to be split, otherwise let the sewermain create the manholes for you in order of operation #2. b.) Enter manhole, snapping it to an existing junction of another type (pump, fitting, etc.) if junction is to be converted to a manhole type junction.	a.) New manholes can be entered first and then sewermains snapped to these manholes, but it is recommended to let the sewermains create the manholes for you for efficiency reasons. b.) Database rules will convert junction to manhole for you.
4.	PumpStation	a.) Enter pumpstation snapping, it to an existing junction of another type (manhole, fitting, etc.) if junction is to be converted to a pumpstation type junction. b.) Enter connected forcemains and modeling link features	a.) Database rules will convert junction to pumpstation for you.
5.	SewerLateral	Digitize sewerLateral feature in the direction of flow, letting the snapping rules jump the cursor to the connecting sewermain.	A LateralFitting subtype of the Fittings feature will be automatically added along the sewermain. Sewermain will be converted to a complex feature. Service junction is automatically created at the beginning of the lateral.
6.	Discharge	Remove manhole at the end of a Outfall subtype of sewermain and replace with a Dischrage junction feature. Snapping to end of sewermain.	None
7.	Fittings	New fitting types are added along sewermain or sewerLateral features, snpping to edge of line.	Sewermain or sewerlateral will be converted to a complex feature.

Geometric Connectivity Rules

The sewer geometric network design includes connectivity rules that enforce valid connections between sewer GIS features. This helps enforce how features are input into the GIS. Invalid connections are not allowed during the editing process. These connectivity rules should be familiar to the person editing and maintaining the GIS sewer database. For example, reading from the charts below, SewerLaterals can connect to the either another lateral or to a sewermain. The connection is via a LateralFitting junction for laterals or via manholes.

The "Edge-Junction-Edge Geometric Network Connectivity Rules" table defines the valid connecitons between the pipes and the junction features in the GIS database.

Edge-Junction-Edge Geometric Network Connectivity Rules				
SewerNetwork				
From		**To**		**Via**
Edge	**Subtype**	**Edge**	**Subtype**	**Junction::Subtype**
SewerLateral	LateralST	SewerLateral	LateralST	Fittings::LateralFittingST [Default]
				Manhole::ManholeST
		SewerMain	ForceST	Manhole::ManholeST [Default]
			GravityST	Fittings::LateralFittingST [Default]
				Manhole::ManholeST
			ModelLinkST	Manhole::ManholeST [Default]
			SiphonST	Manhole::ManholeST [Default]
SewerMain	ForceST	SewerLateral	LateralST	Manhole::ManholeST [Default]
		SewerMain	ForceST	Fittings::GeneralFittingST
				Manhole::ManholeST [Default]
				Plant::TreatmentPlantST
			ModelLinkST	PumpStation::StationST [Default]
			TreatmentST	Plant::TreatmentPlantST [Default]
	GravityST	SewerLateral	LateralST	Fittings::LateralFittingST [Default]
				Manhole::ManholeST
		SewerMain	ForceST	Manhole::ManholeST [Default]
				Plant::TreatmentPlantST
				PumpStation::StationST
			GravityST	Fittings::LateralFittingST
				Manhole::ManholeST [Default]
				Plant::TreatmentPlantST
				PumpStation::StationST
			ModelLinkST	Manhole::ManholeST [Default]
			OutfallST	Plant::TreatmentPlantST [Default]
			SiphonST	Manhole::ManholeST [Default]
	ModelLinkST	SewerLateral	LateralST	Manhole::ManholeST [Default]
		SewerMain	ModelLinkST	Fittings::GeneralFittingST [Default]
	SiphonST	SewerLateral	LateralST	Manhole::ManholeST [Default]
		SewerMain	SiphonST	Fittings::GeneralFittingST
				Manhole::ManholeST [Default]
	TreatmentST	SewerMain	OutfallST	Fittings::GeneralFittingST [Default]
				Manhole::ManholeST
			TreatmentST	Fittings::GeneralFittingST [Default]

The "Edge-Junction Geometric Network Connectivity Rules" table defines the valid connecitons between the pipes and the junctions with the valid number of connections.

Edge-Junction Geometric Network Connectivity Rules							
SewerNetwork							
From		**To**		**No. of Edges**		**No. of Junctions**	
Edge	**Subtype**	**Junction**	**Subtype**	**Min**	**Max**	**Min**	**Max**
SewerLateral	LateralST	Fittings	LateralFittingST	1	10	0	99
		Manhole	ManholeST	0	10	0	1
		Service	ServicePointST [Default]	-1	-1	-1	-1
SewerMain	ForceST	Fittings	GeneralFittingST	0	6	0	99
		Manhole	ManholeST	0	4	0	1
		Plant	TreatmentPlantST	0	10	0	1
		PumpStation	StationST	1	2	1	2
	GravityST	Fittings	GeneralFittingST	0	2	0	99
			LateralFittingST	0	2	0	99
			PluggedEndST	1	1	0	1
		Manhole	ManholeST [Default]	-1	-1	-1	-1
		Plant	TreatmentPlantST	0	4	0	1
		PumpStation	StationST	0	4	0	1
	ModelLinkST	Fittings	GeneralFittingST	-1	-1	-1	-1
		Manhole	ManholeST	0	1	0	1
		PumpStation	StationST	0	1	0	1
	OutfallST	Discharge	DischargePointST	0	1	0	1
		Fittings	GeneralFittingST	0	2	0	99
		Manhole	ManholeST	0	2	0	2
		Plant	TreatmentPlantST	0	1	0	1
	SiphonST	Fittings	GeneralFittingST	0	2	0	10
		Manhole	ManholeST	0	3	0	2
	TreatmentST	Discharge	DischargePointST	0	10	0	10
		Fittings	GeneralFittingST	0	10	0	99
		Manhole	ManholeST	0	10	0	10
		Plant	TreatmentPlantST	0	10	0	1
		PumpStation	StationST	0	10	0	10

Plants

Order of Operation: 1

Adding New
Treatment plants should be added first when adding a new treatment plan system. The plant junction represents the headworks or the centroid of the treatment facility. Sewermains connected to the plant junction are add next.

Moving Plants
Plants can be moved if the location is incorrect in the GIS. Sewermains are interconnected to plants and manholes so the connected sewermains will move with the plant. Refer to "Moving Sewermains" for related information.

Updating Attributes
The data attributes on the plants should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS.

The valid Sub-Types are:

Plants	**TreatmentPlantST**
	PlantType
	Activated Sludge
	Trickling Filter, Solid Contact
	Aerated Lagoon
	Other

Connectivity Rules
Generally, plants are conencted to ends of sewermains. Refer to the Connectivity rules for detail information

SewerMains

Order of Operation: 2

Adding New

Sewermains are added to the sewer GIS database first second only to the “Plant”feature. When adding new sewermains, the geometric connectivity rules will automatically add manholes, by default, to the ends of the sewermains. The default sewermain subtype is “Gravity”, but can be changed once the feature is added. The sewermains must snap to other mains or laterals via manholes or lateral filltings as defined in the connectivity rules. This ensures connectity required for preforming tracing operations on the sewer network.

One of the most steps in adding new sewermains is to digitize the feature in the order of dirrection. When drawing the line, the beginning point should be the location of the upstream manhole with the end point being the downstream manhole.

Splitting SewerMains

Existing sewermains can be split when a new manhole is constructed along a sewermain. The GIS can be updated to accommodate a new manhole by adding a manhole feature on a sewermain feature. It is important that the snapping settings are set to snap manhole vertex to the sewermain edges. This will ensure that the manhole is inserted onto the sewermain line feature. When adding a new manhole, the sewermain feature is automatically split into to two parts. In doing this, the sewermain feature attributes will need to be added since most attributes will have changed, particularily the invert elevations.

Moving Sewermains

Sewermains can be moved if the location or alignment is incorrect in the GIS. Sewermains are interconnected to manholes so the manhole must move with the sewermain. To move the sewermain, the user must move the upstream and downstream manholes. In doing this, the sewermain line feature will move with the manhole. Do not move the line feature independently!

Updating Attributes

The data attributes on the sewermains should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS. Sewermain attributes should be added to the GIS feature as new data is aquired, data is validated and incorrect or is the feature changes because of a construction project.

The valid sub-types are:

SewerMain	**ForceST**
	GravityST
	ModelLinkST
	OutfallST
	SiphonST
	TreatmentST

Connectivity Rules

Generally, sewermains are conencted via manholes and other junction types. Refer to the Connectivity rules for detail information

Manholes

Order of Operation: 3

Adding New

Manholes are adding automatically to the ends of newly digitized sewermains, this is the perfered method of adding manholes to the GIS data. Optionally, new manholes could be added first using X,Y coordinates and then adding connected sewermains as long as the sewermain ednds snap to the new manholes.

Splitting SewerMains

Existing sewermains can be split when a new manhole is constructed along a sewermain. The GIS can be updated to accommodate a new manhole by adding a manhole feature on a sewermain feature. It is important that the snapping settings are set to snap manhole vertex to the sewermain edges. This will ensure that the manhole is inserted onto the sewermain line feature. When adding a new manhole, the sewermain feature is automatically split into to two parts. In doing this, the sewermain feature attributes will need to be added since most attributes will have changed, particularily the invert elevations.

Moving Manholes

Manholes can be moved if the location is incorrect in the GIS. Sewermains are interconnected to manholes so the connected sewermains will move with the manhole. Refer to “Moving Sewermains” for related information.

Updating Attributes

The data attributes on the manholes should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS. This will help to ensure that invert elevations are updated properly on the conencted sewermains.

The valid Sub-Types are:

	ManholeST
Manholes	***ManholeTypes***
	Plan
	Pressure
	Drop
	Shallow Drop
	Junction Box
	Chemney
	Plugged End

Connectivity Rules

Generally, manholes are conencted to ends of sewermains or sewer laterals. Refer to the Connectivity rules for detail information

Pumps

Order of Operation: 4

Adding New
Pumping plants should be added as the sewermain features are being digitized. The pump junction represents the centroid of the pumping facility. Sewermains, as model links or frocemains are add next to build the pump station configuration.

Moving Pumps
Pumps can be moved if the location is incorrect in the GIS. Sewermains are interconnected to pumps so the connected sewermains will move with the plant. Refer to “Moving Sewermains” for related information.

Updating Attributes
The data attributes on the plants should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS.

The valid Sub-Types are:

Pumps	***PumpST***

Connectivity Rules
Generally, pumps are conencted to ends of sewermains with subtypes of modelLinks or Forcemains. Refer to the Connectivity rules for detail information.

Sewer Laterals

Order of Operation: 5

Adding New

Sewer laterals are added to the sewer GIS database after the sewermains are all in place. When adding new sewer laterals, the geometric connectivity rules will automatically add a service junction at the upstream end. When the downstream end is snapped and connected to a sewermain feature, a LateralFitting junction is automatically added. It is important that the snapping environment is setup correctly. The sewerlaterals must snap to other laterals or to sewermains via manholes or lateral filltings and other fitting types.

One of the most steps in adding new sewerlaterals is to digitize the feature in the order of dirrection. When drawing the line, the beginning point should be the location of the upstream service junction with the end point being the downstream fitting or manhole.

Moving SewerLaterals

Sewer laterals can be moved if the location or alignment is incorrect in the GIS. Sewer laterals are interconnected to manholes and fittings so these must move with the sewer lateral. To move the sewer lateral, the user must move the upstream service junction and the downstream fitting. In doing this, the sewer lateral line feature will move with the service junction or fitting. Do not move the line feature independently! In the case that the lateral conenction to the main is incorrect, the manhole feature can be moved along the sewermain. This will move all connected features together, but may require sewermain attributes to be modified in this case.

Updating Attributes

The data attributes on the sewer laterals should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS.

The valid Sub-Types are:

SewerLateral	***LateralST***

Connectivity Rules

Generally, sewer laterals are conencted to other laterals or sewer mains via fittings, or manholes. Refer to the Connectivity rules for detail information

Discharge Points

Order of Operation: 6

Adding New

Discharges are added to the sink junction of the tributary area. To do this, delete the manhole that was automatically added at the downstream end of the Outfall sewermain type and then add a discharge feature. Make sure that the discharge snapping settings are set to snap discharge vertex to sewermain ends.

Moving Discharges

Discharges can be moved if the location is incorrect in the GIS. Sewermains are interconnected to discharge junctions so the connected sewermains will move with the manhole. Refer to "Moving Sewermains" for related information.

Updating Attributes

The data attributes on the discharges should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS.

The valid Sub-Types are:

	DischargeST
	DischargeType
Discharge	Outfall
	Injection Well
	Reclaimamtion Facility
	Manhole
	Gang Cesspool

Connectivity Rules

Generally, discharges are conencted to ends of sewermains at the downstream end. Refer to the Connectivity rules for detail information

Sewer Fittings

Order of Operation: 7

Adding New

Fittings are added along line features without splitting the line. Lateral fittings are added automatically when snappng a new lateral feature to a sewermain feature. Other fittings must be added along sewermains or sewer lateral lines, making sure that the snapping settings has the fittings vertex and the line edges are snapped.

Moving Discharges

Fittings can be moved if the location is incorrect in the GIS. Fittings are not interconnected to the line feature, with the exception of the lateral fittings. Moving the lateral fitting will move the lateral line with it, otherwise fittings can be moved as needed.

Updating Attributes

The data attributes on the fittings should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS.

The valid Sub-Types are:

Fittings	***GeneralST***
	LateralFittingST
	CleanOutST
	SiphonST
	TreatmentST
	FittingType
	LateralFitting
	Plugged End
	Valve
	Test Site
	Coupling
	Boundary
	Clean Out
	Cmimney

Connectivity Rules

Generally, fittings are conencted to other laterals or sewer mains. Refer to the Connectivity rules for detail information

3. GIS Water Distribution Database

The water GIS database is stored in an ESRI geodatabase structure made up of classes and subclasses. It is not the intent of this document to describe how geodatabases work or how they are designed; however it is important to have a general understanding of how the water database is organized. The same geodatabase structure of datasets, feature classes, subtypes and domains within the sewer dataase applies to the water database.

Database Feature Classes

The feature classes defined in the water GIS database are explain in general terms. For more information on the definitions of each feature class refer to the Data Dictionary in this section.

Anode

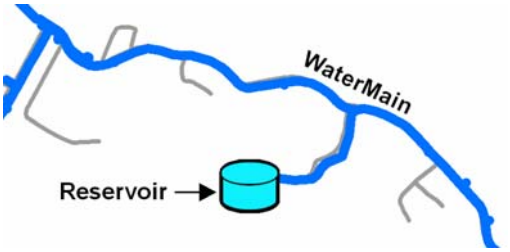
An *anode* is a feature (specifically, an electrical mechanism) that's applied to system components for the prevention of rust, pitting, and the corrosion of metal surfaces that are in contact with water or soil. A low-voltage current is applied to the water or soil in contact with the metal, such that the electromotive force renders the metal component cathodic. Corrosion is concentrated on the anodes instead of on the associated (and protected) water system components. This type of corrosion may occur in copper, steel, stainless steel, cast iron, and ductile iron pipes.

Casing

The *casing* is a line protector that surrounds or encloses a water line in order to protect it from physical damage or other ground-based contaminants. Casings are used when installing water mains under railroad tracks, major highways, and other obstructions. Types of casings are Casement, ConduitBridge, ProtectiveTunnel, and AccessTunnel.

Reservoirs

A *reservoir* feature that represents an open water storage used as water supply wthin the water distrubution system.



ScadaSensor

The SCADA sensor is a feature that's used to remotely measure the status of network components as part of a supervisory control and data acquisition (SCADA) system. SCADA systems provide alarms, responses, data acquisition, and control for collection and distribution systems. Operators use the SCADA system to monitor and adjust processes and facilities. along a line where a repair occurred. The types of spatial operations records are Leak, Maintenance, Repair, and Inspection.

ThrustProtection

The *ThrustProtection* class represents a type of line protector that's used to prevent pipe movement. Thrust protection is commonly implemented as thrust blocks (masses of concrete material) that are placed at bends and around valve structures. The types of thrust protection include Anchor, Blocking, Deadman, and Kicker.

UndergroundEnclosures

UndergroundEnclosure is a general-purpose class that's intended to house various types of aspatial equipment found in a water system. The underground enclosures allow access to and provide protection of facilities and equipment in the water system. The contained equipment does not participate in the network—their relationship to the underground equipment is via peer-to-peer associations. The types of underground enclosures are MeterBox, ValveVault, and Vault.

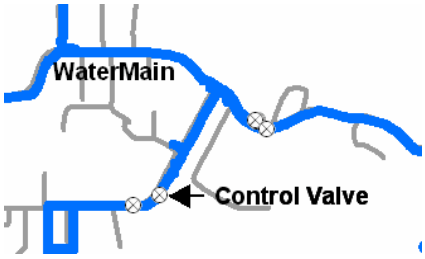
ClearWell

A *clear well* is an enclosed tank that is associated with a treatment plant. Clear wells are used to store filtered water of sufficient capacity to prevent the need to vary the filtration rate with variations in demand. Clear wells are also used to provide chlorine contact time for disinfection. Pumps are used to move the water from the clear well to the treatment plant or to a distribution system. A *pump* is a facility that moves, compresses, or alters the pressure of a fluid, such as water or air, being conveyed through a natural or artificial channel. Pumps are also much like hydrants and meters as they also have an associated warehouse object (WarehousePump).

ControlValve

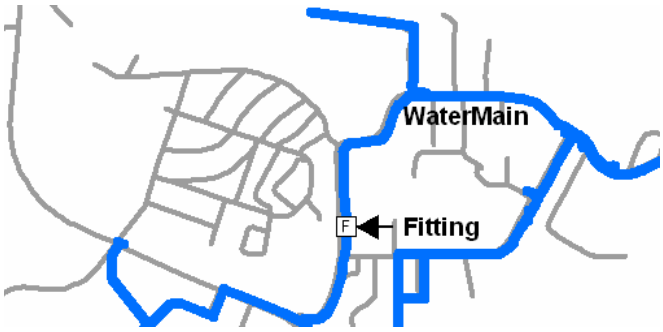
Control valves are a set of valves that operate in special ways. There are three fundamental types of control valves: backflow control, air control, and altitude. A backflow control valve is a control valve designed to prevent water from flowing in the reverse direction. Essentially, backflow control valves allow flow in only one direction—the normal flow direction. Backflow control valves are open in the direction of normal flow and closed with the reversal of flow. Backflow control valves are commonly found near pump stations and reservoirs. Air control valves are control valves that are used to either relieve the system of trapped air or vacuums that may develop. Finally, an altitude valve is a control valve that controls water flow into a tower when the water level drops below a threshold. Altitude valves automatically shut off water flow when the water level in an elevated tank (or tower) reaches a preset elevation. A pressure reducing valve is a system valve with a horizontal disk for automatically reducing water pressures to a preset value. A pressure relief valve is a system valve that opens automatically when water pressure reaches a preset limit to relieve stress on a pipeline. Pressure relief valves are used to protect against rapid increases in pressure (i.e., water hammer). A pressure sustaining valve is a system valve that automatically sustains water pressures at a preset value. A pressure sustaining valve is similar to a pressure reducing valve but governs the pressure on the upstream rather than the downstream flow.

Types of control valves represented include AirGap, AirControl, AirRelease, Altitude, BackflowControl, Combination, AtmosphericVacuum, DoubleCheck, PressureVacuum, ReducedPressureBackflow, RPZ, SimpleCheck, Vacuum, VacuumBreaker, and VacuumRelease.



Fitting

The *Fitting* class represents the facility found at the joint between two lines where a transition of some sort must occur. In order to cut down on the number of network feature classes and improve geometric network performance, we have chosen to rely on subtypes here to differentiate the different types of fitting-related classes. Fitting types include Bend, Cap, Cross, Coupling, ExpansionJoint, Offset, Reducer, Riser, Saddle, Sleeve, Tap, Tee, Wye, and Weld.



GravityMain

A *gravity main* is a type of main line that is unpressurized and relies on gravity to move the water through the main. *GravityMain* is a concrete class. For the water distribution model, the types of gravity mains are Carrier, InlineStorage, and TransportPipe.

For the sewer and stormwater model, the types are Collector, Culvert, InlineStorage, InvertedSiphon, Intercepter, OpenChannel, Outfall, Overflow, and Tunnel. A collector is a pipe that collects and transports wastewater to a treatment plant or disposal system. Service laterals connect to collectors. Outfalls are the conduit leading to the final disposal point or area for wastewater and drainage. Outfalls discharge into a receiving water body, such as a stream, river, lake, ocean, or other surface, or groundwater. An open channel is a channel open to the environment that transmits raw water and drainage. Tunnels are used to transmit water through mountains or deep below the ground. Tunnels are generally created in bedrock and may contain features such as pipes and conduits within the tunnel. An overflow connects a chamber or pipe to another part of the system or outfall during overload conditions or peak flows.

Hydrant

A *hydrant* enables fire fighters to attach fire hoses to the distribution network. Hydrants also have secondary uses that include flushing main lines and laterals, filling tank trucks, and providing a temporary water source for construction jobs. Hydrants have an association with a WarehouseHydrant object. The warehouse hydrant contains the key inventory/warehouse-related properties, while the *Hydrant* facility class is intended primarily to represent the position and connectivity of the warehouse hydrant. Certain warehouse hydrant properties are cached within

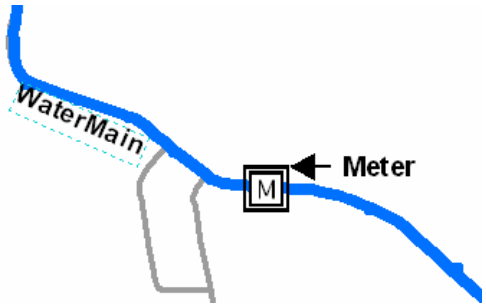
the hydrant, namely, each of the five that are found on the Hydrant class itself (but not including those inherited from its ancestors in the model).

Manhole

A *manhole* is a facility that is used to allow access to water lines. There are two primary types of manholes: standard manholes and drop manholes. A standard manhole is an opening in a sewer allowing access operators or equipment. It may also be called an access hole or maintenance hole. Drop manholes have a line entering the manhole at a higher elevation than the main flow line or channel (hence the “drop”). Drop manholes themselves come in two varieties: inside drop and outside drop. Inside drop manholes route the higher-elevation flow down through the manhole barrel. Outside drop manholes route the flow to the main manhole channel outside of the manhole. Being a facility, a manhole plays the role of a junction on the active network.

Meter

A *meter* is a facility that is used to measure water consumption (volume). Being a facility, a meter plays the role of a junction on the active network. Meters are also much like hydrants as they also have an associated warehouse object, namely, a WarehouseMeter.
The various water meter types are Compound, Current, DetectorCheck, MagneticOrifice, Pito, PositiveDisplacement, Proportional, Sonic, and Venturi. In sewer and stormwater systems the meter types are Flume, Magnetic, ModifiedVenturi, MultiJet, OrificePlate, Propeller, FlowTube, Proportional, Sonic, Turbine, Venturi, and Wier.

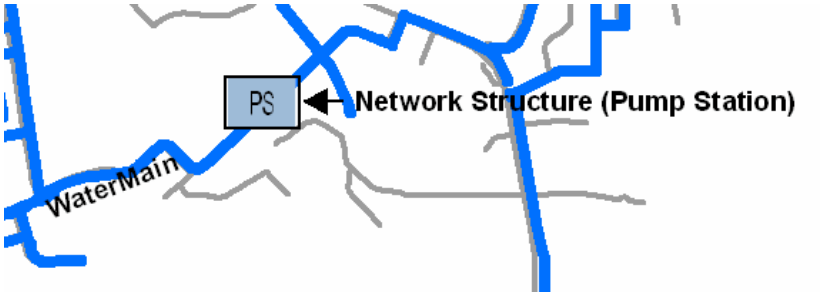


PressureMain

A *pressureMain* is a type of main line that is pressurized and relies a pump to deliever the water. *GravityMain* is a concrete class. For the water distribution model, the types of pressuremains are defined by the subtypes; Blowoff, Bypass, AirRelease, ChemicalInjection, DistributionMain, Interconnect, pipeBridge, SamplingStation, TransmissionMain and unkown.

NetworkStructure

Network structures are used for a variety of purposes within a water distribution system. These purposes include equalizing supply and demand, increasing operating convenience, leveling out pumping requirements, minimizing power costs, providing water in the event of pump or supply failure, and providing large quantities of water for fighting fires. The primary types of water network structures are enclosed StorageFacilities, PumpStations, TreatmentPlants, and ProductionWells. The Primary types of wastewater network structures are DiversionChamber, JunctionChamber, PumpStation, StorageBasin, TreatmentPlant, DischargeStructure, DiversionPoint, ProductionWell, SplitManhole, TideChamber, and LiftStation. Structures may either be enclosed or open and may contain either raw or treated water.

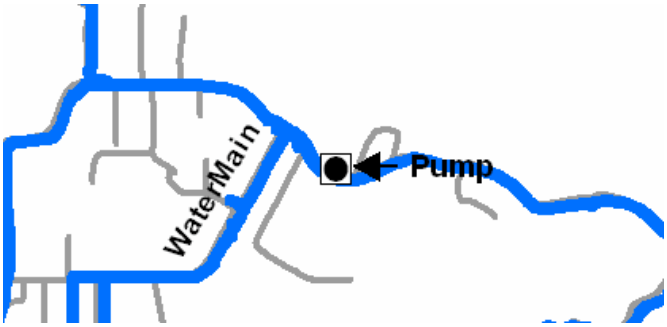


WaterStructure

WaterStructures are used primarily as the main supply centers in the water distribution network. The praimry subtypes are; EnclosedStorageFacility, ProductionWell, PumpStation, StorageBasin and TreatmentPlant.

Pump

A *pump* is a facility that moves, compresses, or alters the pressure of a fluid, such as water or air, being conveyed through a natural or artificial channel. Pumps are also much like hydrants and meters as they also have an associated warehouse object (WarehousePump). Pump types include AxialFlow, Centrifugal, Jet, Reciprocating, Rotary, Screw, and Turbine.



SamplingStation

A *sampling station* is a facility that is used for collecting water samples. Sampling stations may be dedicated sampling devices, or they may be other devices of the system where a sample may be obtained.

SystemValve

A *system valve* is a facility that is fitted to a pipeline or orifice in which the closure member is either rotated or moved transversely or longitudinally in the waterway so as to control or stop the flow. System valves are used to regulate pressure, isolate, throttle flow, prevent backflow, and relieve pressure.

System valve types include Gate, Plug, Ball, Cone, and Butterfly. These specific types may be classified as isolation valves. Isolation valves are designed to start and stop the flow of water within the distribution network (and isolate portions of the network for maintenance or repair).

Isolation valves are the predominant type of SystemValve installed in a distribution network. They are commonly intended to be either fully open or fully closed. They are not intended to throttle flow by being partially open.

A gate valve is an isolation valve (which is modeled here as a system valve) that is used to prevent water flow via a simple gate mechanism. Gate valves may be motorized (and remotely controlled), and they may also have small bypass valves. Gate valves are not installed in locations where they need to be frequently operated due to the time required to open and close them.

A butterfly valve is similar to a gate valve but uses a disk that is rotated ninety degrees to control the flow of water. Butterfly valves operate easier under large pressures and volumes of water than standard gate valves, and are thus found on larger pipes. However, because the butterfly valve disk stays in the water path even when the valve is open, the valve creates a higher resistance to flow (i.e., pressure loss) than a gate valve. Additionally, if it becomes necessary to clean a main by using pigs or swabs, the butterfly valve would block the operation. Butterfly valves can be operated quickly, increasing the risk of serious water hammer.

Database Dictionary

The database dictionary for the water GIS database was generated by a utility called “Geodatabase Reporter” that can be downloaded for free from the ESRI ArcScripts site. The data dictionary generated by this utility is shown below. This is a HTML document so it is easier to read and navigate using the hypertext in the HTML version.

The report shows all field definitions, valid domains, default values, connectivity rules and other geodatabase definitions. If modifications are made to the database design, this Geodatabase Report should be regenerated.

Geodatabase Summary				
FeatureDataset	Object Name (Alias)	Type	Geometry	Subtypes

Water Distribution Features (S)	wAnode (Anode) (C)	Simple Feature	Point	None
	wCasing (Casing) (C)	Simple Feature	Polygon	AccesssTunnel Casement ConduitBridge ProtectiveTunnel
	wReservoirs (wReservoirs) (C)	Simple Feature	Point	None
	wScadaSensor (ScadaSensor) (C)	Simple Feature	Point	None
	wThrustProtection (ThrustProtection) (C)	Simple Feature	Polygon	Anchor Blocking Deadman Kicker
	wUndergroundEnclosure (UndergroundEnclosure) (C)	Simple Feature	Polygon	MeterBox ValveVault Vault
	wWaterStructure (WaterStructure) (C)	Simple Feature	Polygon	EnclosedStorageFacility ProductionWell PumpStation StorageBasin TreatmentPlant
Water Distribution Network (S)	WaterNetwork_Junctions (WaterNetwork_Junctions) (C)	Simple Junction	Point	None
	WaterNetwork	GeometricNetwork		
	wClearWell (wClearWell) (C)	Simple Junction	Point	None
	wControlValve (wControlValve) (C)	Simple Junction	Point	AirControl AirGap Altitude AtmosphericVacuum BackflowControl CVAirRelease CVCombination DoubleCheck PressureVacuum ReducedPressureBackflow RPZ SimpleCheck Unknown Vacuum VacuumBreaker VacuumRelease
	wFitting (wFitting) (C)	Simple Junction	Point	Bend Cap Coupling Cross ExpansionJoint Offset Reducer Riser Saddle Sleeve Tap Tee Unknown Weld Wye
	wGravityMain (wGravityMain) (C)	Complex Edge	Polyline	Carrier InlineStorage TransportPipe Unknown
	wHydrant (wHydrant) (C)	Simple Junction	Point	None
	wLateralLine (wLateralLine) (C)	Complex Edge	Polyline	
	wLateralPoint (wLateralPoint) (C)	Simple Junction	Point	None

	wManhole (wManhole) (C)	Simple Junction	Point	None
	wMeter (wMeter) (C)	Simple Junction	Point	Compound Current DetectorCheck MagneticOrifice Pito PositiveDisplacement Proportional Sonic Uknown Venturi
	wNetworkStructure (wNetworkStructure) (C)	Simple Junction	Point	EnclosedStorageFacility ProductionWell PumpStation StorageBasin TreatmentPlant Unknown
	wPressurizedMain (wPressurizedMain) (C)	Complex Edge	Polyline	AirRelease BlowOff Bypass ChemicalInjection DistributionMain Interconnect PipeBridge SamplingStation TransmissionMain Unknown
	wPump (wPump) (C)	Simple Junction	Point	AxialFlow Centrifugal Jet Reciprocating Rotary Screw Turbine Unknown
	wSamplingStation (wSamplingStation) (C)	Simple Junction	Point	None
	wSystemValve (wSystemValve) (C)	Simple Junction	Point	Ball Butterfly Cone Gate Plug Unknown
None	D_AccessDiam	Domain	Range	
	D_AccessType	Domain	Coded Value	
	D_Basin	Domain	Coded Value	
	D_Boolean	Domain	Coded Value	
	D_FrameCoverMaterial	Domain	Coded Value	
	D_GravityMainShapes	Domain	Coded Value	
	D_HydrantDeviceID	Domain	Coded Value	
	D_JointType	Domain	Coded Value	
	D_JunctionMaterial	Domain	Coded Value	
	D_LifeCycleStatus	Domain	Coded Value	
	D_MainDistDiam	Domain	Coded Value	
	D_Manufacturer	Domain	Coded Value	
	D_NetworkStructureUsage	Domain	Coded Value	
	D_Owner	Domain	Coded Value	
	D_PressurizedMainDiam	Domain	Range	
	D_ScadaSensorType	Domain	Coded Value	
	D_Status	Domain	Coded Value	
	D_ValveDeviceID	Domain	Coded Value	
	D_WarehouseStatus	Domain	Coded Value	
	D_WaterLineMaterial	Domain	Coded Value	
	D_WaterType	Domain	Coded Value	

	D_WHSystemValveReg	Domain	Coded Value
	EnabledDomain	Domain	Coded Value

Geometric Network Summary			
Geometric Newtork Name	Role	FeatureClass Name	Links
WaterNetwork	Simple Junction	WaterNetwork_Junctions	
		wClearWell	
		wControlValve	
		wFitting	
		wHydrant	
		wLateralPoint	
		wManhole	
		wMeter	
		wNetworkStructure	
		wPump	
		wSamplingStation	
		wSystemValve	
	Complex Junction	None	
	Simple Edge	None	
	Complex Edge	wGravityMain	EJ Rules EE Rules
		wLateralLine	EJ Rules EE Rules
		wPressurizedMain	EJ Rules EE Rules

Edge-Junction-Edge Geometric Network Connectivity Rules				
WaterNetwork				
From		To		Via
Edge	Subtype	Edge	Subtype	Junction::Subtype
This Geometric Network Does Not Contain Any Edge->Junction->Edge Connectivity Rules				

Edge-Junction Geometric Network Connectivity Rules							
WaterNetwork							
From		To		No. of Edges		No. of Junctions	
Edge	Subtype	Junction	Subtype	Min	Max	Min	Max
This Geometric Network Does Not Contain Any Edge->Junction Connectivity Rules							

ObjectClass Information

wAnode (Simple Feature) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
AssetID	Integer	0	0	4		
BasinID	String	0	0	8		D_Basin
Owner	String	0	0	8		D_Owner
Status	String	0	0	8		D_Status
Location_Desc	String	0	0	255		
Elevation	Double	0	0	8		
AnodeCount	Small Integer	0	0	2		
Material	String	0	0	8		D_JunctionMaterial
Weight	String	0	0	20		

WaterType	String	0	0	8		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wCasing (Simple Feature) (Polygon)

Subtype: Casement (SUBTYPE = 0) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SubType	Integer	0	0	4		
AssetId	Integer	0	0	4		
BasinID	String	0	0	4		D_Basin
Owner	String	0	0	8	GWA	D_Owner
Status	String	0	0	8	ACT	D_Status
Location_Desc	String	0	0	255		
Elevation	Double	0	0	8		
Diameter	String	0	0	50		
Material	String	0	0	8		D_WaterLineMaterial
WaterType	String	0	0	8	POT	D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: ConduitBridge (SUBTYPE = 1)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SubType	Integer	0	0	4		
AssetId	Integer	0	0	4		
BasinID	String	0	0	4		D_Basin
Owner	String	0	0	8	GWA	D_Owner
Status	String	0	0	8	ACT	D_Status
Location_Desc	String	0	0	255		
Elevation	Double	0	0	8		
Diameter	String	0	0	50		
Material	String	0	0	8		D_WaterLineMaterial
WaterType	String	0	0	8	POT	D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: ProtectiveTunnel (SUBTYPE = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SubType	Integer	0	0	4		
AssetId	Integer	0	0	4		
BasinID	String	0	0	4		D_Basin
Owner	String	0	0	8	GWA	D_Owner
Status	String	0	0	8	ACT	D_Status
Location_Desc	String	0	0	255		
Elevation	Double	0	0	8		
Diameter	String	0	0	50		
Material	String	0	0	8		D_WaterLineMaterial
WaterType	String	0	0	8	POT	D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DateInstalled	Date	0	0	8		

DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: AccesssTunnel (SUBTYPE = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SubType	Integer	0	0	4		
AssetId	Integer	0	0	4		
BasinID	String	0	0	4		D_Basin
Owner	String	0	0	8	GWA	D_Owner
Status	String	0	0	8	ACT	D_Status
Location_Desc	String	0	0	255		
Elevation	Double	0	0	8		
Diameter	String	0	0	50		
Material	String	0	0	8		D_WaterLineMaterial
WaterType	String	0	0	8	POT	D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wReservoirs (Simple Feature) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
ENTITY	String	0	0	14		
LAYER	String	0	0	32		
ELEVATION	Double	0	0	8		
THICKNESS	Double	0	0	8		
COLOR	Integer	0	0	4		

wScadaSensor (Simple Feature) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8		D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8		D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
CURRENTVALUE	String	0	0	20		
SCADAID	String	0	0	20		
MEASUREMENTTYPE	String	0	0	20		D_ScadaSensorType
WATERTYPE	String	0	0	8		D_WaterType
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

wThrustProtection (Simple Feature) (Polygon)

Subtype: Anchor (SUBTYPE = 0) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner

BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: Blocking (SUBTYPE = 1)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: Deadman (SUBTYPE = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: Kicker (SUBTYPE = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

wUndergroundEnclosure (Simple Feature) (Polygon)

Subtype: MeterBox (SUBTYPE = 0) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8		D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8		D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
COVERMATERIAL	String	0	0	8		D_FrameCoverMaterial
COVERTYPE	String	0	0	50		D_AccessType
DEPTH	Integer	0	0	4		
FRAMEMATERIAL	String	0	0	20		D_FrameCoverMaterial
FRAMETYPE	String	0	0	8		
INVERTELEVATION	Integer	0	0	4		
MEASUREMENT1	Small Integer	0	0	2		
MEASUREMENT2	Small Integer	0	0	2		
WATERTYPE	String	0	0	8		D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: ValveVault (SUBTYPE = 1)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8		D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8		D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
COVERMATERIAL	String	0	0	8		D_FrameCoverMaterial
COVERTYPE	String	0	0	50		D_AccessType
DEPTH	Integer	0	0	4		
FRAMEMATERIAL	String	0	0	20		D_FrameCoverMaterial
FRAMETYPE	String	0	0	8		
INVERTELEVATION	Integer	0	0	4		
MEASUREMENT1	Small Integer	0	0	2		
MEASUREMENT2	Small Integer	0	0	2		
WATERTYPE	String	0	0	8		D_WaterType
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: Vault (SUBTYPE = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8		D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8		D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		

COVERMATERIAL	String	0	0	8	D_FrameCoverMaterial
COVERTYPE	String	0	0	50	D_AccessType
DEPTH	Integer	0	0	4	
FRAMEMATERIAL	String	0	0	20	D_FrameCoverMaterial
FRAMETYPE	String	0	0	8	
INVERTELEVATION	Integer	0	0	4	
MEASUREMENT1	Small Integer	0	0	2	
MEASUREMENT2	Small Integer	0	0	2	
WATERTYPE	String	0	0	8	D_WaterType
SHAPE_Length	Double	0	0	8	
SHAPE_Area	Double	0	0	8	
DATEINSTALLED	Date	0	0	8	
DATEDIGITIZED	Date	0	0	8	
DATEMODIFIED	Date	0	0	8	

wWaterStructure (Simple Feature) (Polygon)

Subtype: EnclosedStorageFacility (SUBTYPE = 0) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
OPERATIONDATE	Date	0	0	8		
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: ProductionWell (SUBTYPE = 1)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
OPERATIONDATE	Date	0	0	8		
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: PumpStation (SUBTYPE = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status

LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
OPERATIONDATE	Date	0	0	8		
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: StorageBasin (SUBTYPE = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
OPERATIONDATE	Date	0	0	8		
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

Subtype: TreatmentPlant (SUBTYPE = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
SUBTYPE	Small Integer	0	0	2		
ASSETID	Integer	0	0	4		
OWNER	String	0	0	8	GWA	D_Owner
BASINID	String	0	0	8		D_Basin
STATUS	String	0	0	8	ACT	D_Status
LOCATION_DESC	String	0	0	255		
ELEVATION	Double	0	0	8		
WATERTYPE	String	0	0	8		D_WaterType
OPERATIONDATE	Date	0	0	8		
SHAPE_Length	Double	0	0	8		
SHAPE_Area	Double	0	0	8		
DATEINSTALLED	Date	0	0	8		
DATEDIGITIZED	Date	0	0	8		
DATEMODIFIED	Date	0	0	8		

WaterNetwork_Junctions (Simple Junction) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
SHAPE	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain

wClearWell (Simple Junction) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain

SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
BasinID	String	0	0	200		
Owner	String	0	0	4		D_Owner
Status	String	0	0	204		
LocationDescription	String	0	0	200		
Elevation	Double	0	0	8		
Capacity	String	0	0	20		
Depth	Integer	0	0	4		
OperatingMax	String	0	0	10		
OperatingMin	String	0	0	10		
StationID	String	0	0	20		
Diameter1	Integer	0	0	4		D_AccessDiam
Diameter2	Integer	0	0	4		D_AccessDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wControlValve (Simple Junction) (Point)

Subtype: AirGap (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: AirControl (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: CVAirRelease (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		

Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: AtmosphericVacuum (Subtype = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Altitude (Subtype = 5)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: BackflowControl (Subtype = 6)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		

Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: CVCombination (Subtype = 7)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: DoubleCheck (Subtype = 8)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: PressureVacuum (Subtype = 9)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		

Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: ReducedPressureBackflow (Subtype = 10)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: RPZ (Subtype = 11)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: SimpleCheck (Subtype = 12)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		

DateModified	Date	0	0	8		

Subtype: Vacuum (Subtype = 13)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: VacuumBreaker (Subtype = 14)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: VacuumRelease (Subtype = 15)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Unknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		

Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wFitting (Simple Junction) (Point)

Subtype: Bend (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Cap (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam

Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Cross (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Coupling (Subtype = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: ExpansionJoint (Subtype = 5)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin

Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Offset (Subtype = 6)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Reducer (Subtype = 7)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Riser (Subtype = 8)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Saddle (Subtype = 9)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Sleeve (Subtype = 10)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		

JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Tap (Subtype = 11)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Tee (Subtype = 12)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Weld (Subtype = 13)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		

AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Wye (Subtype = 14)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam
Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Unknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
SubType	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
JointType	String	0	0	20	Flange	D_JointType
Material	String	0	0	20	PVC	D_JunctionMaterial
WaterType	String	0	0	50	POT	D_WaterType
Diameter1	Small Integer	0	0	2		D_MainDistDiam

Diameter2	Small Integer	0	0	2		D_MainDistDiam
Diameter3	Small Integer	0	0	2		D_MainDistDiam
Diameter4	Small Integer	0	0	2		D_MainDistDiam
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wGravityMain (Complex Edge) (Polyline)

Subtype: Carrier (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
BarrelCount	Integer	0	0	4		
UpstreamInvert	Double	0	0	8		
DownstreamInvert	Double	0	0	8		
Slope	Double	0	0	8		
Measurement1	Small Integer	0	0	2	12	D_MainDistDiam
Measurement2	Small Integer	0	0	2	12	D_MainDistDiam
NominalDiameter	Small Integer	0	0	2	12	D_MainDistDiam
FrictionFactor	Double	0	0	8		
CrossSectionShape	String	0	0	20		D_GravityMainShapes
WaterType	String	0	0	20		
Shape_Length	Double	0	0	8		
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: InlineStorage (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
BarrelCount	Integer	0	0	4		
UpstreamInvert	Double	0	0	8		
DownstreamInvert	Double	0	0	8		
Slope	Double	0	0	8		
Measurement1	Small Integer	0	0	2	12	D_MainDistDiam
Measurement2	Small Integer	0	0	2	12	D_MainDistDiam

NominalDiameter	Small Integer	0	0	2	12	D_MainDistDiam
FrictionFactor	Double	0	0	8		
CrossSectionShape	String	0	0	20		D_GravityMainShapes
WaterType	String	0	0	20		
Shape_Length	Double	0	0	8		
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: TransportPipe (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
BarrelCount	Integer	0	0	4		
UpstreamInvert	Double	0	0	8		
DownstreamInvert	Double	0	0	8		
Slope	Double	0	0	8		
Measurement1	Small Integer	0	0	2	12	D_MainDistDiam
Measurement2	Small Integer	0	0	2	12	D_MainDistDiam
NominalDiameter	Small Integer	0	0	2	12	D_MainDistDiam
FrictionFactor	Double	0	0	8		
CrossSectionShape	String	0	0	20		D_GravityMainShapes
WaterType	String	0	0	20		
Shape_Length	Double	0	0	8		
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Unknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
BarrelCount	Integer	0	0	4		
UpstreamInvert	Double	0	0	8		
DownstreamInvert	Double	0	0	8		
Slope	Double	0	0	8		
Measurement1	Small Integer	0	0	2	12	D_MainDistDiam
Measurement2	Small Integer	0	0	2	12	D_MainDistDiam

NominalDiameter	Small Integer	0	0	2	12	D_MainDistDiam
FrictionFactor	Double	0	0	8		
CrossSectionShape	String	0	0	20		D_GravityMainShapes
WaterType	String	0	0	20		D_WaterType
Shape_Length	Double	0	0	8		
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wHydrant (Simple Junction) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
MainValveType	String	0	0	20		
OutletConfiguration	String	0	0	20		
SeatDiameter	Integer	0	0	4		
BarrellDiameter	Small Integer	0	0	2	10	D_MainDistDiam
NozzleDiameter1	Small Integer	0	0	2	4	D_MainDistDiam
NozzleDiameter2	Small Integer	0	0	2	4	D_MainDistDiam
NozzleDiameter3	Small Integer	0	0	2		D_MainDistDiam
NozzleDiameter4	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wLateralLine (Complex Edge) (Polyline)

wLateralPoint (Simple Junction) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
AccountID	String	0	0	20		
CriticalCustomer	Small Integer	0	0	2	0	D_Boolean
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wManhole (Simple Junction) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
AccessDiameter	Integer	0	0	4	36	D_AccessDiam
AccessType	String	0	0	20	Cover	D_AccessType
GroundType	String	0	0	20		
HighPipeElevation	Double	0	0	8		
InteriorDrop	Small Integer	0	0	2		
InvertElevation	Double	0	0	8		
Wallmaterial	String	0	0	20		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wMeter (Simple Junction) (Point)

Subtype: Compound (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Current (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status

LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: DetectorCheck (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: MagneticOrifice (Subtype = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Pito (Subtype = 5)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin

Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Proportional (Subtype = 6)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: PositiveDisplacement (Subtype = 7)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Sonic (Subtype = 8)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner

BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Venturi (Subtype = 9)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Uknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
FlowRange	String	0	0	20		
MeasurementDate	Date	0	0	8		
Diameter	Small Integer	0	0	2		D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wNetworkStructure (Simple Junction) (Point)

Subtype: EnclosedStorageFacility (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		

Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	String	0	0	20		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	20		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Name	String	0	0	20		
OperationalDate	Date	0	0	8		
ReferenceID	String	0	0	20		
Source	String	0	0	20		
NetworkUsage	String	0	0	20		D_NetworkStructureUsage
NetworkOID	Integer	0	0	4		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: ProductionWell (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	String	0	0	20		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	20		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Name	String	0	0	20		
OperationalDate	Date	0	0	8		
ReferenceID	String	0	0	20		
Source	String	0	0	20		
NetworkUsage	String	0	0	20		D_NetworkStructureUsage
NetworkOID	Integer	0	0	4		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: PumpStation (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	String	0	0	20		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	20		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Name	String	0	0	20		
OperationalDate	Date	0	0	8		
ReferenceID	String	0	0	20		
Source	String	0	0	20		
NetworkUsage	String	0	0	20		D_NetworkStructureUsage

NetworkOID	Integer	0	0	4		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: StorageBasin (Subtype = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	String	0	0	20		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	20		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Name	String	0	0	20		
OperationalDate	Date	0	0	8		
ReferenceID	String	0	0	20		
Source	String	0	0	20		
NetworkUsage	String	0	0	20		D_NetworkStructureUsage
NetworkOID	Integer	0	0	4		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: TreatmentPlant (Subtype = 5)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	String	0	0	20		
Owner	String	0	0	200		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	20		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Name	String	0	0	20		
OperationalDate	Date	0	0	8		
ReferenceID	String	0	0	20		
Source	String	0	0	20		
NetworkUsage	String	0	0	20		D_NetworkStructureUsage
NetworkOID	Integer	0	0	4		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Unknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	String	0	0	20		
Owner	String	0	0	200		D_Owner

BasinID	String	0	0	200		D_Basin
Status	String	0	0	20		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
Name	String	0	0	20		
OperationalDate	Date	0	0	8		
ReferenceID	String	0	0	20		
Source	String	0	0	20		
NetworkUsage	String	0	0	20		D_NetworkStructureUsage
NetworkOID	Integer	0	0	4		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wPressurizedMain (Complex Edge) (Polyline)

Subtype: BlowOff (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Bypass (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		

Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: AirRelease (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: ChemicalInjection (Subtype = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		

DateModified	Date	0	0	8		

Subtype: DistributionMain (Subtype = 5)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Interconnect (Subtype = 6)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: PipeBridge (Subtype = 7)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		

Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: SamplingStation (Subtype = 8)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: TransmissionMain (Subtype = 9)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType

LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Unknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
FlowMeasurementID	String	0	0	255		
Material	String	0	0	255	PVC	D_WaterLineMaterial
ExteriorCoating	String	0	0	20		
JointType1	String	0	0	20	Flange	D_JointType
JointType2	String	0	0	20	Flange	D_JointType
LiningType	String	0	0	20		
PipeClass	String	0	0	20		
Roughness	Double	0	0	8		
Depth	Integer	0	0	4		
GroundSurfaceType	String	0	0	20		
PressureRating	String	0	0	20		
Shape_Length	Double	0	0	8		
Diameter	Small Integer	0	0	2	12	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wPump (Simple Junction) (Point)

Subtype: AxialFlow (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		

DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Centrifugal (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Jet (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Reciprocating (Subtype = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		

RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Rotary (Subtype = 5)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Screw (Subtype = 6)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Turbine (Subtype = 7)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	

AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Unknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	200		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
RatedFlow	String	0	0	20		
RatedPressure	String	0	0	20		
TotalDynamicHead	String	0	0	20		
InletDiameter	Small Integer	0	0	2	10	D_MainDistDiam
DischargeDiameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

wSamplingStation (Simple Junction) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
Shape	Geometry	0	0	0		
OBJECTID	OID	0	0	4		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
StationID	String	0	0	20		
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitied	Date	0	0	8		
DateModified	Date	0	0	8		

wSystemValve (Simple Junction) (Point)

Subtype: Ball (Subtype = 1) [Default]

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
BypassValve	Small Integer	0	0	2	0	D_Boolean
ClockwiseToClose	Small Integer	0	0	2	1	D_Boolean
CurrentlyOpen	Small Integer	0	0	2	1	D_Boolean
Motorized	Small Integer	0	0	2	0	D_Boolean
NormallyOpen	Small Integer	0	0	2	1	D_Boolean
PercentOpen	Integer	0	0	4	100	
PressureSetting	String	0	0	20		
RegulationType	String	0	0	20		D_WHSystemValveReg
TurnsToClose	Integer	0	0	4		
Diameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Butterfly (Subtype = 2)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
BypassValve	Small Integer	0	0	2	0	D_Boolean
ClockwiseToClose	Small Integer	0	0	2	1	D_Boolean
CurrentlyOpen	Small Integer	0	0	2	1	D_Boolean
Motorized	Small Integer	0	0	2	0	D_Boolean
NormallyOpen	Small Integer	0	0	2	1	D_Boolean
PercentOpen	Integer	0	0	4	100	
PressureSetting	String	0	0	20		
RegulationType	String	0	0	20		D_WHSystemValveReg
TurnsToClose	Integer	0	0	4		
Diameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Cone (Subtype = 3)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		

Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
BypassValve	Small Integer	0	0	2	0	D_Boolean
ClockwiseToClose	Small Integer	0	0	2	1	D_Boolean
CurrentlyOpen	Small Integer	0	0	2	1	D_Boolean
Motorized	Small Integer	0	0	2	0	D_Boolean
NormallyOpen	Small Integer	0	0	2	1	D_Boolean
PercentOpen	Integer	0	0	4	100	
PressureSetting	String	0	0	20		
RegulationType	String	0	0	20		D_WHSystemValveReg
TurnsToClose	Integer	0	0	4		
Diameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Gate (Subtype = 4)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
BypassValve	Small Integer	0	0	2	0	D_Boolean
ClockwiseToClose	Small Integer	0	0	2	1	D_Boolean
CurrentlyOpen	Small Integer	0	0	2	1	D_Boolean
Motorized	Small Integer	0	0	2	0	D_Boolean
NormallyOpen	Small Integer	0	0	2	1	D_Boolean
PercentOpen	Integer	0	0	4	100	
PressureSetting	String	0	0	20		
RegulationType	String	0	0	20		D_WHSystemValveReg
TurnsToClose	Integer	0	0	4		
Diameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Plug (Subtype = 5)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status

LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
BypassValve	Small Integer	0	0	2	0	D_Boolean
ClockwiseToClose	Small Integer	0	0	2	1	D_Boolean
CurrentlyOpen	Small Integer	0	0	2	1	D_Boolean
Motorized	Small Integer	0	0	2	0	D_Boolean
NormallyOpen	Small Integer	0	0	2	1	D_Boolean
PercentOpen	Integer	0	0	4	100	
PressureSetting	String	0	0	20		
RegulationType	String	0	0	20		D_WHSystemValveReg
TurnsToClose	Integer	0	0	4		
Diameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

Subtype: Unknown (Subtype = 99)

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AncillaryRole	Small Integer	0	0	2		
Enabled	Small Integer	0	0	2	1	EnabledDomain
Subtype	Integer	0	0	4	1	
AssetID	Integer	0	0	4		
Owner	String	0	0	4		D_Owner
BasinID	String	0	0	4		D_Basin
Status	String	0	0	4		D_Status
LocationDescription	String	0	0	200		
Rotation	Double	0	0	8		
Elevation	Double	0	0	8		
BypassValve	Small Integer	0	0	2	0	D_Boolean
ClockwiseToClose	Small Integer	0	0	2	1	D_Boolean
CurrentlyOpen	Small Integer	0	0	2	1	D_Boolean
Motorized	Small Integer	0	0	2	0	D_Boolean
NormallyOpen	Small Integer	0	0	2	1	D_Boolean
PercentOpen	Integer	0	0	4	100	
PressureSetting	String	0	0	20		
RegulationType	String	0	0	20		D_WHSystemValveReg
TurnsToClose	Integer	0	0	4		
Diameter	Small Integer	0	0	2	10	D_MainDistDiam
WaterType	String	0	0	255		D_WaterType
DateInstalled	Date	0	0	8		
DateDigitized	Date	0	0	8		
DateModified	Date	0	0	8		

RelationshipClass Information

The Geodatabase does not contain any Relationships.

Domain Information

D_AccessDiam

Field Type	Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
0	Minimum
72	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wClearWell	None	Diameter1

FeatureClass	wClearWell	None	Diameter2
FeatureClass	wManhole	None	AccessDiameter

D_AccessType

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
Door	Door
Grate	Grate
Hand	Hand
Lid	Lid
Cover	Manhole Cover
Oth	Other
Unk	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wManhole	None	AccessType
FeatureClass	wUndergroundEnclosure	MeterBox	COVERTYPE
FeatureClass	wUndergroundEnclosure	ValveVault	COVERTYPE
FeatureClass	wUndergroundEnclosure	Vault	COVERTYPE

D_Basin

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
Agat	

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wAnode	None	BasinID
FeatureClass	wCasing	AccesssTunnel	BasinID
FeatureClass	wCasing	Casement	BasinID
FeatureClass	wCasing	ConduitBridge	BasinID
FeatureClass	wCasing	ProtectiveTunnel	BasinID
FeatureClass	wControlValve	AirControl	BasinID
FeatureClass	wControlValve	AirGap	BasinID
FeatureClass	wControlValve	Altitude	BasinID
FeatureClass	wControlValve	AtmosphericVacuum	BasinID
FeatureClass	wControlValve	BackflowControl	BasinID
FeatureClass	wControlValve	CVAirRelease	BasinID
FeatureClass	wControlValve	CVCombination	BasinID
FeatureClass	wControlValve	DoubleCheck	BasinID
FeatureClass	wControlValve	PressureVacuum	BasinID
FeatureClass	wControlValve	ReducedPressureBackflow	BasinID
FeatureClass	wControlValve	RPZ	BasinID
FeatureClass	wControlValve	SimpleCheck	BasinID
FeatureClass	wControlValve	Unknown	BasinID
FeatureClass	wControlValve	Vacuum	BasinID
FeatureClass	wControlValve	VacuumBreaker	BasinID
FeatureClass	wControlValve	VacuumRelease	BasinID
FeatureClass	wFitting	Bend	BasinID
FeatureClass	wFitting	Cap	BasinID
FeatureClass	wFitting	Coupling	BasinID
FeatureClass	wFitting	Cross	BasinID
FeatureClass	wFitting	ExpansionJoint	BasinID
FeatureClass	wFitting	Offset	BasinID
FeatureClass	wFitting	Reducer	BasinID
FeatureClass	wFitting	Riser	BasinID
FeatureClass	wFitting	Saddle	BasinID
FeatureClass	wFitting	Sleeve	BasinID

FeatureClass	wFitting	Tap	BasinID
FeatureClass	wFitting	Tee	BasinID
FeatureClass	wFitting	Unknown	BasinID
FeatureClass	wFitting	Weld	BasinID
FeatureClass	wFitting	Wye	BasinID
FeatureClass	wGravityMain	Carrier	BasinID
FeatureClass	wGravityMain	InlineStorage	BasinID
FeatureClass	wGravityMain	TransportPipe	BasinID
FeatureClass	wGravityMain	Unknown	BasinID
FeatureClass	wHydrant	None	BasinID
FeatureClass	wLateralPoint	None	BasinID
FeatureClass	wManhole	None	BasinID
FeatureClass	wMeter	Compound	BasinID
FeatureClass	wMeter	Current	BasinID
FeatureClass	wMeter	DetectorCheck	BasinID
FeatureClass	wMeter	MagneticOrifice	BasinID
FeatureClass	wMeter	Pito	BasinID
FeatureClass	wMeter	PositiveDisplacement	BasinID
FeatureClass	wMeter	Proportional	BasinID
FeatureClass	wMeter	Sonic	BasinID
FeatureClass	wMeter	Uknown	BasinID
FeatureClass	wMeter	Venturi	BasinID
FeatureClass	wNetworkStructure	EnclosedStorageFacility	BasinID
FeatureClass	wNetworkStructure	ProductionWell	BasinID
FeatureClass	wNetworkStructure	PumpStation	BasinID
FeatureClass	wNetworkStructure	StorageBasin	BasinID
FeatureClass	wNetworkStructure	TreatmentPlant	BasinID
FeatureClass	wNetworkStructure	Unknown	BasinID
FeatureClass	wPressurizedMain	AirRelease	BasinID
FeatureClass	wPressurizedMain	BlowOff	BasinID
FeatureClass	wPressurizedMain	Bypass	BasinID
FeatureClass	wPressurizedMain	ChemicalInjection	BasinID
FeatureClass	wPressurizedMain	DistributionMain	BasinID
FeatureClass	wPressurizedMain	Interconnect	BasinID
FeatureClass	wPressurizedMain	PipeBridge	BasinID
FeatureClass	wPressurizedMain	SamplingStation	BasinID
FeatureClass	wPressurizedMain	TransmissionMain	BasinID
FeatureClass	wPressurizedMain	Unknown	BasinID
FeatureClass	wPump	AxialFlow	BasinID
FeatureClass	wPump	Centrifugal	BasinID
FeatureClass	wPump	Jet	BasinID
FeatureClass	wPump	Reciprocating	BasinID
FeatureClass	wPump	Rotary	BasinID
FeatureClass	wPump	Screw	BasinID
FeatureClass	wPump	Turbine	BasinID
FeatureClass	wPump	Unknown	BasinID
FeatureClass	wSamplingStation	None	BasinID
FeatureClass	wScadaSensor	None	BASINID
FeatureClass	wSystemValve	Ball	BasinID
FeatureClass	wSystemValve	Butterfly	BasinID
FeatureClass	wSystemValve	Cone	BasinID
FeatureClass	wSystemValve	Gate	BasinID
FeatureClass	wSystemValve	Plug	BasinID
FeatureClass	wSystemValve	Unknown	BasinID
FeatureClass	wThrustProtection	Anchor	BASINID
FeatureClass	wThrustProtection	Blocking	BASINID
FeatureClass	wThrustProtection	Deadman	BASINID
FeatureClass	wThrustProtection	Kicker	BASINID
FeatureClass	wUndergroundEnclosure	MeterBox	BASINID
FeatureClass	wUndergroundEnclosure	ValveVault	BASINID
FeatureClass	wUndergroundEnclosure	Vault	BASINID
FeatureClass	wWaterStructure	EnclosedStorageFacility	BASINID
FeatureClass	wWaterStructure	ProductionWell	BASINID
FeatureClass	wWaterStructure	PumpStation	BASINID

FeatureClass	wWaterStructure	StorageBasin	BASINID
FeatureClass	wWaterStructure	TreatmentPlant	BASINID

D_Boolean

Field Type	Small Integer	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
0	False
1	True

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wLateralPoint	None	CriticalCustomer
FeatureClass	wSystemValve	Ball	BypassValve
FeatureClass	wSystemValve	Ball	ClockwiseToClose
FeatureClass	wSystemValve	Ball	CurrentlyOpen
FeatureClass	wSystemValve	Ball	Motorized
FeatureClass	wSystemValve	Ball	NormallyOpen
FeatureClass	wSystemValve	Butterfly	BypassValve
FeatureClass	wSystemValve	Butterfly	ClockwiseToClose
FeatureClass	wSystemValve	Butterfly	CurrentlyOpen
FeatureClass	wSystemValve	Butterfly	Motorized
FeatureClass	wSystemValve	Butterfly	NormallyOpen
FeatureClass	wSystemValve	Cone	BypassValve
FeatureClass	wSystemValve	Cone	ClockwiseToClose
FeatureClass	wSystemValve	Cone	CurrentlyOpen
FeatureClass	wSystemValve	Cone	Motorized
FeatureClass	wSystemValve	Cone	NormallyOpen
FeatureClass	wSystemValve	Gate	BypassValve
FeatureClass	wSystemValve	Gate	ClockwiseToClose
FeatureClass	wSystemValve	Gate	CurrentlyOpen
FeatureClass	wSystemValve	Gate	Motorized
FeatureClass	wSystemValve	Gate	NormallyOpen
FeatureClass	wSystemValve	Plug	BypassValve
FeatureClass	wSystemValve	Plug	ClockwiseToClose
FeatureClass	wSystemValve	Plug	CurrentlyOpen
FeatureClass	wSystemValve	Plug	Motorized
FeatureClass	wSystemValve	Plug	NormallyOpen
FeatureClass	wSystemValve	Unknown	BypassValve
FeatureClass	wSystemValve	Unknown	ClockwiseToClose
FeatureClass	wSystemValve	Unknown	CurrentlyOpen
FeatureClass	wSystemValve	Unknown	Motorized
FeatureClass	wSystemValve	Unknown	NormallyOpen

D_FrameCoverMaterial

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
Street	Street
Iron	Iron
Oth	Other
Unk	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wUndergroundEnclosure	MeterBox	COVERMATERIAL
FeatureClass	wUndergroundEnclosure	MeterBox	FRAMEMATERIAL
FeatureClass	wUndergroundEnclosure	ValveVault	COVERMATERIAL
FeatureClass	wUndergroundEnclosure	ValveVault	FRAMEMATERIAL
FeatureClass	wUndergroundEnclosure	Vault	COVERMATERIAL
FeatureClass	wUndergroundEnclosure	Vault	FRAMEMATERIAL

D_GravityMainShapes

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
CIRC	Circular
HORSE	Horseshoe
OBLONG	Oblong
UNK	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wGravityMain	Carrier	CrossSectionShape
FeatureClass	wGravityMain	InlineStorage	CrossSectionShape
FeatureClass	wGravityMain	TransportPipe	CrossSectionShape
FeatureClass	wGravityMain	Unknown	CrossSectionShape

D_HydrantDeviceID

Field Type	Small Integer	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
0	Hydrant Equipment #1
1	Hydrant Equipment #2
2	Hydrant Equipment #3

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
Not Assigned			

D_JointType

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
Flange	Flange
Weld	Weld
Bond	Bond
Oth	Other
Unk	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wFitting	Bend	JointType
FeatureClass	wFitting	Cap	JointType
FeatureClass	wFitting	Coupling	JointType
FeatureClass	wFitting	Cross	JointType
FeatureClass	wFitting	ExpansionJoint	JointType
FeatureClass	wFitting	Offset	JointType
FeatureClass	wFitting	Reducer	JointType
FeatureClass	wFitting	Riser	JointType
FeatureClass	wFitting	Saddle	JointType
FeatureClass	wFitting	Sleeve	JointType
FeatureClass	wFitting	Tap	JointType
FeatureClass	wFitting	Tee	JointType
FeatureClass	wFitting	Unknown	JointType
FeatureClass	wFitting	Weld	JointType
FeatureClass	wFitting	Wye	JointType
FeatureClass	wGravityMain	Carrier	JointType1
FeatureClass	wGravityMain	Carrier	JointType2
FeatureClass	wGravityMain	InlineStorage	JointType1
FeatureClass	wGravityMain	InlineStorage	JointType2
FeatureClass	wGravityMain	TransportPipe	JointType1

FeatureClass	wGravityMain	TransportPipe	JointType2
FeatureClass	wGravityMain	Unknown	JointType1
FeatureClass	wGravityMain	Unknown	JointType2
FeatureClass	wPressurizedMain	AirRelease	JointType1
FeatureClass	wPressurizedMain	AirRelease	JointType2
FeatureClass	wPressurizedMain	BlowOff	JointType1
FeatureClass	wPressurizedMain	BlowOff	JointType2
FeatureClass	wPressurizedMain	Bypass	JointType1
FeatureClass	wPressurizedMain	Bypass	JointType2
FeatureClass	wPressurizedMain	ChemicalInjection	JointType1
FeatureClass	wPressurizedMain	ChemicalInjection	JointType2
FeatureClass	wPressurizedMain	DistributionMain	JointType1
FeatureClass	wPressurizedMain	DistributionMain	JointType2
FeatureClass	wPressurizedMain	Interconnect	JointType1
FeatureClass	wPressurizedMain	Interconnect	JointType2
FeatureClass	wPressurizedMain	PipeBridge	JointType1
FeatureClass	wPressurizedMain	PipeBridge	JointType2
FeatureClass	wPressurizedMain	SamplingStation	JointType1
FeatureClass	wPressurizedMain	SamplingStation	JointType2
FeatureClass	wPressurizedMain	TransmissionMain	JointType1
FeatureClass	wPressurizedMain	TransmissionMain	JointType2
FeatureClass	wPressurizedMain	Unknown	JointType1
FeatureClass	wPressurizedMain	Unknown	JointType2

D_JunctionMaterial

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
DI	Ductile Iron
CI	Cast Iron
PVC	Poly Vinyl Chloride
AC	Asbestos Concrete
CL	Clay
WO	Wood
OTH	Other
UNK	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wAnode	None	Material
FeatureClass	wFitting	Bend	Material
FeatureClass	wFitting	Cap	Material
FeatureClass	wFitting	Coupling	Material
FeatureClass	wFitting	Cross	Material
FeatureClass	wFitting	ExpansionJoint	Material
FeatureClass	wFitting	Offset	Material
FeatureClass	wFitting	Reducer	Material
FeatureClass	wFitting	Riser	Material
FeatureClass	wFitting	Saddle	Material
FeatureClass	wFitting	Sleeve	Material
FeatureClass	wFitting	Tap	Material
FeatureClass	wFitting	Tee	Material
FeatureClass	wFitting	Unknown	Material
FeatureClass	wFitting	Weld	Material
FeatureClass	wFitting	Wye	Material

D_LifeCycleStatus

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
ACT	Active

PRO	Proposed
ABAN	Abandoned
REM	Removed

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
Not Assigned			

D_MainDistDiam

Field Type	Small Integer	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
1	1 Inch
2	2 Inch
4	4 Inch
6	6 Inch
8	8 Inch
10	10 Inch
12	12 Inch
14	14 Inch
16	16 Inch
18	18 Inch
20	20 Inch
24	24 Inch
0	Unknown
-1	Other

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wControlValve	AirControl	Diameter
FeatureClass	wControlValve	AirGap	Diameter
FeatureClass	wControlValve	Altitude	Diameter
FeatureClass	wControlValve	AtmosphericVacuum	Diameter
FeatureClass	wControlValve	BackflowControl	Diameter
FeatureClass	wControlValve	CVAirRelease	Diameter
FeatureClass	wControlValve	CVCombination	Diameter
FeatureClass	wControlValve	DoubleCheck	Diameter
FeatureClass	wControlValve	PressureVacuum	Diameter
FeatureClass	wControlValve	ReducedPressureBackflow	Diameter
FeatureClass	wControlValve	RPZ	Diameter
FeatureClass	wControlValve	SimpleCheck	Diameter
FeatureClass	wControlValve	Unknown	Diameter
FeatureClass	wControlValve	Vacuum	Diameter
FeatureClass	wControlValve	VacuumBreaker	Diameter
FeatureClass	wControlValve	VacuumRelease	Diameter
FeatureClass	wFitting	Bend	Diameter1
FeatureClass	wFitting	Bend	Diameter2
FeatureClass	wFitting	Bend	Diameter3
FeatureClass	wFitting	Bend	Diameter4
FeatureClass	wFitting	Cap	Diameter1
FeatureClass	wFitting	Cap	Diameter2
FeatureClass	wFitting	Cap	Diameter3
FeatureClass	wFitting	Cap	Diameter4
FeatureClass	wFitting	Coupling	Diameter1
FeatureClass	wFitting	Coupling	Diameter2
FeatureClass	wFitting	Coupling	Diameter3
FeatureClass	wFitting	Coupling	Diameter4
FeatureClass	wFitting	Cross	Diameter1
FeatureClass	wFitting	Cross	Diameter2
FeatureClass	wFitting	Cross	Diameter3
FeatureClass	wFitting	Cross	Diameter4
FeatureClass	wFitting	ExpansionJoint	Diameter1
FeatureClass	wFitting	ExpansionJoint	Diameter2

FeatureClass	wFitting	ExpansionJoint	Diameter3
FeatureClass	wFitting	ExpansionJoint	Diameter4
FeatureClass	wFitting	Offset	Diameter1
FeatureClass	wFitting	Offset	Diameter2
FeatureClass	wFitting	Offset	Diameter3
FeatureClass	wFitting	Offset	Diameter4
FeatureClass	wFitting	Reducer	Diameter1
FeatureClass	wFitting	Reducer	Diameter2
FeatureClass	wFitting	Reducer	Diameter3
FeatureClass	wFitting	Reducer	Diameter4
FeatureClass	wFitting	Riser	Diameter1
FeatureClass	wFitting	Riser	Diameter2
FeatureClass	wFitting	Riser	Diameter3
FeatureClass	wFitting	Riser	Diameter4
FeatureClass	wFitting	Saddle	Diameter1
FeatureClass	wFitting	Saddle	Diameter2
FeatureClass	wFitting	Saddle	Diameter3
FeatureClass	wFitting	Saddle	Diameter4
FeatureClass	wFitting	Sleeve	Diameter1
FeatureClass	wFitting	Sleeve	Diameter2
FeatureClass	wFitting	Sleeve	Diameter3
FeatureClass	wFitting	Sleeve	Diameter4
FeatureClass	wFitting	Tap	Diameter1
FeatureClass	wFitting	Tap	Diameter2
FeatureClass	wFitting	Tap	Diameter3
FeatureClass	wFitting	Tap	Diameter4
FeatureClass	wFitting	Tee	Diameter1
FeatureClass	wFitting	Tee	Diameter2
FeatureClass	wFitting	Tee	Diameter3
FeatureClass	wFitting	Tee	Diameter4
FeatureClass	wFitting	Unknown	Diameter1
FeatureClass	wFitting	Unknown	Diameter2
FeatureClass	wFitting	Unknown	Diameter3
FeatureClass	wFitting	Unknown	Diameter4
FeatureClass	wFitting	Weld	Diameter1
FeatureClass	wFitting	Weld	Diameter2
FeatureClass	wFitting	Weld	Diameter3
FeatureClass	wFitting	Weld	Diameter4
FeatureClass	wFitting	Wye	Diameter1
FeatureClass	wFitting	Wye	Diameter2
FeatureClass	wFitting	Wye	Diameter3
FeatureClass	wFitting	Wye	Diameter4
FeatureClass	wGravityMain	Carrier	Measurement1
FeatureClass	wGravityMain	Carrier	Measurement2
FeatureClass	wGravityMain	Carrier	NominalDiameter
FeatureClass	wGravityMain	InlineStorage	Measurement1
FeatureClass	wGravityMain	InlineStorage	Measurement2
FeatureClass	wGravityMain	InlineStorage	NominalDiameter
FeatureClass	wGravityMain	TransportPipe	Measurement1
FeatureClass	wGravityMain	TransportPipe	Measurement2
FeatureClass	wGravityMain	TransportPipe	NominalDiameter
FeatureClass	wGravityMain	Unknown	Measurement1
FeatureClass	wGravityMain	Unknown	Measurement2
FeatureClass	wGravityMain	Unknown	NominalDiameter
FeatureClass	wHydrant	None	BarrellDiameter
FeatureClass	wHydrant	None	NozzleDiameter1
FeatureClass	wHydrant	None	NozzleDiameter2
FeatureClass	wHydrant	None	NozzleDiameter3
FeatureClass	wHydrant	None	NozzleDiameter4
FeatureClass	wMeter	Compound	Diameter
FeatureClass	wMeter	Current	Diameter
FeatureClass	wMeter	DetectorCheck	Diameter
FeatureClass	wMeter	MagneticOrifice	Diameter
FeatureClass	wMeter	Pito	Diameter

FeatureClass	wMeter	PositiveDisplacement	Diameter
FeatureClass	wMeter	Proportional	Diameter
FeatureClass	wMeter	Sonic	Diameter
FeatureClass	wMeter	Uknown	Diameter
FeatureClass	wMeter	Venturi	Diameter
FeatureClass	wPressurizedMain	AirRelease	Diameter
FeatureClass	wPressurizedMain	BlowOff	Diameter
FeatureClass	wPressurizedMain	Bypass	Diameter
FeatureClass	wPressurizedMain	ChemicalInjection	Diameter
FeatureClass	wPressurizedMain	DistributionMain	Diameter
FeatureClass	wPressurizedMain	Interconnect	Diameter
FeatureClass	wPressurizedMain	PipeBridge	Diameter
FeatureClass	wPressurizedMain	SamplingStation	Diameter
FeatureClass	wPressurizedMain	TransmissionMain	Diameter
FeatureClass	wPressurizedMain	Unknown	Diameter
FeatureClass	wPump	AxialFlow	DischargeDiameter
FeatureClass	wPump	AxialFlow	InletDiameter
FeatureClass	wPump	Centrifugal	DischargeDiameter
FeatureClass	wPump	Centrifugal	InletDiameter
FeatureClass	wPump	Jet	DischargeDiameter
FeatureClass	wPump	Jet	InletDiameter
FeatureClass	wPump	Reciprocating	DischargeDiameter
FeatureClass	wPump	Reciprocating	InletDiameter
FeatureClass	wPump	Rotary	DischargeDiameter
FeatureClass	wPump	Rotary	InletDiameter
FeatureClass	wPump	Screw	DischargeDiameter
FeatureClass	wPump	Screw	InletDiameter
FeatureClass	wPump	Turbine	DischargeDiameter
FeatureClass	wPump	Turbine	InletDiameter
FeatureClass	wPump	Unknown	DischargeDiameter
FeatureClass	wPump	Unknown	InletDiameter
FeatureClass	wSystemValve	Ball	Diameter
FeatureClass	wSystemValve	Butterfly	Diameter
FeatureClass	wSystemValve	Cone	Diameter
FeatureClass	wSystemValve	Gate	Diameter
FeatureClass	wSystemValve	Plug	Diameter
FeatureClass	wSystemValve	Unknown	Diameter

D_Manufacturer

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
VEN1	Vendor 1
VEN2	Vendor 2
VEN3	Vendor 3

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
Not Assigned			

D_NetworkStructureUsage

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
RAW	Raw
POT	Potable
TRT	Treated
STR	Storm
WW	Waterwater Effluent
REC	Reclaimed

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wNetworkStructure	EnclosedStorageFacility	NetworkUsage
FeatureClass	wNetworkStructure	ProductionWell	NetworkUsage
FeatureClass	wNetworkStructure	PumpStation	NetworkUsage
FeatureClass	wNetworkStructure	StorageBasin	NetworkUsage
FeatureClass	wNetworkStructure	TreatmentPlant	NetworkUsage
FeatureClass	wNetworkStructure	Unknown	NetworkUsage

D_Owner

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
GWA	Guam Waterworks
PVT	Private
MIL	Military
UNK	Unknown

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wAnode	None	Owner
FeatureClass	wCasing	AccesssTunnel	Owner
FeatureClass	wCasing	Casement	Owner
FeatureClass	wCasing	ConduitBridge	Owner
FeatureClass	wCasing	ProtectiveTunnel	Owner
FeatureClass	wClearWell	None	Owner
FeatureClass	wControlValve	AirControl	Owner
FeatureClass	wControlValve	AirGap	Owner
FeatureClass	wControlValve	Altitude	Owner
FeatureClass	wControlValve	AtmosphericVacuum	Owner
FeatureClass	wControlValve	BackflowControl	Owner
FeatureClass	wControlValve	CVAirRelease	Owner
FeatureClass	wControlValve	CVCombination	Owner
FeatureClass	wControlValve	DoubleCheck	Owner
FeatureClass	wControlValve	PressureVacuum	Owner
FeatureClass	wControlValve	ReducedPressureBackflow	Owner
FeatureClass	wControlValve	RPZ	Owner
FeatureClass	wControlValve	SimpleCheck	Owner
FeatureClass	wControlValve	Unknown	Owner
FeatureClass	wControlValve	Vacuum	Owner
FeatureClass	wControlValve	VacuumBreaker	Owner
FeatureClass	wControlValve	VacuumRelease	Owner
FeatureClass	wFitting	Bend	Owner
FeatureClass	wFitting	Cap	Owner
FeatureClass	wFitting	Coupling	Owner
FeatureClass	wFitting	Cross	Owner
FeatureClass	wFitting	ExpansionJoint	Owner
FeatureClass	wFitting	Offset	Owner
FeatureClass	wFitting	Reducer	Owner
FeatureClass	wFitting	Riser	Owner
FeatureClass	wFitting	Saddle	Owner
FeatureClass	wFitting	Sleeve	Owner
FeatureClass	wFitting	Tap	Owner
FeatureClass	wFitting	Tee	Owner
FeatureClass	wFitting	Unknown	Owner
FeatureClass	wFitting	Weld	Owner
FeatureClass	wFitting	Wye	Owner
FeatureClass	wGravityMain	Carrier	Owner
FeatureClass	wGravityMain	InlineStorage	Owner
FeatureClass	wGravityMain	TransportPipe	Owner
FeatureClass	wGravityMain	Unknown	Owner
FeatureClass	wHydrant	None	Owner
FeatureClass	wLateralPoint	None	Owner

FeatureClass	wManhole	None	Owner
FeatureClass	wMeter	Compound	Owner
FeatureClass	wMeter	Current	Owner
FeatureClass	wMeter	DetectorCheck	Owner
FeatureClass	wMeter	MagneticOrifice	Owner
FeatureClass	wMeter	Pito	Owner
FeatureClass	wMeter	PositiveDisplacement	Owner
FeatureClass	wMeter	Proportional	Owner
FeatureClass	wMeter	Sonic	Owner
FeatureClass	wMeter	Uknown	Owner
FeatureClass	wMeter	Venturi	Owner
FeatureClass	wNetworkStructure	EnclosedStorageFacility	Owner
FeatureClass	wNetworkStructure	ProductionWell	Owner
FeatureClass	wNetworkStructure	PumpStation	Owner
FeatureClass	wNetworkStructure	StorageBasin	Owner
FeatureClass	wNetworkStructure	TreatmentPlant	Owner
FeatureClass	wNetworkStructure	Unknown	Owner
FeatureClass	wPressurizedMain	AirRelease	Owner
FeatureClass	wPressurizedMain	BlowOff	Owner
FeatureClass	wPressurizedMain	Bypass	Owner
FeatureClass	wPressurizedMain	ChemicalInjection	Owner
FeatureClass	wPressurizedMain	DistributionMain	Owner
FeatureClass	wPressurizedMain	Interconnect	Owner
FeatureClass	wPressurizedMain	PipeBridge	Owner
FeatureClass	wPressurizedMain	SamplingStation	Owner
FeatureClass	wPressurizedMain	TransmissionMain	Owner
FeatureClass	wPressurizedMain	Unknown	Owner
FeatureClass	wPump	AxialFlow	Owner
FeatureClass	wPump	Centrifugal	Owner
FeatureClass	wPump	Jet	Owner
FeatureClass	wPump	Reciprocating	Owner
FeatureClass	wPump	Rotary	Owner
FeatureClass	wPump	Screw	Owner
FeatureClass	wPump	Turbine	Owner
FeatureClass	wPump	Unknown	Owner
FeatureClass	wSamplingStation	None	Owner
FeatureClass	wScadaSensor	None	OWNER
FeatureClass	wSystemValve	Ball	Owner
FeatureClass	wSystemValve	Butterfly	Owner
FeatureClass	wSystemValve	Cone	Owner
FeatureClass	wSystemValve	Gate	Owner
FeatureClass	wSystemValve	Plug	Owner
FeatureClass	wSystemValve	Unknown	Owner
FeatureClass	wThrustProtection	Anchor	OWNER
FeatureClass	wThrustProtection	Blocking	OWNER
FeatureClass	wThrustProtection	Deadman	OWNER
FeatureClass	wThrustProtection	Kicker	OWNER
FeatureClass	wUndergroundEnclosure	MeterBox	OWNER
FeatureClass	wUndergroundEnclosure	ValveVault	OWNER
FeatureClass	wUndergroundEnclosure	Vault	OWNER
FeatureClass	wWaterStructure	EnclosedStorageFacility	OWNER
FeatureClass	wWaterStructure	ProductionWell	OWNER
FeatureClass	wWaterStructure	PumpStation	OWNER
FeatureClass	wWaterStructure	StorageBasin	OWNER
FeatureClass	wWaterStructure	TreatmentPlant	OWNER

D_PressurizedMainDiam

Field Type	Small Integer	Merge Policy	Default Value
Domain Type	Range	Split policy	Default Value

Value	Description
0	Minimum
48	Maximum

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
Not Assigned			

D_ScadaSensorType

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
AMP	Amperage
CR	Chlorine Residual
CTW	Chlorine Tank Weight
DEP	Depth
DP	Discharge Pressure
ELEV	Elevation
FLOW	Flow
PRES	Pressure
SP	Suction Pressure
TL	Tank Level
TEMP	Temperature
TURB	Turbidity
VELO	Velocity
VOLT	Voltage
WL	Well Level

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wScadaSensor	None	MEASUREMENTTYPE

D_Status

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
ACT	Active
PRO	Proposed
ABAN	Abandoned
REM	Removed

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wAnode	None	Status
FeatureClass	wCasing	AccesssTunnel	Status
FeatureClass	wCasing	Casement	Status
FeatureClass	wCasing	ConduitBridge	Status
FeatureClass	wCasing	ProtectiveTunnel	Status
FeatureClass	wControlValve	AirControl	Status
FeatureClass	wControlValve	AirGap	Status
FeatureClass	wControlValve	Altitude	Status
FeatureClass	wControlValve	AtmosphericVacuum	Status
FeatureClass	wControlValve	BackflowControl	Status
FeatureClass	wControlValve	CVAirRelease	Status
FeatureClass	wControlValve	CVCombination	Status
FeatureClass	wControlValve	DoubleCheck	Status
FeatureClass	wControlValve	PressureVacuum	Status
FeatureClass	wControlValve	ReducedPressureBackflow	Status
FeatureClass	wControlValve	RPZ	Status
FeatureClass	wControlValve	SimpleCheck	Status
FeatureClass	wControlValve	Unknown	Status
FeatureClass	wControlValve	Vacuum	Status
FeatureClass	wControlValve	VacuumBreaker	Status
FeatureClass	wControlValve	VacuumRelease	Status
FeatureClass	wFitting	Bend	Status

FeatureClass	wFitting	Cap	Status
FeatureClass	wFitting	Coupling	Status
FeatureClass	wFitting	Cross	Status
FeatureClass	wFitting	ExpansionJoint	Status
FeatureClass	wFitting	Offset	Status
FeatureClass	wFitting	Reducer	Status
FeatureClass	wFitting	Riser	Status
FeatureClass	wFitting	Saddle	Status
FeatureClass	wFitting	Sleeve	Status
FeatureClass	wFitting	Tap	Status
FeatureClass	wFitting	Tee	Status
FeatureClass	wFitting	Unknown	Status
FeatureClass	wFitting	Weld	Status
FeatureClass	wFitting	Wye	Status
FeatureClass	wGravityMain	Carrier	Status
FeatureClass	wGravityMain	InlineStorage	Status
FeatureClass	wGravityMain	TransportPipe	Status
FeatureClass	wGravityMain	Unknown	Status
FeatureClass	wHydrant	None	Status
FeatureClass	wLateralPoint	None	Status
FeatureClass	wManhole	None	Status
FeatureClass	wMeter	Compound	Status
FeatureClass	wMeter	Current	Status
FeatureClass	wMeter	DetectorCheck	Status
FeatureClass	wMeter	MagneticOrifice	Status
FeatureClass	wMeter	Pito	Status
FeatureClass	wMeter	PositiveDisplacement	Status
FeatureClass	wMeter	Proportional	Status
FeatureClass	wMeter	Sonic	Status
FeatureClass	wMeter	Uknown	Status
FeatureClass	wMeter	Venturi	Status
FeatureClass	wNetworkStructure	EnclosedStorageFacility	Status
FeatureClass	wNetworkStructure	ProductionWell	Status
FeatureClass	wNetworkStructure	PumpStation	Status
FeatureClass	wNetworkStructure	StorageBasin	Status
FeatureClass	wNetworkStructure	TreatmentPlant	Status
FeatureClass	wNetworkStructure	Unknown	Status
FeatureClass	wPressurizedMain	AirRelease	Status
FeatureClass	wPressurizedMain	BlowOff	Status
FeatureClass	wPressurizedMain	Bypass	Status
FeatureClass	wPressurizedMain	ChemicalInjection	Status
FeatureClass	wPressurizedMain	DistributionMain	Status
FeatureClass	wPressurizedMain	Interconnect	Status
FeatureClass	wPressurizedMain	PipeBridge	Status
FeatureClass	wPressurizedMain	SamplingStation	Status
FeatureClass	wPressurizedMain	TransmissionMain	Status
FeatureClass	wPressurizedMain	Unknown	Status
FeatureClass	wPump	AxialFlow	Status
FeatureClass	wPump	Centrifugal	Status
FeatureClass	wPump	Jet	Status
FeatureClass	wPump	Reciprocating	Status
FeatureClass	wPump	Rotary	Status
FeatureClass	wPump	Screw	Status
FeatureClass	wPump	Turbine	Status
FeatureClass	wPump	Unknown	Status
FeatureClass	wSamplingStation	None	Status
FeatureClass	wScadaSensor	None	STATUS
FeatureClass	wSystemValve	Ball	Status
FeatureClass	wSystemValve	Butterfly	Status
FeatureClass	wSystemValve	Cone	Status
FeatureClass	wSystemValve	Gate	Status
FeatureClass	wSystemValve	Plug	Status
FeatureClass	wSystemValve	Unknown	Status
FeatureClass	wThrustProtection	Anchor	STATUS

FeatureClass	wThrustProtection	Blocking	STATUS
FeatureClass	wThrustProtection	Deadman	STATUS
FeatureClass	wThrustProtection	Kicker	STATUS
FeatureClass	wUndergroundEnclosure	MeterBox	STATUS
FeatureClass	wUndergroundEnclosure	ValveVault	STATUS
FeatureClass	wUndergroundEnclosure	Vault	STATUS
FeatureClass	wWaterStructure	EnclosedStorageFacility	STATUS
FeatureClass	wWaterStructure	ProductionWell	STATUS
FeatureClass	wWaterStructure	PumpStation	STATUS
FeatureClass	wWaterStructure	StorageBasin	STATUS
FeatureClass	wWaterStructure	TreatmentPlant	STATUS

D_ValveDeviceID

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
0	Valve Equipment #1
1	Valve Equipment #2
2	Valve Equipment #3

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
Not Assigned			

D_WarehouseStatus

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
INS	In Service
INT	In Transit
INW	In Warehouse
RET	Retired

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
Not Assigned			

D_WaterLineMaterial

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
DI	Ductile Iron
CI	Cast Iron
PVC	Poly Vinyl Chloride
AC	Asbestos Concrete
WO	Wood
OTH	Unknown
UNK	Other

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wCasing	AccesssTunnel	Material
FeatureClass	wCasing	Casement	Material
FeatureClass	wCasing	ConduitBridge	Material
FeatureClass	wCasing	ProtectiveTunnel	Material
FeatureClass	wGravityMain	Carrier	Material
FeatureClass	wGravityMain	InlineStorage	Material
FeatureClass	wGravityMain	TransportPipe	Material
FeatureClass	wGravityMain	Unknown	Material
FeatureClass	wPressurizedMain	AirRelease	Material
FeatureClass	wPressurizedMain	BlowOff	Material

FeatureClass	wPressurizedMain	Bypass	Material
FeatureClass	wPressurizedMain	ChemicalInjection	Material
FeatureClass	wPressurizedMain	DistributionMain	Material
FeatureClass	wPressurizedMain	Interconnect	Material
FeatureClass	wPressurizedMain	PipeBridge	Material
FeatureClass	wPressurizedMain	SamplingStation	Material
FeatureClass	wPressurizedMain	TransmissionMain	Material
FeatureClass	wPressurizedMain	Unknown	Material

D_WaterType

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
TRT	Treated Water
POT	Potable Water
RAW	Raw Water
REC	Reclaimed Water
SALT	Salt Water
SEW	Sewage
STR	Storm Runoff
EFF	Wastewater Effluent

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wAnode	None	WaterType
FeatureClass	wCasing	AccesssTunnel	WaterType
FeatureClass	wCasing	Casement	WaterType
FeatureClass	wCasing	ConduitBridge	WaterType
FeatureClass	wCasing	ProtectiveTunnel	WaterType
FeatureClass	wClearWell	None	WaterType
FeatureClass	wControlValve	AirControl	WaterType
FeatureClass	wControlValve	AirGap	WaterType
FeatureClass	wControlValve	Altitude	WaterType
FeatureClass	wControlValve	AtmosphericVacuum	WaterType
FeatureClass	wControlValve	BackflowControl	WaterType
FeatureClass	wControlValve	CVAirRelease	WaterType
FeatureClass	wControlValve	CVCombination	WaterType
FeatureClass	wControlValve	DoubleCheck	WaterType
FeatureClass	wControlValve	PressureVacuum	WaterType
FeatureClass	wControlValve	ReducedPressureBackflow	WaterType
FeatureClass	wControlValve	RPZ	WaterType
FeatureClass	wControlValve	SimpleCheck	WaterType
FeatureClass	wControlValve	Unknown	WaterType
FeatureClass	wControlValve	Vacuum	WaterType
FeatureClass	wControlValve	VacuumBreaker	WaterType
FeatureClass	wControlValve	VacuumRelease	WaterType
FeatureClass	wFitting	Bend	WaterType
FeatureClass	wFitting	Cap	WaterType
FeatureClass	wFitting	Coupling	WaterType
FeatureClass	wFitting	Cross	WaterType
FeatureClass	wFitting	ExpansionJoint	WaterType
FeatureClass	wFitting	Offset	WaterType
FeatureClass	wFitting	Reducer	WaterType
FeatureClass	wFitting	Riser	WaterType
FeatureClass	wFitting	Saddle	WaterType
FeatureClass	wFitting	Sleeve	WaterType
FeatureClass	wFitting	Tap	WaterType
FeatureClass	wFitting	Tee	WaterType
FeatureClass	wFitting	Unknown	WaterType
FeatureClass	wFitting	Weld	WaterType
FeatureClass	wFitting	Wye	WaterType
FeatureClass	wGravityMain	Unknown	WaterType
FeatureClass	wHydrant	None	WaterType

FeatureClass	wLateralPoint	None	WaterType
FeatureClass	wManhole	None	WaterType
FeatureClass	wMeter	Compound	WaterType
FeatureClass	wMeter	Current	WaterType
FeatureClass	wMeter	DetectorCheck	WaterType
FeatureClass	wMeter	MagneticOrifice	WaterType
FeatureClass	wMeter	Pito	WaterType
FeatureClass	wMeter	PositiveDisplacement	WaterType
FeatureClass	wMeter	Proportional	WaterType
FeatureClass	wMeter	Sonic	WaterType
FeatureClass	wMeter	Uknown	WaterType
FeatureClass	wMeter	Venturi	WaterType
FeatureClass	wNetworkStructure	EnclosedStorageFacility	WaterType
FeatureClass	wNetworkStructure	ProductionWell	WaterType
FeatureClass	wNetworkStructure	PumpStation	WaterType
FeatureClass	wNetworkStructure	StorageBasin	WaterType
FeatureClass	wNetworkStructure	TreatmentPlant	WaterType
FeatureClass	wNetworkStructure	Unknown	WaterType
FeatureClass	wPressurizedMain	AirRelease	WaterType
FeatureClass	wPressurizedMain	BlowOff	WaterType
FeatureClass	wPressurizedMain	Bypass	WaterType
FeatureClass	wPressurizedMain	ChemicalInjection	WaterType
FeatureClass	wPressurizedMain	DistributionMain	WaterType
FeatureClass	wPressurizedMain	Interconnect	WaterType
FeatureClass	wPressurizedMain	PipeBridge	WaterType
FeatureClass	wPressurizedMain	SamplingStation	WaterType
FeatureClass	wPressurizedMain	TransmissionMain	WaterType
FeatureClass	wPressurizedMain	Unknown	WaterType
FeatureClass	wPump	AxialFlow	WaterType
FeatureClass	wPump	Centrifugal	WaterType
FeatureClass	wPump	Jet	WaterType
FeatureClass	wPump	Reciprocating	WaterType
FeatureClass	wPump	Rotary	WaterType
FeatureClass	wPump	Screw	WaterType
FeatureClass	wPump	Turbine	WaterType
FeatureClass	wPump	Unknown	WaterType
FeatureClass	wSamplingStation	None	WaterType
FeatureClass	wScadaSensor	None	WATERTYPE
FeatureClass	wSystemValve	Ball	WaterType
FeatureClass	wSystemValve	Butterfly	WaterType
FeatureClass	wSystemValve	Cone	WaterType
FeatureClass	wSystemValve	Gate	WaterType
FeatureClass	wSystemValve	Plug	WaterType
FeatureClass	wSystemValve	Unknown	WaterType
FeatureClass	wThrustProtection	Anchor	WATERTYPE
FeatureClass	wThrustProtection	Blocking	WATERTYPE
FeatureClass	wThrustProtection	Deadman	WATERTYPE
FeatureClass	wThrustProtection	Kicker	WATERTYPE
FeatureClass	wUndergroundEnclosure	MeterBox	WATERTYPE
FeatureClass	wUndergroundEnclosure	ValveVault	WATERTYPE
FeatureClass	wUndergroundEnclosure	Vault	WATERTYPE
FeatureClass	wWaterStructure	EnclosedStorageFacility	WATERTYPE
FeatureClass	wWaterStructure	ProductionWell	WATERTYPE
FeatureClass	wWaterStructure	PumpStation	WATERTYPE
FeatureClass	wWaterStructure	StorageBasin	WATERTYPE
FeatureClass	wWaterStructure	TreatmentPlant	WATERTYPE

D_WHSystemValveReg

Field Type	String	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
FLOW	Flow

PRES	Pressure

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	wSystemValve	Ball	RegulationType
FeatureClass	wSystemValve	Butterfly	RegulationType
FeatureClass	wSystemValve	Cone	RegulationType
FeatureClass	wSystemValve	Gate	RegulationType
FeatureClass	wSystemValve	Plug	RegulationType
FeatureClass	wSystemValve	Unknown	RegulationType

EnabledDomain

Field Type	Small Integer	Merge Policy	Default Value
Domain Type	Coded Value	Split policy	Default Value

Value	Description
0	False
1	True

Domain Assigned To

ObjectClass Type	ObjectClass Name	Subtype	Field
FeatureClass	WaterNetwork_Junctions	None	Enabled
FeatureClass	wClearWell	None	Enabled
FeatureClass	wControlValve	AirControl	Enabled
FeatureClass	wControlValve	AirGap	Enabled
FeatureClass	wControlValve	Altitude	Enabled
FeatureClass	wControlValve	AtmosphericVacuum	Enabled
FeatureClass	wControlValve	BackflowControl	Enabled
FeatureClass	wControlValve	CVAirRelease	Enabled
FeatureClass	wControlValve	CVCombination	Enabled
FeatureClass	wControlValve	DoubleCheck	Enabled
FeatureClass	wControlValve	PressureVacuum	Enabled
FeatureClass	wControlValve	ReducedPressureBackflow	Enabled
FeatureClass	wControlValve	RPZ	Enabled
FeatureClass	wControlValve	SimpleCheck	Enabled
FeatureClass	wControlValve	Unknown	Enabled
FeatureClass	wControlValve	Vacuum	Enabled
FeatureClass	wControlValve	VacuumBreaker	Enabled
FeatureClass	wControlValve	VacuumRelease	Enabled
FeatureClass	wFitting	Bend	Enabled
FeatureClass	wFitting	Cap	Enabled
FeatureClass	wFitting	Coupling	Enabled
FeatureClass	wFitting	Cross	Enabled
FeatureClass	wFitting	ExpansionJoint	Enabled
FeatureClass	wFitting	Offset	Enabled
FeatureClass	wFitting	Reducer	Enabled
FeatureClass	wFitting	Riser	Enabled
FeatureClass	wFitting	Saddle	Enabled
FeatureClass	wFitting	Sleeve	Enabled
FeatureClass	wFitting	Tap	Enabled
FeatureClass	wFitting	Tee	Enabled
FeatureClass	wFitting	Unknown	Enabled
FeatureClass	wFitting	Weld	Enabled
FeatureClass	wFitting	Wye	Enabled
FeatureClass	wGravityMain	Carrier	Enabled
FeatureClass	wGravityMain	InlineStorage	Enabled
FeatureClass	wGravityMain	TransportPipe	Enabled
FeatureClass	wGravityMain	Unknown	Enabled
FeatureClass	wHydrant	None	Enabled
FeatureClass	wLateralPoint	None	Enabled
FeatureClass	wManhole	None	Enabled
FeatureClass	wMeter	Compound	Enabled
FeatureClass	wMeter	Current	Enabled
FeatureClass	wMeter	DetectorCheck	Enabled

FeatureClass	wMeter	MagneticOrifice	Enabled
FeatureClass	wMeter	Pito	Enabled
FeatureClass	wMeter	PositiveDisplacement	Enabled
FeatureClass	wMeter	Proportional	Enabled
FeatureClass	wMeter	Sonic	Enabled
FeatureClass	wMeter	Uknown	Enabled
FeatureClass	wMeter	Venturi	Enabled
FeatureClass	wNetworkStructure	EnclosedStorageFacility	Enabled
FeatureClass	wNetworkStructure	ProductionWell	Enabled
FeatureClass	wNetworkStructure	PumpStation	Enabled
FeatureClass	wNetworkStructure	StorageBasin	Enabled
FeatureClass	wNetworkStructure	TreatmentPlant	Enabled
FeatureClass	wNetworkStructure	Unknown	Enabled
FeatureClass	wPressurizedMain	AirRelease	Enabled
FeatureClass	wPressurizedMain	BlowOff	Enabled
FeatureClass	wPressurizedMain	Bypass	Enabled
FeatureClass	wPressurizedMain	ChemicalInjection	Enabled
FeatureClass	wPressurizedMain	DistributionMain	Enabled
FeatureClass	wPressurizedMain	Interconnect	Enabled
FeatureClass	wPressurizedMain	PipeBridge	Enabled
FeatureClass	wPressurizedMain	SamplingStation	Enabled
FeatureClass	wPressurizedMain	TransmissionMain	Enabled
FeatureClass	wPressurizedMain	Unknown	Enabled
FeatureClass	wPump	AxialFlow	Enabled
FeatureClass	wPump	Centrifugal	Enabled
FeatureClass	wPump	Jet	Enabled
FeatureClass	wPump	Reciprocating	Enabled
FeatureClass	wPump	Rotary	Enabled
FeatureClass	wPump	Screw	Enabled
FeatureClass	wPump	Turbine	Enabled
FeatureClass	wPump	Unknown	Enabled
FeatureClass	wSamplingStation	None	Enabled
FeatureClass	wSystemValve	Ball	Enabled
FeatureClass	wSystemValve	Butterfly	Enabled
FeatureClass	wSystemValve	Cone	Enabled
FeatureClass	wSystemValve	Gate	Enabled
FeatureClass	wSystemValve	Plug	Enabled
FeatureClass	wSystemValve	Unknown	Enabled

Row/Feature Count Information

Feature Dataset	Dataset (Type)	Subtype/ Band	Count	Extent	SnapShot
Water Distribution Features	wAnode (FeatureClass)	No Subtypes	0	No Spatial Extent	
	wCasing (FeatureClass)	AccesssTunnel	0	No Spatial Extent	
		Casement	0		
		ConduitBridge	0		
		ProtectiveTunnel	0		
	wReservoirs (FeatureClass)	No Subtypes	9	Xmin 91318.2004422331 Xmax 110705.99489228 Ymin 174917.257127393 Ymax 201787.290560404	
	wScadaSensor (FeatureClass)	No Subtypes	0	No Spatial Extent	
	wThrustProtection (FeatureClass)	Anchor	0	No Spatial Extent	
		Blocking	0		
		Deadman	0		

		Kicker	0		
	wUndergroundEnclosure (FeatureClass)	MeterBox	0	No Spatial Extent	
		ValveVault	0		
		Vault	0		
	wWaterStructure (FeatureClass)	EnclosedStorageFacility	0	No Spatial Extent	
		ProductionWell	0		
		PumpStation	0		
		StorageBasin	0		
		TreatmentPlant	0		
Water Distribution Network	WaterNetwork_Junctions (FeatureClass)	No Subtypes	1600	Xmin 89644.0925366748 Xmax 400000 Ymin 172956.901285568 Ymax 690000	
	wClearWell (FeatureClass)	No Subtypes	9	Xmin 98995.6281613794 Xmax 400000 Ymin 194885.39333798 Ymax 690000	
	wControlValve (FeatureClass)	AirControl	0	Xmin 89643.6040886743 Xmax 400000 Ymin 172957.693861569 Ymax 690000	
		AirGap	0		
		Altitude	0		
		AtmosphericVacuum	0		
		BackflowControl	0		
		CVAirRelease	0		
		CVCombination	0		
		DoubleCheck	0		
		PressureVacuum	0		
		ReducedPressureBackflow	0		
		RPZ	0		
		SimpleCheck	0		
		Unknown	985		
		Vacuum	0		
		VacuumBreaker	0		
		VacuumRelease	0		
	wFitting (FeatureClass)	Bend	0	No Spatial Extent	
		Cap	0		
		Coupling	0		
		Cross	0		
		ExpansionJoint	0		
		Offset	0		
		Reducer	0		
		Riser	0		
		Saddle	0		
		Sleeve	0		
		Tap	0		
		Tee	0		
		Unknown	0		
		Weld	0		
		Wye	0		
	wGravityMain (FeatureClass)	Carrier	0	No Spatial Extent	
		InlineStorage	0		
		TransportPipe	0		
		Unknown	0		

	wHydrant (FeatureClass)	No Subtypes	249	Xmin 89662.7467446922 Xmax 400000 Ymin 175411.738535853 Ymax 690000	
	wLateralPoint (FeatureClass)	No Subtypes	0	No Spatial Extent	
	wManhole (FeatureClass)	No Subtypes	0	No Spatial Extent	
	wMeter (FeatureClass)	Compound	0	No Spatial Extent	
		Current	0		
		DetectorCheck	0		
		MagneticOrifice	0		
		Pito	0		
		PositiveDisplacement	0		
		Proportional	0		
		Sonic	0		
		Uknown	0		
		Venturi	0		
	wNetworkStructure (FeatureClass)	EnclosedStorageFacility	0	No Spatial Extent	
		ProductionWell	0		
		PumpStation	0		
		StorageBasin	0		
		TreatmentPlant	0		
		Unknown	0		
	wPressurizedMain (FeatureClass)	AirRelease	0	Xmin 89643.6040886743 Xmax 400000 Ymin 172956.901285568 Ymax 690000	
		BlowOff	2731		
		Bypass	0		
		ChemicalInjection	0		
		DistributionMain	0		
		Interconnect	0		
		PipeBridge	0		
		SamplingStation	0		
		TransmissionMain	0		
		Unknown	0		
	wPump (FeatureClass)	AxialFlow	0	Xmin 90141.9756731382 Xmax 400000 Ymin 178069.076906327 Ymax 690000	
		Centrifugal	0		
		Jet	0		
		Reciprocating	0		
		Rotary	0		
		Screw	0		
		Turbine	0		
		Unknown	4		
	wSamplingStation (FeatureClass)	No Subtypes	0	No Spatial Extent	
	wSystemValve (FeatureClass)	Ball	0	No Spatial Extent	
		Butterfly	0		
		Cone	0		
		Gate	0		
		Plug	0		
		Unknown	0		

Spatial Reference Information

Water Distribution Features (FeatureDataset)

Spatial Domain

Minimum	Maximum	Precision

	Minimum	Maximum	Precision
X	-40000	2159023.25452689	} 976.562499091
Y	-830000	1369023.25452689	
M	0	21474.83645	100000
Z	0	21474.83645	100000

Projection System

PROJCS["1993 Guam Geodetic Network"
PROJECTION["Transverse_Mercator"]
PARAMETER["False_Easting",100000.0]
PARAMETER["False_Northing",200000.0]
PARAMETER["Central_Meridian",144.75]
PARAMETER["Scale_Factor",1.0]
PARAMETER["Latitude_Of_Origin",13.5]
UNIT["Meter",1.0]]

Geographic Coordinate System

GEOGCS["GCS_North_American_1983"
DATUM["D_North_American_1983"
SPHEROID["GRS_1980",6378137.0,298.257222101]]
PRIMEM["Greenwich",0.0]
UNIT["Degree",0.0174532925199433]]

Water Distribution Network (FeatureDataset)

Spatial Domain

	Minimum	Maximum	Precision
X	-40000	2159023.25452689	} 976.562499091
Y	-830000	1369023.25452689	
M	0	21474.83645	100000
Z	0	21474.83645	100000

Projection System

PROJCS["1993 Guam Geodetic Network"
PROJECTION["Transverse_Mercator"]
PARAMETER["False_Easting",100000.0]
PARAMETER["False_Northing",200000.0]
PARAMETER["Central_Meridian",144.75]
PARAMETER["Scale_Factor",1.0]
PARAMETER["Latitude_Of_Origin",13.5]
UNIT["Meter",1.0]]

Geographic Coordinate System

GEOGCS["GCS_North_American_1983"
DATUM["D_North_American_1983"
SPHEROID["GRS_1980",6378137.0,298.257222101]]
PRIMEM["Greenwich",0.0]
UNIT["Degree",0.0174532925199433]]

Water Information Management System

WIMS Plugin

The WIMS Plug in enhances the MxEdit2 editing by allowing functions and other operations to be available at edit time or as an add-on application. The two types of components, which make up the plug in, are the 'Edit Time' and the 'Add-On' components. The Edit Time component is activated during edit time, usually unseen by the editor, and offers functions to the editor to make editing data easier and more efficient. The Add-On component offers customized applications that an editor needs to ensure data integrity and also provides tools that will help in data processing or in other areas pertaining to the geodatabase as a whole.

Installation and Setup

The WIMS plug in is installed as an MxEdit2 Plug in. The computer must already have ArcGIS software installed, the MxEdit2 extension installed and proper database access components normally loaded with ArcGIS.

Database Connection

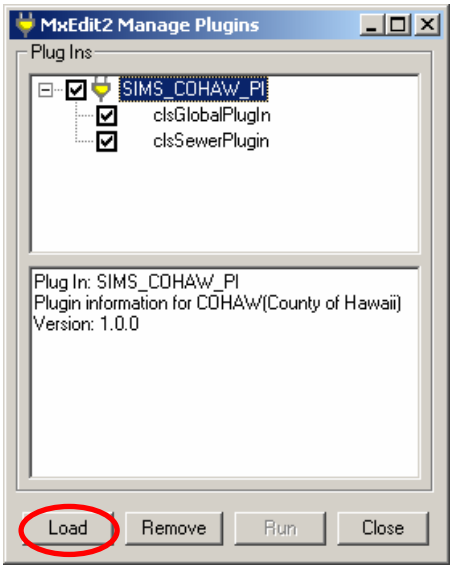
There must be a valid Personal Geodatabase designed specifically for the GWA in order to use the SIMS plug in.

Installing WIMS Plug in

If a previous version of WIMS Plug in is installed, uninstall it first (step 4). Then load the plug in through the 'MxEdit2 Manage Plug in' form by clicking the 'Load' button and locating the WIMS_COHAW_PI.ini file and choosing it. This will create a WIMS plug in folder in the MxEdit2 application folder and install all the files required to run the WIMS plug in. An entry in the MxEdit2 plug in manager will be listed. The plug in DLL will be registered in the Microsoft Registry. The following is a list of files that will be installed in the plug in directory:

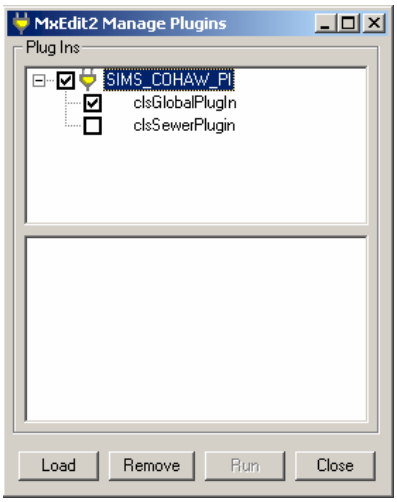
- WIMS_COHAW_PI.dll
- WIMS_COHAW_PI.ini

The plug in manager with the WIMS plug is successfully loaded if they show up under the MX-Edit Plugin Manager.



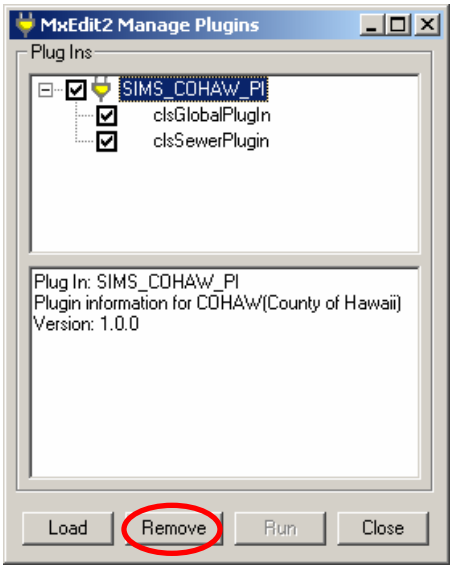
Enabling the Plug in

Within the plug in manager, the SIMS plug in components can be disabled or enabled by checking the component in the plug in tree. By disabling a plug in component, the functions of the component will not execute.



Uninstalling WIMS Plug in

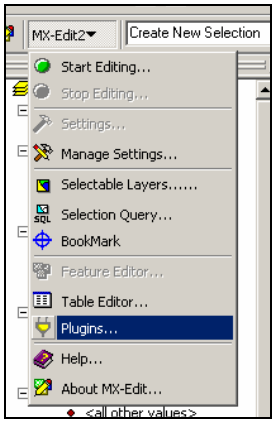
The WIMS plug in can be uninstalled selecting the plug in located in the tree and clicking the 'Remove' button on the plug in manager form. All WIMS plug in related files will be removed and not affect the common libraries and DLLs or ArcGIS files.



Using WIMS Plugin

The Edit Time component is used only with MxEdit and in an edit session in ArcMap. The geodatabase editor usually will not see the Edit Time functions take place so it is recommended to check any Edit Time functions that have taken place.

The WIMS plug in manager can be accessed through the MxEdit2 menu. This will bring up the 'MxEdit2 Manage Plugins' form. This plug in manager is also where the plug in components can be loaded or removed and enabled or disabled.



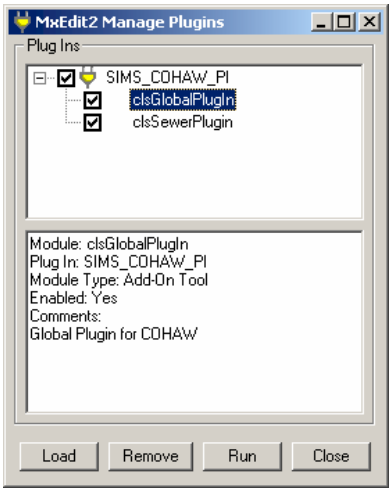
Edit Time Routines

Below is a table of Edit Time routines with it's associated feature classes, fields and descriptions.

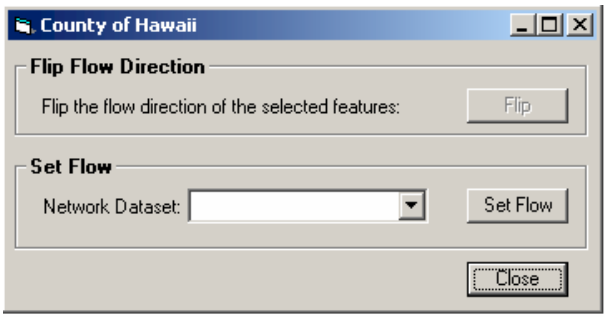
Edit Time Component: Routines			
List of routines that are executed by the SIMS plug in at edit time.			
Functions	FeatureClasss	Fields	Description
Auto AssetID	All featureclasses in the Sewers geometric network except SewerNetwork_Junctions	ASSETID	Assigns a unique Asset ID to all features throughout all featureclasses
Modified Date	All featureclasses in the Sewers geometric network except SewerNetwork_Junctions	DATEMODIFIED	Populates the DATEMODIFIED field with the current system date when any changes are made to the feature.

Add-on Applications

The Add-On applications for the SIMS plug in can be accessed by selecting the Add-On plug in located in the plug in tree and clicking the 'Run' button.



Two applications are currently included in the Add-On plug in, 'Flip Flow Direction' and 'Set Flow'. An edit session must be open to use these applications.



Flip Flow Direction

This application was developed to flip the flow direction of the linear features that were drawn in the wrong direction.

1. Open an edit session on the Water geodatabase.
2. Select all the linear features that need to flipped.
3. Click the 'Flip' button and save edits to save the new flow direction of the pipes.

Set Flow

When the flow of the Water Distribution geometric network needs to be reset for any reason, the user may need to set the flow of the geometric network. The flow of the geometric network allows tracing on then geometric network.

1. Open an edit session on the Water geodatabase.
2. Select the Water Distribution feature dataset in from the Network Dataset combo box.
3. Click the 'Set Flow' button to set the flow and save edits to save the flow of the geometric network.

Editing the Water Network

It is assumed that the basic editing functionalities are understood. Refer to the ESRI ArcGIS documentation that comes with the software for editing GIS features. This document provides the editing procedures related specifically to the Sewer GIS database designed and is not intended to replace the documentation that comes with ArcGIS software.

Although each user will probably discover tricks and techniques that work for them, often depending on the data sources, this section will address the important steps in editing the GIS sewer network database designed for the GWA.

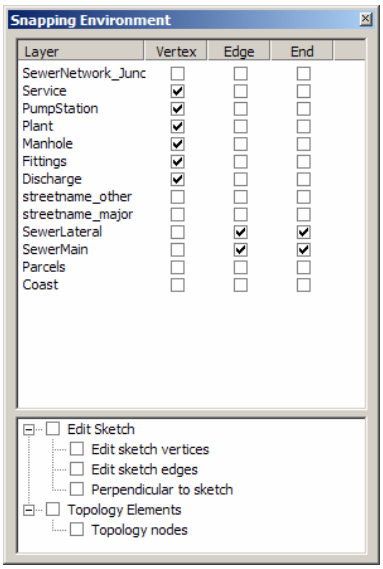
The SIMS plugin that was developed specifically for the GWA sewer database should be loaded and turned on within MX-Edit to provide automated QA/QC routines that are run as features are edited. Refer to the section "WIMS Plugin" for more information on how to use MX-Edit.

Adding New Features

New sewer feature are entered into the GIS using the standard ArcMap Editor tools. Load the editor toolbar from the ArcMap "Customize… menu item under "Tools". Users that will be editing the sewer GIS database should be very familiar with the Editor Toolbar, refer to the ESRI ArcGIS documentation for help on using the Editor Toolbar. As the graphical features are added to the GIS, the attributes will need to be entered using the MX-Edit and SIMS plug-in routines.

Feature Snapping

One of the most important steps in setting up an editing environment is the snapping of features. This will help ensure that dependant features that are associated are connected as they are entered. It is more difficult to debug disconnected features later as they discovered by the users of the data. The snapping settings are located under the standard Editor Toolbar. The snapping of associated sewer features may change depending on the task at hand. Generally the linear feature ends and edges should snap to the vertecies of the junction features. The default settings should be set as shown below:



Order of Operation

The order of operation when adding GIS sewer features will help structure how data is created in the geometric network. Following the recommended order of operation will help to ensure that GIS features are created properly with some operations automatically performed by the database. The recommended order of operation is:

Order of Operation when Digitizing			
Order	**Feature**	**Editor Action**	**Database Action**
1.	WaterStructure	Add new waterstrutures as the supply centers in the system. The network can then be digitized from these junctions.	None
2.	Pressure and Gravity Mains	Digitize pressure and gravity main feature in the direction of flow starting from the upstream point to the downstream point. Snap to existingjunctions if they already exist in the database.	None
3.	Junction Types	Add various junction types defined in the geodatabase	None
4.	LateralLines	Digitize LateralLine features in the direction of flow, letting the snapping rules jump the cursor to the connecting sewermain.	None
5.	Fittings	New fitting types are added along pipe features, snpping to edge of line.	Pipe features will be converted to a complex feature.

Geometric Connectivity Rules

The sewer geometric network design includes connectivity rules that enforce valid connections between water GIS features. This helps enforce how features are input into the GIS. Invalid connections are not allowed during the editing process. At this time no connectivity rules are defined. These can be setup as the data is used in the modeling.

The "Edge-Junction-Edge Geometric Network Connectivity Rules" table defines the valid connecitons between the pipes and the junction features in the GIS database.

Edge-Junction-Edge Geometric Network Connectivity Rules				
WaterNetwork				
From		**To**		**Via**
Edge	**Subtype**	**Edge**	**Subtype**	**Junction::Subtype**
This Geometric Network Does Not Contain Any Edge->Junction->Edge Connectivity Rules				

The "Edge-Junction Geometric Network Connectivity Rules" table defines the valid connecitons between the pipes and the junctions with the valid number of connections.

Edge-Junction Geometric Network Connectivity Rules							
WaterNetwork							
From		**To**		**No. of Edges**		**No. of Junctions**	
Edge	**Subtype**	**Junction**	**Subtype**	**Min**	**Max**	**Min**	**Max**
This Geometric Network Does Not Contain Any Edge->Junction Connectivity Rules							

Plants

Order of Operation: 1

Adding New
Treatment plants should be added first when adding a new treatment plan system. The plant junction represents the headworks or the centroid of the treatment facility. Sewermains connected to the plant junction are add next.

Moving Plants
Plants can be moved if the location is incorrect in the GIS. Sewermains are interconnected to plants and manholes so the connected sewermains will move with the plant. Refer to "Moving Sewermains" for related information.

Updating Attributes
The data attributes on the plants should be updated with the SIMS programs. This will help maintain the integrity of the data with the built in data validation routines in SIMS.

The valid Sub-Types are:

Plants	**TreatmentPlantST**
	PlantType
	Activated Sludge
	Trickling Filter, Solid Contact
	Aerated Lagoon
	Other

Connectivity Rules
Generally, plants are conencted to ends of sewermains. Refer to the Connectivity rules for detail information

4. GIS Basemap Database

The related GIS layers used for general mapping and analysis, have been organized into a GIS geodatabase. The GIS features layers used for the project should be inserted into the geodatabase for organization and asurance that the projection information is the same. The source of the data varies from different Guam Government agencies. The layers currently in the basemap geodatabase are:

- Wetlands
- Municipal
- Landmarks
- Parcels
- Guam Island
- Map Tiles used to create Map series for field inspection
- Census Tracts
- Census Blocks

Database Dictionary

The databases within the Guam_Basemap geodatabase are documented using the Geodatabase Reporter tool. Thi data dictionary should be updated with this tool as the database is changed, either from data structure or with added layers.

Geodatabase Summary				
FeatureDataset	Object Name (Alias)	Type	Geometry	Subtypes
Basemap Layers (S)	Guam_Island (Guam_Island) (C)	Simple Feature	Polygon	None
	Landmarks (Landmarks) (C)	Simple Feature	Point	None
	Municipal (Municipal) (C)	Simple Feature	Polygon	None
	Parcels (Parcels) (C)	Simple Feature	Polygon	None
	Roads (Roads) (C)	Simple Feature	Polyline	None
	Wetlands (Wetlands) (C)	Simple Feature	Polyline	None
Map Tiles (S)	Fieldmaps100_2 (Fieldmaps100_2) (C)	Simple Feature	Polygon	None
	fieldmaps100 (fieldmaps100) (C)	Simple Feature	Polygon	None
Population (S)	CenusBlockGrps_2000 (CenusBlockGrps_2000) (C)	Simple Feature	Polygon	None
	CenusTracts_2000 (CenusTracts_2000) (C)	Simple Feature	Polygon	None

ObjectClass Information

Guam_Island (Simple Feature) (Polygon)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
AREA	Double	0	0	8		
PERIMETER	Double	0	0	8		
GUAM_POLY_	Integer	0	0	4		
GUAM_POL_1	Integer	0	0	4		
centerx	Double	0	0	8		

center_y	Double	0	0	8
Shape_Length	Double	0	0	8
Shape_Area	Double	0	0	8

Landmarks (Simple Feature) (Point)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
ID	Integer	0	0	4		
CATEGORY	String	0	0	35		
DESC_	String	0	0	40		
LAND_USE	String	0	0	40		
CONTACT	String	0	0	20		
PHONE	String	0	0	14		
ADDRESS	String	0	0	16		
ADDTAG	String	0	0	16		
ADD_	String	0	0	40		

Municipal (Simple Feature) (Polygon)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
TAG	String	0	0	32		
SQ_MILES	Double	0	0	8		
Shape_Length	Double	0	0	8		
Shape_Area	Double	0	0	8		

Parcels (Simple Feature) (Polygon)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
TAG	String	0	0	32		
VILLAGE	String	0	0	20		
TRACT	String	0	0	30		
BLOCK	String	0	0	30		
LOT	String	0	0	50		
UNIT	String	0	0	30		
MUN	String	0	0	3		
TLEN	Double	0	0	8		
BLEN	Double	0	0	8		
ULEN	Double	0	0	8		
DLMTAG	String	0	0	50		
Shape_Length	Double	0	0	8		
Shape_Area	Double	0	0	8		

Roads (Simple Feature) (Polyline)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
TAG	String	0	0	32		
PRE_DIR	String	0	0	10		
PRE_TYPE	String	0	0	16		
STREETNAME	String	0	0	45		
STR_TYPE	String	0	0	12		
SUF_DIR	String	0	0	12		

LTOLFROM	String	0	0	15
CSTATUS	String	0	0	16
LFROM	Integer	0	0	4
LTO	Integer	0	0	4
RFROM	Integer	0	0	4
RTO	Integer	0	0	4
Shape_Length	Double	0	0	8

Wetlands (Simple Feature) (Polyline)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
LAYER	String	0	0	32		
COUNT_	Double	0	0	8		
MAX_COLOR	Integer	0	0	4		
Shape_Length	Double	0	0	8		

Fieldmaps100_2 (Simple Feature) (Polygon)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID_1	OID	0	0	4		
Shape	Geometry	0	0	0		
OBJECTID	Integer	0	0	4		
ID	Integer	0	0	4		
MapID	String	0	0	8		
Village	String	0	0	50		
Shape_Leng	Double	0	0	8		
Shape_Length	Double	0	0	8		
Shape_Area	Double	0	0	8		

fieldmaps100 (Simple Feature) (Polygon)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
ID	Integer	0	0	4		
MapID	String	0	0	8		
Village	String	0	0	50		
Shape_Length	Double	0	0	8		
Shape_Area	Double	0	0	8		

CenusBlockGrps_2000 (Simple Feature) (Polygon)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
GIST_ID	Integer	0	0	4		
FIPSSTCO	String	0	0	5		
TRACT	String	0	0	6		
GROUP_	String	0	0	1		
STFID	String	0	0	12		
Shape_Length	Double	0	0	8		
Shape_Area	Double	0	0	8		
RES2000	Integer	0	0	4		
RES2005	Integer	0	0	4		
RES2010	Integer	0	0	4		
RES2015	Integer	0	0	4		
RES2020	Integer	0	0	4		

RES2050	Integer	0	0	4
RES2100	Integer	0	0	4
EMP2000	Integer	0	0	4
EMP2005	Integer	0	0	4
EMP2010	Integer	0	0	4
EMP2015	Integer	0	0	4
EMP2020	Integer	0	0	4
EMP2050	Integer	0	0	4
EMP2100	Integer	0	0	4
RESGROWTH	Integer	0	0	4
EMPGROWTH	Integer	0	0	4
HOTELGROWTH	Integer	0	0	4
RESCAP	Integer	0	0	4
EMPCAP	Integer	0	0	4
HOTELCAP	Integer	0	0	4

CenusTracts_2000 (Simple Feature) (Polygon)

No Subtypes

Field Name	Field Type	Pre	Sc	Len	DV	Domain
OBJECTID	OID	0	0	4		
Shape	Geometry	0	0	0		
GIST_ID	Integer	0	0	4		
FIPSSTCO	String	0	0	5		
TRT2000	String	0	0	6		
STFID	String	0	0	11		
TRACTID	String	0	0	10		
Shape_Length	Double	0	0	8		
Shape_Area	Double	0	0	8		

Row/Feature Count Information

Feature Dataset	Dataset (Type)	Subtype/ Band	Count	Extent	SnapShot
Basemap Layers	Guam_Island (FeatureClass)	No Subtypes	43	Xmin 85712.656501079 Xmax 122390.840471238 Ymin 170580.501411863 Ymax 217084.715983174	
	Landmarks (FeatureClass)	No Subtypes	552	Xmin 87973.0085031841 Xmax 118210.474131345 Ymin 172130.085797306 Ymax 217203.088335284	
	Municipal (FeatureClass)	No Subtypes	19	Xmin 85751.1947411149 Xmax 122589.959319424 Ymin 171593.823140807 Ymax 217072.377807162	
	Parcels (FeatureClass)	No Subtypes	32500	Xmin 88303.1829674917 Xmax 120293.920917285 Ymin 170736.211876008 Ymax 217308.780495382	

	Roads (FeatureClass)	No Subtypes	5346	Xmin 88745.0993839032 Xmax 119114.846356187 Ymin 171995.509669181 Ymax 209855.380424441	
	Wetlands (FeatureClass)	No Subtypes	22	Xmin 85620.4719249932 Xmax 122527.894679366 Ymin 170061.74710738 Ymax 217308.087247382	
Map Tiles	Fieldmaps100_2 (FeatureClass)	No Subtypes	14696	Xmin 84855.6002442808 Xmax 123479.856280252 Ymin 171772.000164973 Ymax 217583.439823638	
	fieldmaps100 (FeatureClass)	No Subtypes	14696	Xmin 84855.6002442808 Xmax 123479.856280252 Ymin 171593.823140807 Ymax 217583.439823638	
Population	CenusBlockGrps_2000 (FeatureClass)	No Subtypes	203	Xmin 85736.0641171008 Xmax 122385.668247233 Ymin 170546.336675831 Ymax 217102.63393519	
	CenusTracts_2000 (FeatureClass)	No Subtypes	56	Xmin 85736.0641171008 Xmax 122385.668247233 Ymin 170546.336675831 Ymax 217102.63393519	

Spatial Reference Information

Basemap Layers (FeatureDataset)

Spatial Domain

	Minimum	Maximum	Precision
X	-40000	2159023.254528	} 976.562499090505
Y	-830000	1369023.254528	
M	0	21474.83645	100000
Z	0	21474.83645	100000

Projection System

PROJCS["1993 Guam Geodetic Network"
PROJECTION["Transverse_Mercator"]
PARAMETER["False_Easting",100000.0]
PARAMETER["False_Northing",200000.0]
PARAMETER["Central_Meridian",144.75]
PARAMETER["Scale_Factor",1.0]
PARAMETER["Latitude_Of_Origin",13.5]
UNIT["Meter",1.0]]

Geographic Coordinate System

GEOGCS["GCS_North_American_1983"
DATUM["D_North_American_1983"
SPHEROID["GRS_1980",6378137.0,298.257222101]]
PRIMEM["Greenwich",0.0]
UNIT["Degree",0.0174532925199433]]

Map Tiles (FeatureDataset)

Spatial Domain

	Minimum	Maximum	Precision
X	-40000	2159023.254528	} 976.562499090505
Y	-830000	1369023.254528	
M	0	21474.83645	100000
Z	0	21474.83645	100000

Projection System

PROJCS["1993 Guam Geodetic Network"
PROJECTION["Transverse_Mercator"]
PARAMETER["False_Easting",100000.0]
PARAMETER["False_Northing",200000.0]
PARAMETER["Central_Meridian",144.75]
PARAMETER["Scale_Factor",1.0]
PARAMETER["Latitude_Of_Origin",13.5]
UNIT["Meter",1.0]]

Geographic Coordinate System

GEOGCS["GCS_North_American_1983"
DATUM["D_North_American_1983"
SPHEROID["GRS_1980",6378137.0,298.257222101]]
PRIMEM["Greenwich",0.0]
UNIT["Degree",0.0174532925199433]]

Population (FeatureDataset)

Spatial Domain

	Minimum	Maximum	Precision
X	-40000	2159023.254528	} 976.562499090505
Y	-830000	1369023.254528	
M	0	21474.83645	100000
Z	0	21474.83645	100000

Projection System

PROJCS["1993 Guam Geodetic Network"
PROJECTION["Transverse_Mercator"]
PARAMETER["False_Easting",100000.0]
PARAMETER["False_Northing",200000.0]
PARAMETER["Central_Meridian",144.75]
PARAMETER["Scale_Factor",1.0]
PARAMETER["Latitude_Of_Origin",13.5]
UNIT["Meter",1.0]]

Geographic Coordinate System

GEOGCS["GCS_North_American_1983"
DATUM["D_North_American_1983"
SPHEROID["GRS_1980",6378137.0,298.257222101]]
PRIMEM["Greenwich",0.0]
UNIT["Degree",0.0174532925199433]]

5. Population Database

A prototype table has been designed for your reference with the field definitions that are expected for the modeling tasks. This table has been populated with the blockgroup records from the original US Census Block group data (bg66_d00). There are 204 block level records in this table.

This table can then be linked back to the Census tract and block shapefiles related by the “Tract” and “BlkGroup” fields respectively and used for spatial operations in GIS.
The wastewater and water models expect some breakdown in the types of population, residential, employment and hotel or visitor and transient population. These categories are included in this table with the base year and some target years.

Model Resolution

The GIS modeling should use the smallest resolution of data possible, since these numbers will be used to project flow or water demand in pipes. The US Census tract level data contains employment information, while the residential population exists at the smaller block group level. It is recommended that all data be processed down to the block level. In the case of employment and hotel/visitor population the distribution could be done using landuse or zoning information or aerial photos.

Employment and hotel population could be distributed to the block level based on local knowledge and resources. The Census employment population at the tract level could be used as a reference to cross check the local population numbers.

Census blocks that are clearly vacant should remain vacant unless future uses are indicated in a landuse or zoning plan or other weighting factor. As much as possible and based on information available, population must be applied to areas where the actually development exists (near the modeling pipes).

Growth Rates

The population growth rate factors should use historical data for growth trends, but consider regional geographic trends. As a whole, the Guam growth rates can be easily determined using statistical methods, but for wastewater and water modeling we need to apply growth rates geographically based on landuse, zoning or Guam government planning policies. These growth rates should be applied to the smallest possible resolution, either by some defined growth rate area, by village, by Census Tract or Census bock.

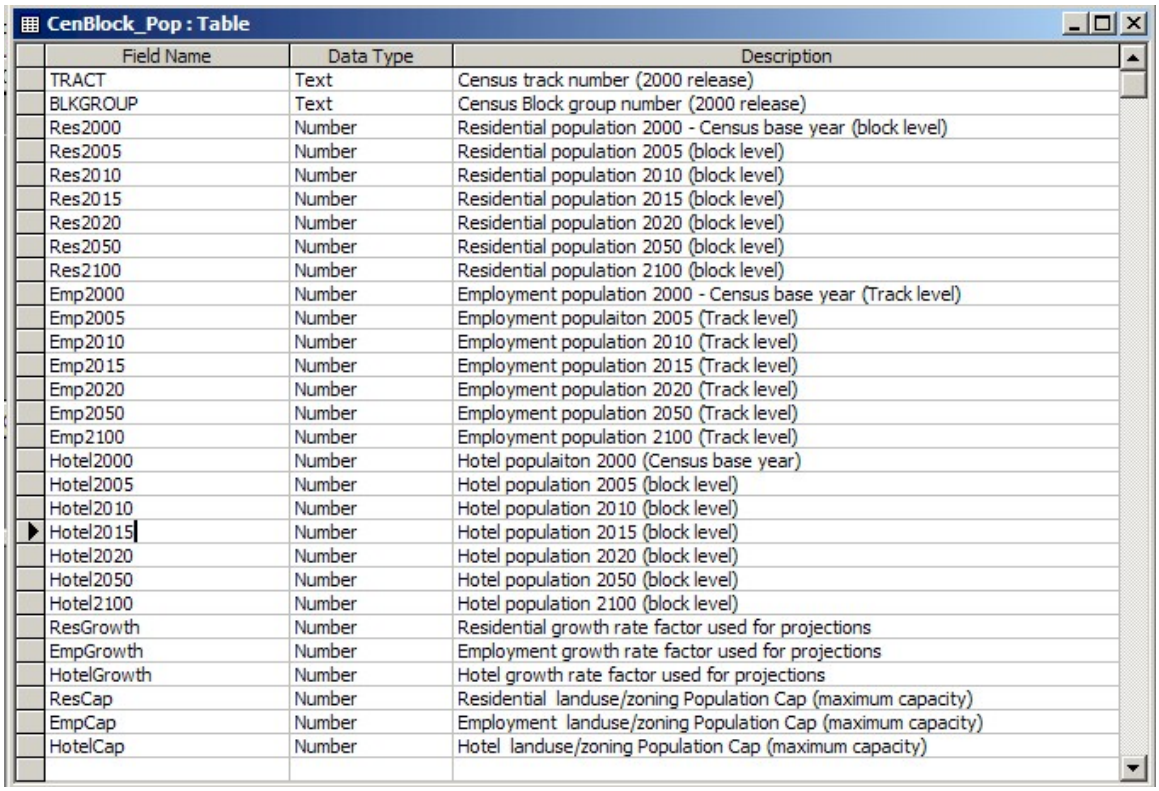
A uniform growth rate applied to the entire island is not reasonable as input for hydraulic modeling requiring a lower resolution. If growth rates are feasible at the Census block level, fields can be used in the prototype table to store this data. (e.g. resGrowth, EmpGrowth, HotelGrowth)

Maximum Capacity

The population projection should also consider the carrying capacity or target maximum capacity or density. Growth rates applied based on historical growth rates cannot continue infinitely without exceeding reasonable capacity. Based on landuse, zoning and judgment from a planning perspective, the maximum allowable capacity should be determined for each census clock. This will prevent the GIS modeling from projecting and distributing growth unrealistically. A maximum population capacity should be expressed for each of the population categories in the fields ResCap, EmpCap and HotelCap.

Database Design

A MS Access table has been designed as an example of the expected population data. Other data may be necessary. The table has been linked to the Census block group GIS shapefiles by then blkgroup field. This shapefile is used within ArcView to process the data with the spatial component. Once the data is complete the table can be imported into the basemap geodatabase and used for the GIS modeling. This table can also be exported to Excel if needed and loaded with the existing data that you have prepared.



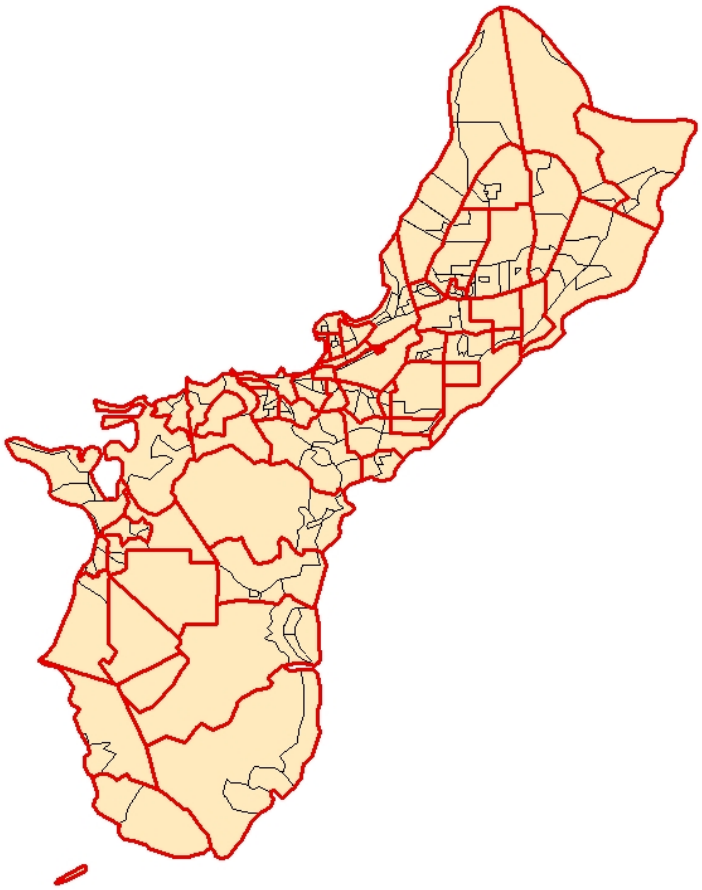
CenBlock_Pop : Table

Field Name	Data Type	Description
TRACT	Text	Census track number (2000 release)
BLKGROUP	Text	Census Block group number (2000 release)
Res2000	Number	Residential population 2000 - Census base year (block level)
Res2005	Number	Residential population 2005 (block level)
Res2010	Number	Residential population 2010 (block level)
Res2015	Number	Residential population 2015 (block level)
Res2020	Number	Residential population 2020 (block level)
Res2050	Number	Residential population 2050 (block level)
Res2100	Number	Residential population 2100 (block level)
Emp2000	Number	Employment population 2000 - Census base year (Track level)
Emp2005	Number	Employment populaiton 2005 (Track level)
Emp2010	Number	Employment population 2010 (Track level)
Emp2015	Number	Employment population 2015 (Track level)
Emp2020	Number	Employment population 2020 (Track level)
Emp2050	Number	Employment population 2050 (Track level)
Emp2100	Number	Employment population 2100 (Track level)
Hotel2000	Number	Hotel populaiton 2000 (Census base year)
Hotel2005	Number	Hotel population 2005 (block level)
Hotel2010	Number	Hotel population 2010 (block level)
Hotel2015	Number	Hotel population 2015 (block level)
Hotel2020	Number	Hotel population 2020 (block level)
Hotel2050	Number	Hotel population 2050 (block level)
Hotel2100	Number	Hotel population 2100 (block level)
ResGrowth	Number	Residential growth rate factor used for projections
EmpGrowth	Number	Employment growth rate factor used for projections
HotelGrowth	Number	Hotel growth rate factor used for projections
ResCap	Number	Residential landuse/zoning Population Cap (maximum capacity)
EmpCap	Number	Employment landuse/zoning Population Cap (maximum capacity)
HotelCap	Number	Hotel landuse/zoning Population Cap (maximum capacity)

Census Tract and Block Shapefiles

The population projection table is linked to the GIS via the Census Tract (tr66_d00 file) and the Census Blockgroup (bg66_d00 file). As seen in the map below the resolution of the tracts does not put population where development is since the entire island is covered by tracts, including open space. The blockgroup level allows the population to be distributed to developed areas or areas where wastewater and water pipes are located. Data should be distributed down to the tract level to provide a more adequate resolution to support the GIS modeling.

There are 57 Census tract areas and 204 Census block areas in the GIS shape files. The population projection table should have a one to one match.



5. Using MX-Edit

MX-Edit is an ArcGIS extension that enhances feature editing for more productive and intuitive editing of GIS data. It enhances the tools that are used most often while editing GIS data. The objective of the MX-EDIT extension is to provide an advanced and customizable interface for organizing attribute edit forms within ArcMap and to make editing GIS data more efficient. This extension can make editing GIS data both more productive and more enjoyable, because you can organize the look and feel of edit forms that match your style of editing, and your work flow.

The major benefits of the MX-Edit extension are:

1. User Customizable Edit Forms: MX-Edit allows the user to take control of the edit interface customized the layouts, ordering of fields and the overall look of the attribute edit forms. These forms are created "on-the-fly" using saved edit session settings tied to GIS datasets.

2. Improved User Interfaces: Many of the commonly used tools for feature selection and attribute editing are improved and organized for efficiency. This reduces the number of clicks of the mouse for tools that you most often use during editing.

3. Custom plugins can be developed that can be executed automatically at edit time from the database, featureclass or down to the feature attribute level.

Why Use MX-EDIT?

1. Increase Productivity

Increasing productivity results in cost savings in the GIS data collection process. Cost savings from increased productivity is sometimes less quantifiable, but it can be an absolute difference in project schedules. MX-Edit provides the user with enhanced tools to make their edit session more productive. This is done by setting up edit forms that match the work flow of the data, by organizing the form using order of field display, colors font types and all the features available with MX-Edit.

Example Scenario

Assuming 10,000 features in the data collection project and a savings of 3 seconds per feature results in over 8 hours of labor costs. It is estimated that MX-Edit can provide 1-5 seconds per feature in a typical GIS data collection process. Providing productivity tools in GIS editing makes sense.

Productivity Tools

- Customized data entry forms with "Feature Editor"
- Entry forms supported one to many related tables defined in the relationship classes
- Enhanced "Table Editor" for geodatabase tables
- More efficient "Selectable Layers" interface
- Enhanced Bookmark tool for marking editing zones
- Stored SQL procedures for recalling features needing editing
- Most common editing tools stored in common toolbar

2. Increase Quality Control

Custom data entry forms can be designed within MX-Edit to provide a more structured way of entering data. All fields use attribute domains from the database design. Controlling the attribute field order, visibility, permissions, colors can help reduce bad data. One of the most powerful features of MX-Edit is the ability to run custom plugin routines that can be executed at edit or run time down to the field level. The plugins can be developed to automatically calculate fields based on other fields, database rules or anything that can be programmed with ArcObjects. This provides the highest level of quality control for a specific database design.

Quality Control Tools

- Automatically update date fields in the database as features are added or modified
- Lock or hide fields that should not be altered
- Perform mass calculates for consistency and efficiency

MX-Edit plugins are developed in Visual Basic using ArcObject and common database components. These plugins can be developed to provide very high level editing routines and quality control processes. These are usually developed for specific database designs. Custom plugins for MX-Edit are developed by Integrated Information Solutions on contract basis. Consulting service also available to help design databases and related work flow processes.

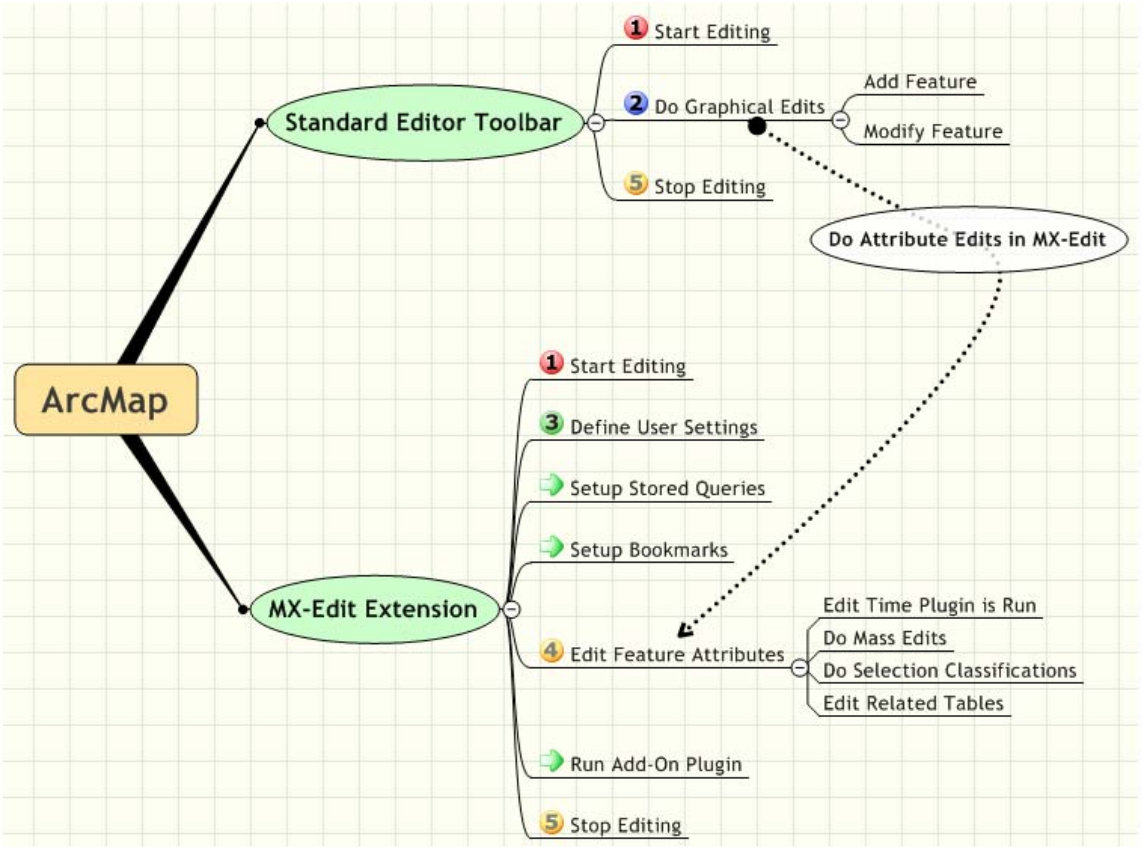
Example Plugin capabilities

- Increment unique IDs for primary keys
- Calculate and update a slope field when ever the length and elevations field values change
- Automatically update fields based on database rules or connectivity
- Run global database updates or spatial operations before saving or posting
- Run global database QA/QC checks on the data before saving or posting

Using MX-Edit

MX-Edit complements and works in conjuction with the standard Editor tools. The standard ArcMap Editor toolbar is used to do the graphical edits to features, while the enhanced tools in MX-Edit provide additional tools for doing the attribute edits. The start and stop edit processes on both the standard editor toolbar and the MX-Edit tools are integrated. Starting and stopping edits in either tool bar does the same thing.

Although attributes can be editted from either tool, using one tool for the attribute edits can help establish controls to the data, particularily if plugin routines are implemented. MX-Edit is best used with the process defined in the following diagram.



Installation and Registration

MX-Edit is installed using an Installshield installation program. After installation the MX-Edit will be made available as an ArcGIS extension. An unregistered version is a fully functioning program with, but works with a limitation of 100 databases records. Registering MX-Edit and entering a valid registration code, will remove this database size limitation. Registration is done under the "About..." menu item on the MX-Edit toolbar.

System Requirements

- Administrator rights for installation
- Windows 2000 or XP
- ArcGIS 8.3 with either ArcView or ArcInfo (version for 9.0 will be available soon)
- 2 mb disk space
- Edits Geodatabases and Shapefiles with appropriate ESRI software licenses.

Evaluation License

If MX-EDIT is not registered, it is fully functioning except on feature classes with fewer than 100 features. To enable editing on unlimited number of features, a MX-EDIT license must be purchased and valid username and registration code must be entered. Evaluation version, with the 100 record limiation will never expire.

Registering Single Use License

A single use license authorizes the use of MX-EDIT on one computer using the registered user name and registration code. Please see "How to Buy MX-Edit" for more information.

Registering a Site-License

Site licenses can be purchased, which provides a special username and registration ID which can be used to install on unlimited computers within an organization. Please see "How to Buy MX-Edit" for more information.

Upgrades

To check for the latest version of MX-EDIT visit www.iisgis.com. All minor updates are free of charge.

After purchasing a license, a registration code will be emailed to the email address provided. This registration code should be entered into the "Key Code" and the user name must match the user name provided when the license was purchased.

User Name: Enter the valid user name supplied after purchasing MX-Edit Note: must be exact, case sensitive.

Key Code: Enter the valid key code supplied after purchasing MX-Edit Note: must be exact, case sensitive.

Register: Press to register MX-Edit using the user name and key code entered

Registration: Collapses and expands the registration information

Show Credits: Displays the developer information and credits

Close: Closes the dialog

Getting Support

Support Forum

If you have a question about MX-Edit, please use the product Support Forum at www.iisgis.com/products/Support.htm. Some questions can be addressed by responses from other users. Supporting software in a support forum helps keep our software overhead down, resulting in lower costs on our products. All responses will be posted to this forum as well as by direct email to the person submitting the support question.

Feedback Forum

This product will continue to be enhanced to provide the tools that will help you be more productive. Your feedback is greatly appreciated and can be helpful to continue the support and enhancements of this product. If you have an idea, comment or question about how to make MX-Edit better, we would like to hear from you. Please use email: support@iisgis.com or visit the product Feedback forum at www.iisgis.com/products/Support.htm

Product Demos

MX-Edit demos can be viewed at www.iisgis.com/products/products.asp

Contact Us

If you need to contact us directly, please use email. This helps us keep support cost down, allowing us to offer lower costing products.

1. Product Support Forum
www.iisgis.com/products/Support.htm

2. email: support@iisgis.com

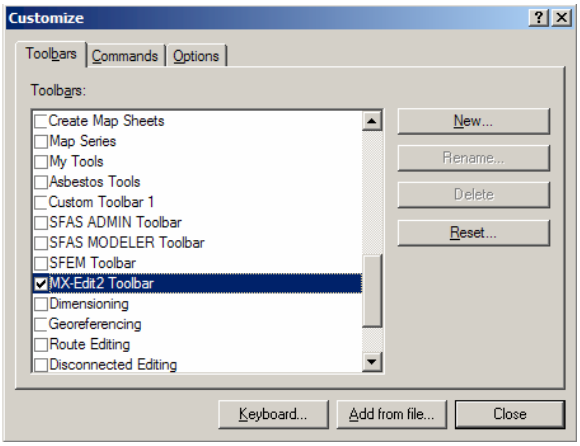
Please use template in email requests:
- ArcGIS product and version (ArcView or ArcInfo)
- MX-Edit version and installation date
- Database type
- Question or description of problem

Loading the Extension

After installing the MX-Edit software, the extension will appear in the list of extensions and toolbars in ArcMap.

Activating the MX-Edit Extension in ArcMap

The MX-EDIT extension can be loaded into ArcMap under the "Tools/Extensions..." ArcMap menu. The extension must be activated to enable the MX-EDIT toolbar, even if the toolbar is already loaded.

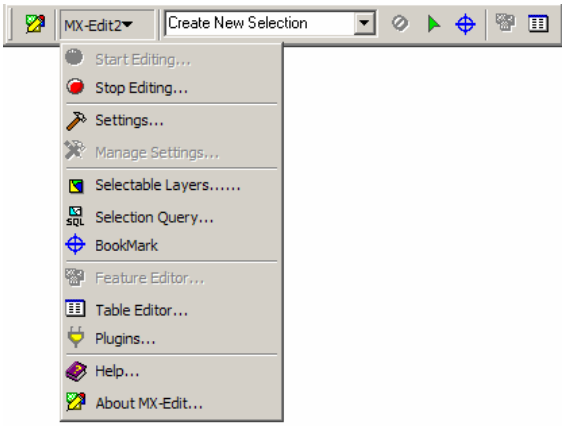


MX-Edit ToolBar

The MX-Edit extension is organized on an ArcMap toolbar. This toolbar can be loaded into ArcMap using the "Tools" and "Customize..." menu in ArcMap. The items on the toolbar are enabled if the extension is loaded. As with other toolbars in ArcMap, it can be moved and can be used as a tear-off or floating toolbar if desired.

Some capabilities, such as the selection method, selection tool and clear selection, operate the same as those that are standard in ArcMap. However, the placement and organization of these tools was considered for increased productivity.

Note: Some Menu Features are disabled until data is loaded into the project and editing has been started.



Start Editing: If data is loaded into the ArcMap document, the Start Editing menu item is enabled.

Stop Editing: If a dataset is currently being edited, then the Stop Editing menu item is enabled.

Settings: If a dataset is currently being edited and the Feature Editor is not open, the Settings menu item is enabled.

Manage Settings: Open a dialog to manage reset and clear settings for previously defined datasets. The current edit dataset cannot be reset until editing is stopped.

Selectable Layers: Opens enhanced dialog for controlling selectable layers

Selection Query: Opens enhanced dialog for defining, saving and running SQL queries.

Bookmark: Opens enhanced bookmark tool for creating, managing and zooming to saved bookmarks

Feature Editor: Opens the Attribute Editor using the current selection set

Table Editor*:* Opens the Table Editor

Plugins: Opens dialog to load, manage and turn off and on custom plugins

Help: Opens this help file

About MX-Edit: Opens dialog for more Information about MX-Edit, the developer and registration

 Loads the MX-Edit "About" dialog. Information about the product, including version and release date, registration information and a brief description of the product.

 Clears current selection of all features

 Selects features set as Selectable, same as ArcMap selection tool

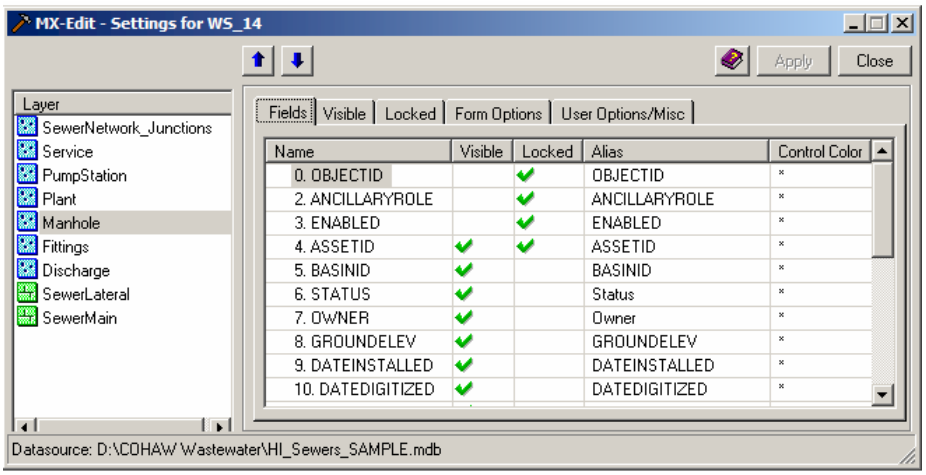
 Bookmark tool, intentionally does nothing. Required for ArcObjects programming

 Opens the Attribute Editor using the current selection set

 Opens the Table Editor

Settings Dialog

The "Settings" dialog is used to customize the layout and characteristics of the Feature Editor. These settings are saved in system files to be loaded each time that a dataset is opened for editing. The settings are saved by dataset and for each feature class. The settings can be cleared using the Manage Settings dialog or using the reset button within the Options tab of this dialog.



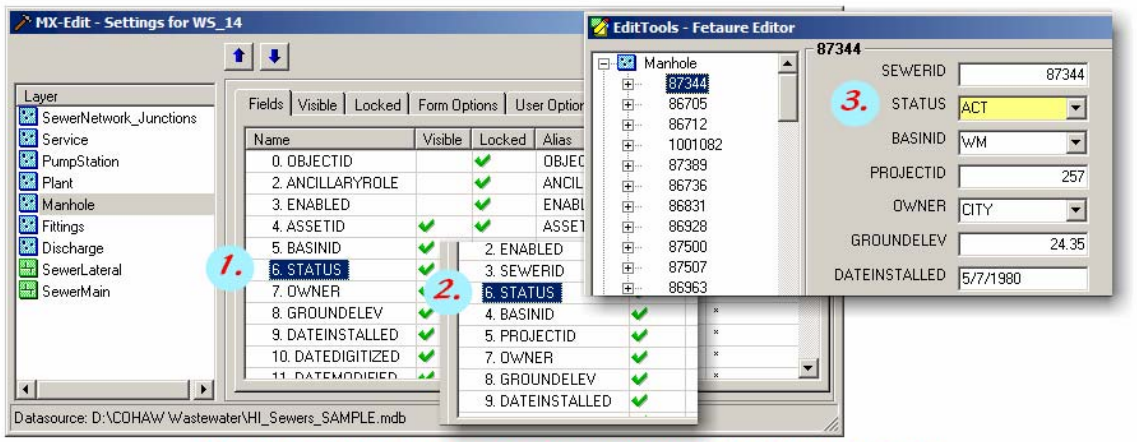
The customization options are:

- Changing Field Display Order: Moves the field up or down on the list. This defines the order of display in the "Feature Editor" tool
- Changing Field labels: Change the font color and Bold font state
- Changing Field Control Color: Change the color of each field control to emphasis and group common fields
- Changing Label Text: Change the label text displayed in the list of selected features
- Making Fields Invisible: Turn on or off fields on the 'Feature Editor" tool
- Locking Fields: Make fields read-only status on the 'Feature Editor" tool
- Changing Form Options: Change general layout option on the "Feature Editor" Tool
- Changing User Options: Change user editor name, and date stamp settings.

Field Display Order

The display order in the 'Feature Editor" for each field can be arranged within the"Settings" form. This is done using the up and down arrows. The order of the field is saved and remembered each time this feature class is edited using MX-Edit.

Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form

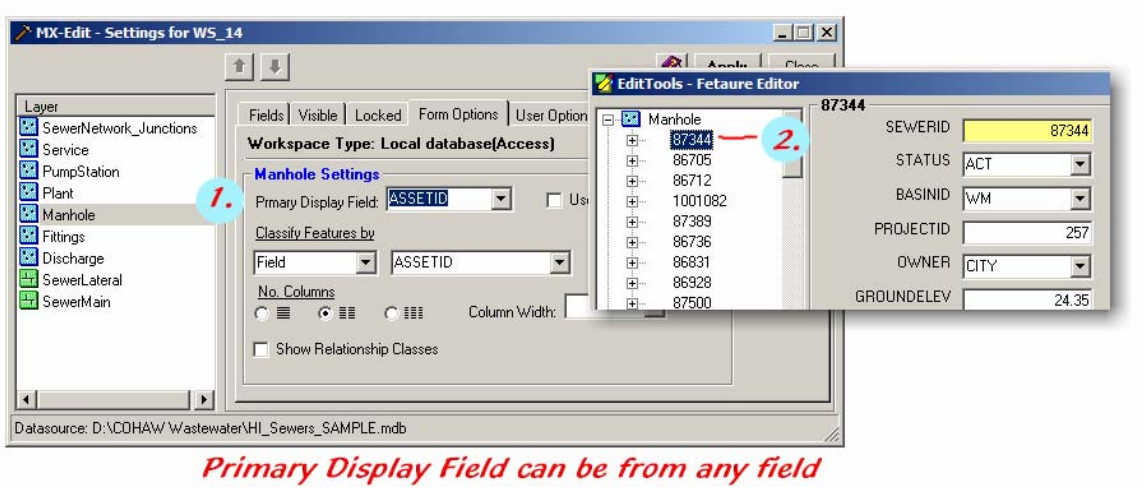


Status Moved up up to Second Position in Edit Form

Changing Field Labels

The field labels in the "Feature Editor" can be changed to read from the defined Alias name in the database or from any field in the Feature Class. This primary display field by default is the Primary display field defined in the Geodatabase, but can be changed in the 'Form Options" tab of the 'Settings" form.

Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form

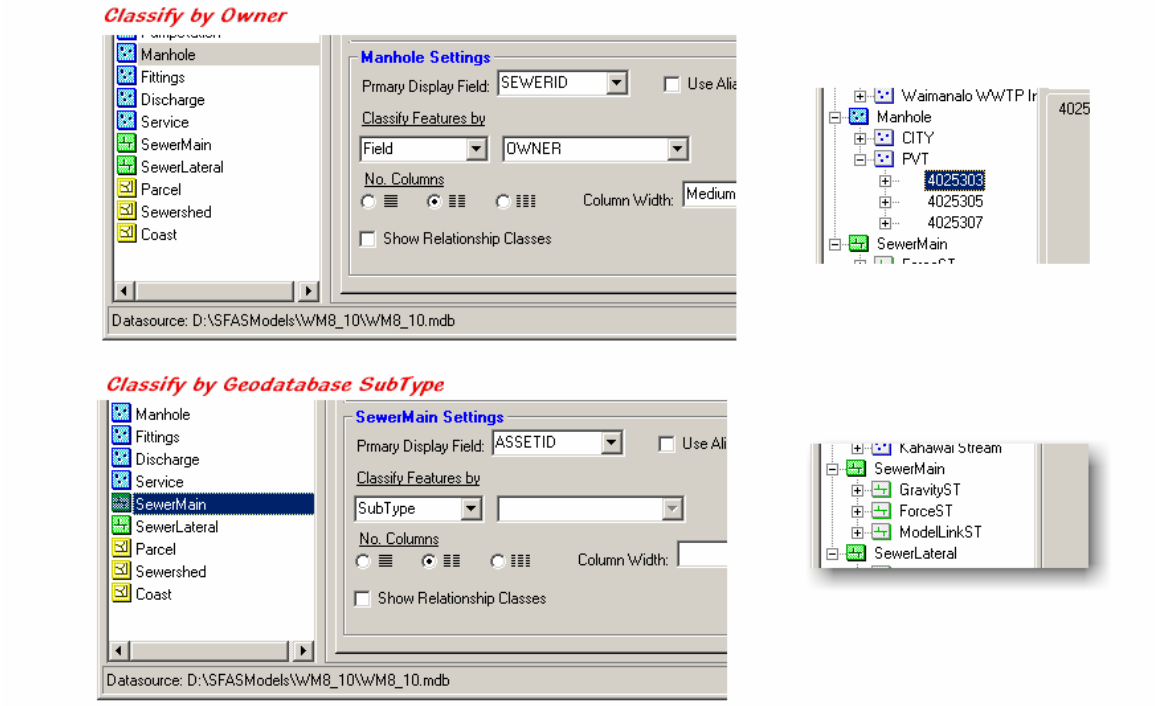


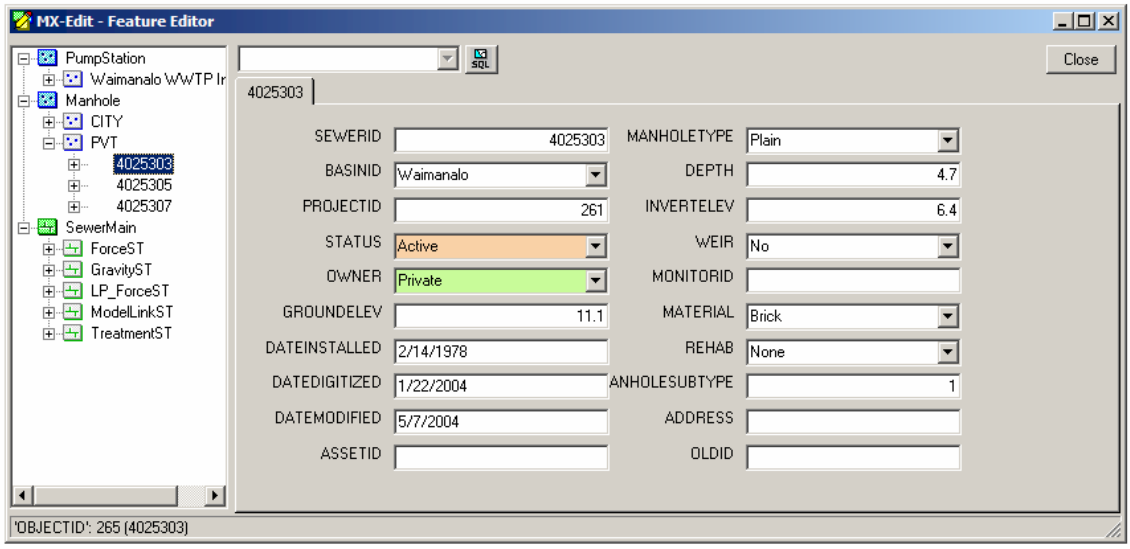
Primary Display Field can be from any field

Classify Features

The selected feature in the "Feature Editor" can be classified by either subtypes defined in a geodatabase or by an attribute field. This is useful to organize selected features requiring editing. The classified selections are particular useful when doing mass edits on multiple features. For example, when selecting features from ArcMap a field called "owner", the selected features can be sorted by the unique values such as "City", "Private", or "Military".

Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form

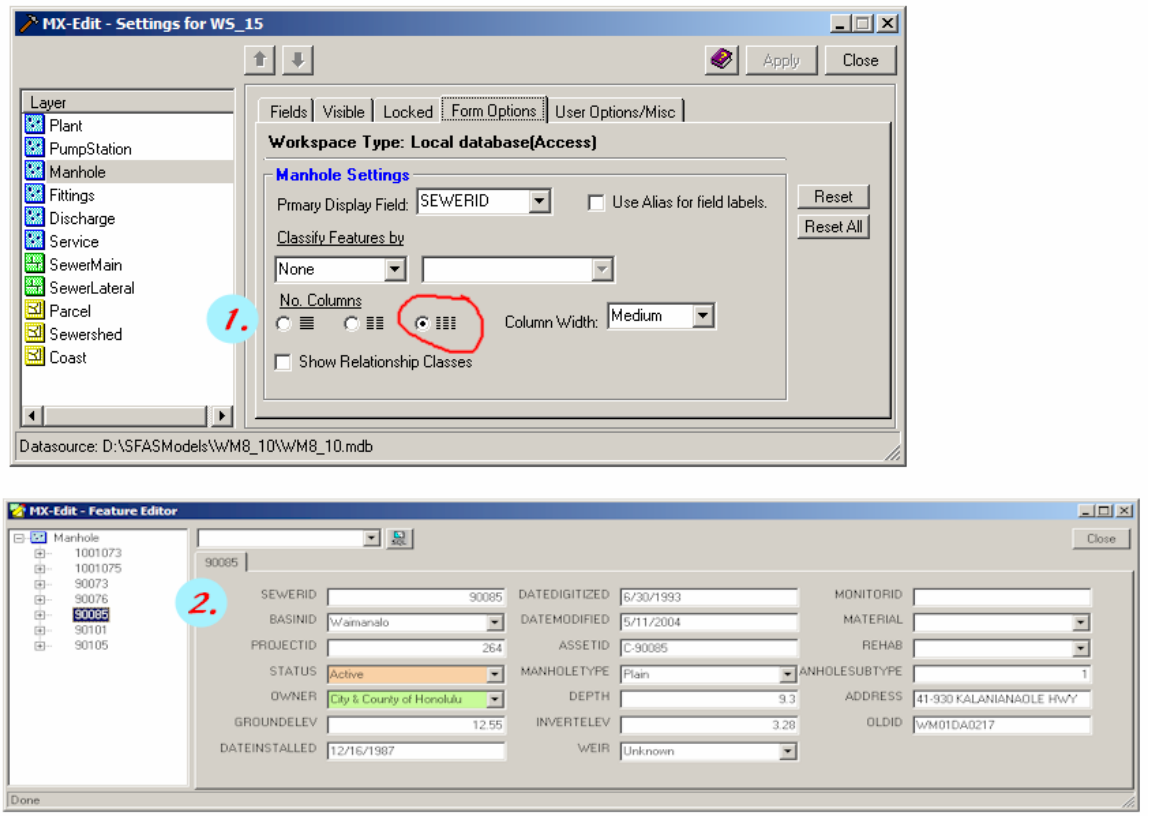




Changing Number of Columns

The fields in the 'Feature Editor" can be organized in one, two or three columns. This is useful to organize feature classes with varying number of fields.

Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form

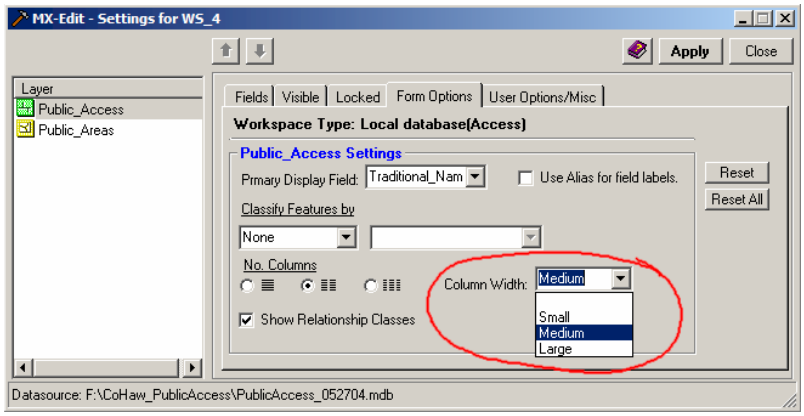


Changing Number of Columns

Changing Column Width

The attribute editor form is automatically created at run time using the definitions in the database. Each attribute data entry control is created with default and user settings. Based on the length of the field names in the database, the width of the columns can be adjusted to three settings; Small, Medium and Large. The default is medium. To change the column width, go to the Settings dialog and the Form Options tab. The columns are equal spaced based on this setting, customizable for each feature class.

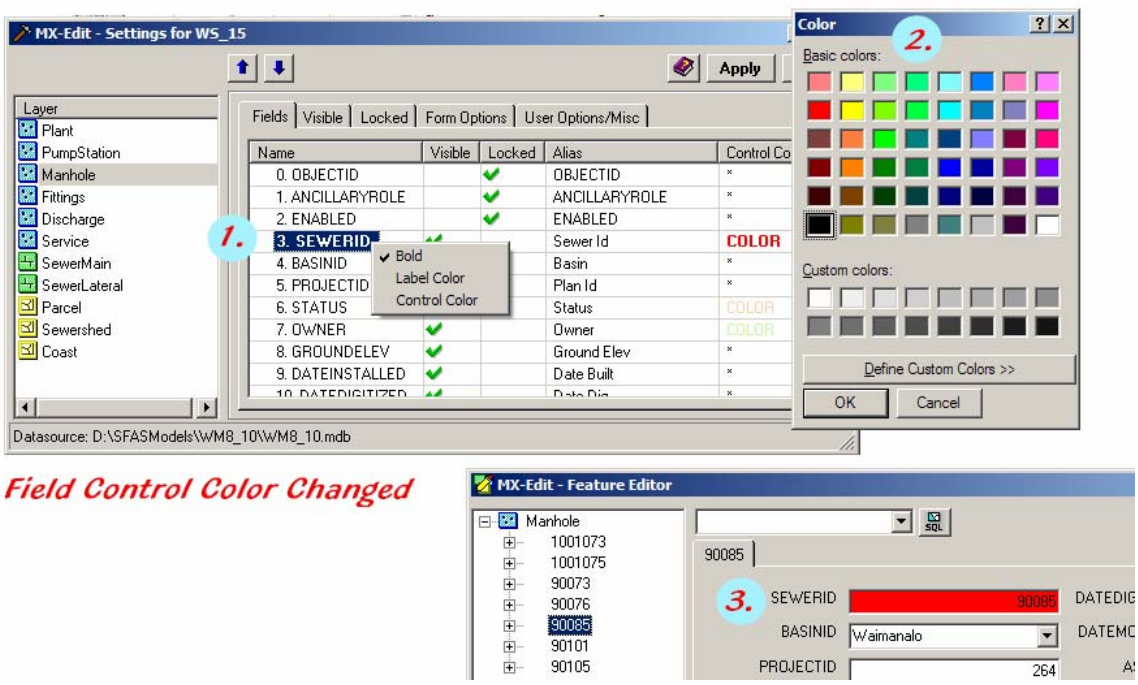
Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form



Changing Field Control Colors

The colors for each of the field controls can be changed to provide greater control of the organization and emphasis of fields. Colors can be used to group similar field types or to place emphasis on critical fields. To change the color of a field control, use the right mouse button on the field name. A context menu is displayed to change the Control Color.

Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form

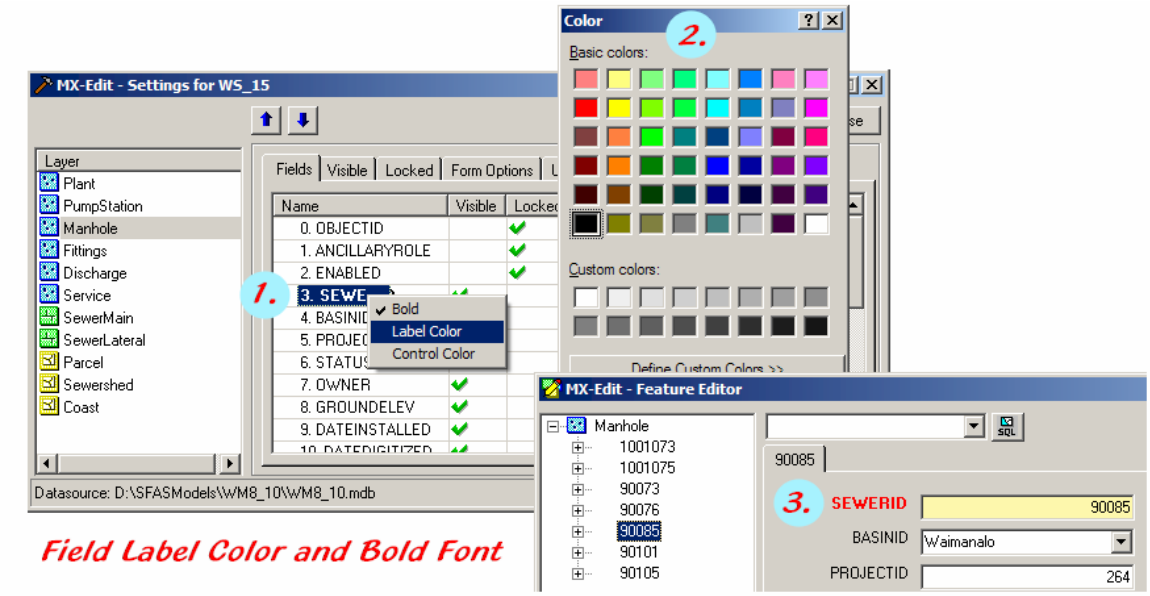


Field Control Color Changed

Changing Field Text

The field labels in the "Feature Edit" can be changed to provide better organization and emphasis on certain fields. To change the label color, use the right mouse button on the label name and select "Label Color". To change the field label font to use a bold font, do the same and check the "Bold" option. Using color and bold fonts in customizing an edit form provides greater control in organizing an edit form that is more efficient and readable.

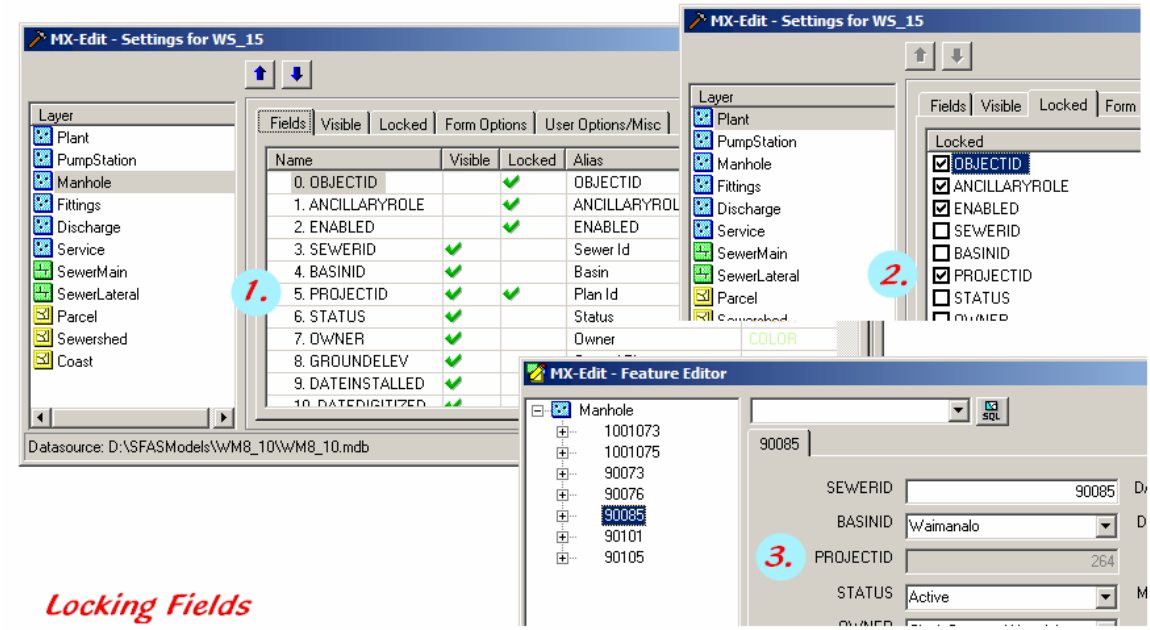
Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form



Making Fields Invisible

The fields in the "Feature Edit" visibility can be turned off to provide better control of editing only the fields that are of interest. MX-Edit increases the productivity of the editing process by focusing the user's attention to the fields that require editing. If a field needs to be displayed for reference only, use the option to change the "Locked" status. This will allow the values of fields to be seen in read only mode useful for reference information.

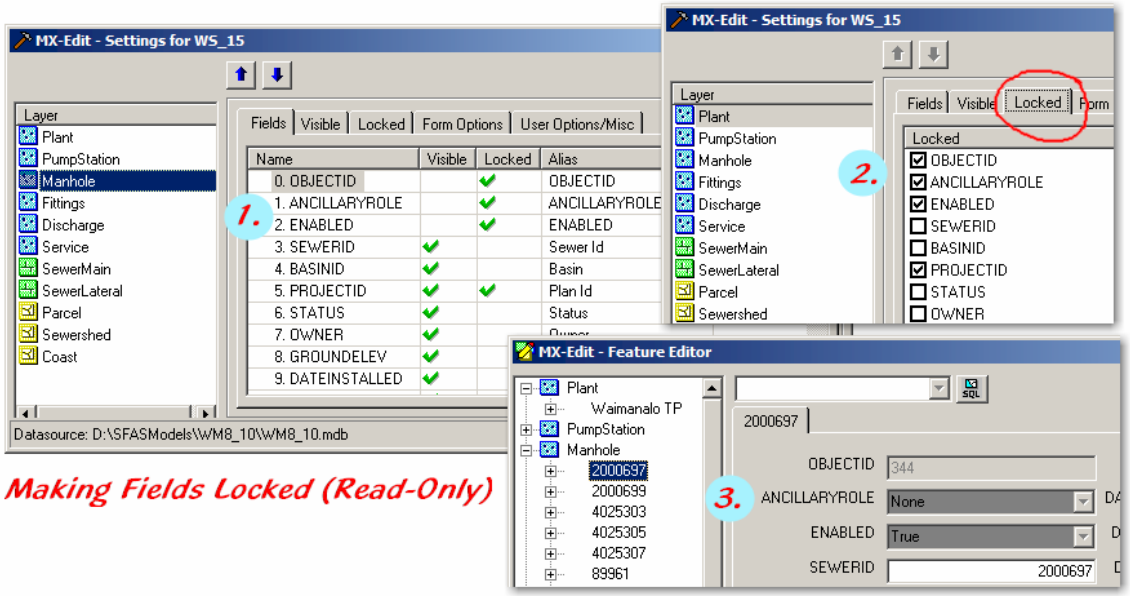
Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form



Locking Field

The fields in the "Feature Edit" can be locked and viewable in read-only mode in the form. This allows critical system fields and those not requiring editing to be locked and protected from accidental editing. When a field is locked the color of the field control is set to gray, over-riding any control color set on the field. This is an important safe guard to make system sensitive data viewable to the editing process, but secure against accentual editing.

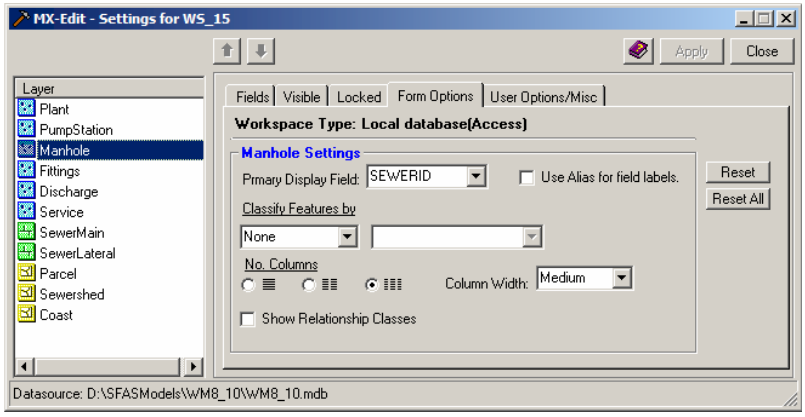
Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form



Form Options

Each feature class in a Geodatabase can be customized individually for the 'Feature Editor". The Settings tab provides the tools to customize "Feature Editor" forms at the dataset or feature class levels. It is important to remember that these settings can be set for each feature class as desired. For example, a feature class with a few fields can be set to use one column while a feature class with many fields can be set to use three columns.

Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form



Primary Display Field: Changes the label on the feature of the 'Feature Editor". Refer to Changing Field Labels.

Use Alias for Field Label: Sets the field label in the "Feature Editor" to use the Alias field name defined in the Geodatabase. Refer to Changing Field Labels.

Classify Features by: Changes the method of classifying selected features in the "Feature Editor". Refer to Using Classified Selections.

No. Columns: Choice to organize field controls in the 'Feature Editor" to one, two or three columns. Refer to Changing Number of Columns.

Column Width: There are three settings to adjust the width of the controls in the feature editor (small, medium and large)

Show Relationship Classes: Enables the related tables to be shown for editing in the Feature Editor Refer to Relationship Classes.

Reset: Resets all settings of the current feature class to the defaults. This affects settings in all the tabs of this form .

Reset All: Resets all settings of all the feature classes to the defaults. This affects settings in all the tabs of this form.

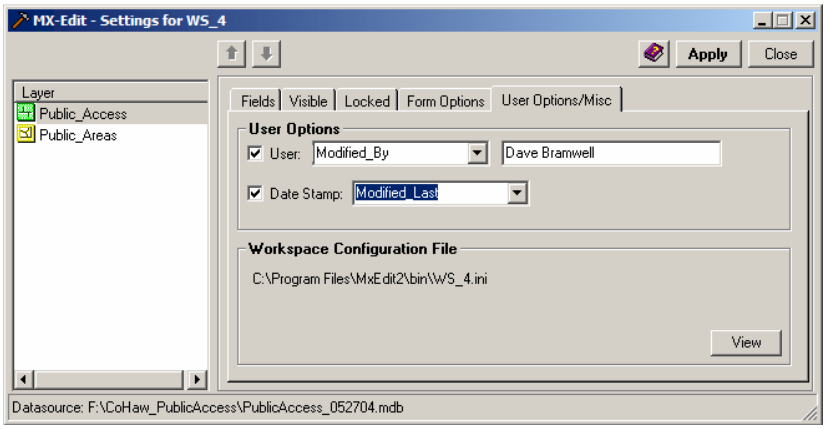
Apply: Changes made on this tab are applied to the current feature class.

User/Misc Options

Each feature class in a Geodatabase can be customized to automatically update fields that can store the name of the editor and the date of the last update. This is useful in tracking attribute changes made to a database. All database settings are stored at the computer level and therefore can be setup at the user level on each computer that will be editing databases. If users share computers, they may have to change the name string each time they begin an editing session.

The workspace configuration file is the system file that MX-Edit user to save all database settings. This file can be opened, by extreme caution should be used in editing this file. A corrupted file can cause error in the software. In some cases minor changes can be made, such as the database path, if a database is moved or copied to another file location.

Note: The Apply Button must be pressed after making a change on each tab of the "Settings" form



User: If enabled, a character defined field can be updated by a name as features attributes are edited.

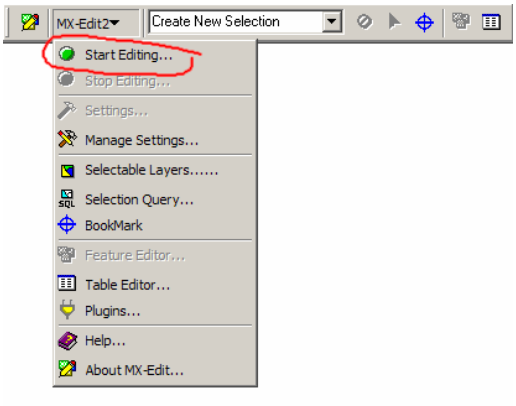
Date Stamp: If enabled, a date defined field can be updated with the system date as features attributes are edited.

View Workspace Configuration File: The settings file that stores the settings for the database.

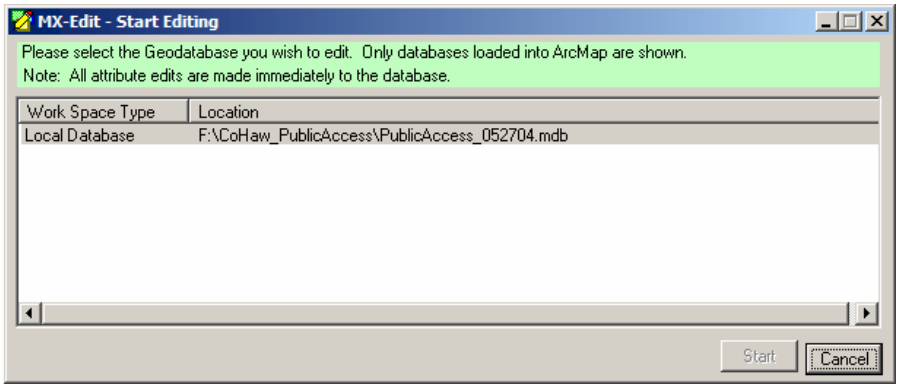
Starting and Edit Session

Before a Geodatabase can be edited using MX-Edit, the database must first be loaded into the ArcMap document and then be opened for editing. To open a Geodatabase in the document, use the "Start Editing..." menu item on the MX-Edit toolbar. Only one database can be edited at a time supporting any of the database format (Geodatabases, ShapeFiles and Coverages). Most menu items and toolbar buttons are disabled until a valid database is opened for editing. If a dataset that was previously edited using MX-Edit is opened all previous settings are loaded. To clear settings of a previously opened database, use the Manage Settings feature.

The edit session that is started is integrated with the standard Edit Toolbar. Starting and stopping edits from either the MX-Edit toolbar and the Editor Toolbar perform the same function. All edits to features attributes in MX-Edit are held in the Edit Cache until the database is saved by stopping or saving edits.



The Start Editing form displays all valid database formats that are loaded in the ArcMap document, including the source file path.

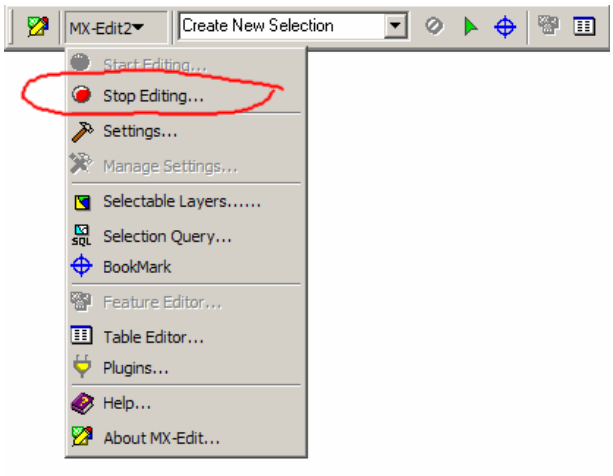


Start: Opens the currently selected for editing.

Cancel: Closes the form without opening any database for editing.

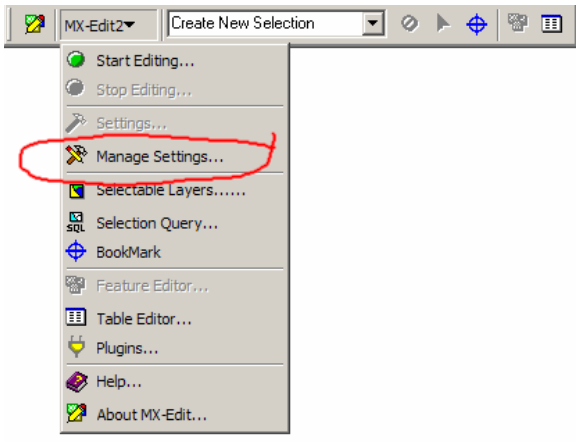
Stopping an Edit Session

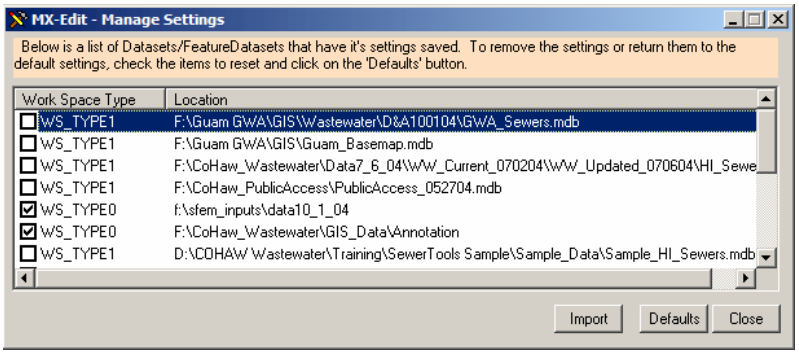
The currently edit database is stopped from editing using this menu item. All feature class and database settings are saved and remembered for the next time the database is edited. The important thing to remember, unlike the start and stop editing feature under the standard ArcMap Editor toolbar, is that the database is saved live. As edits are made to the field controls in the 'Feature Editor" the changes are made directly and immediately to the database. The current version of MX-Edit does not support any undo or recovery to the database. If this is a concern, especially during the evaluation of MX-Edit, you should make a working copy of the database.



Manage Settings

Each time a database is edited using MX-Edit, the settings are remembered in system files stored with the application as INI files. This enables you to customize the editing forms for each feature class and dataset and have these settings automatically loaded each time the dataset is edited using MX-Edit. Over time these settings files can accumulate and should be managed and removed. The "Manage Settings" feature provides the interface to safely clean up these system files and efficiently reset all MX-Edit settings back to default. It is highly recommended that you use this interface for your house cleaning, rather than manually deleting all associated files.





Import: Import settings from other saved settings files. MX-Edit stores these files in the ../Program Files/MX-Edit/bin folder.

Defaults: Restores the default settings for all databases that are checked. Also removes system settings files.

Close: Closes the dialog.

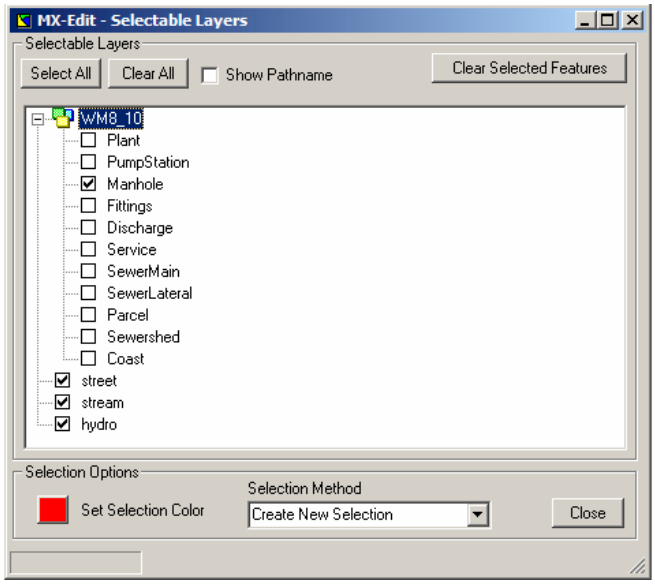
Data Structure Changes

All the user settings in MX-Edit are stored in configuration files within the MX-Edit installation folders. These configuration files are saved and linked to previously edited databases. Since some settings is dependent on a specific data structure, fields names or relationship classes. If a database item changes and is stored in the MX-Edit settings, the user will be notified of this change and will need to reset the settings files. All saved settings will need to be setup again with this new data structure.

Note: It is recommended that a database structure be stablized before creating elaborate MX-Edit user settings.

Setting Selectable Layers

One of the most commonly used tasks in editing feature attributes is the constant changing of selectable layers. The "Feature Selection" tool is an enhanced tool to organize all layers by data source, making layers easier to locate and change the selectable state. This affects both the standard ArcMap select tool and the one located on the MX-Edit toolbar. The list of selectable layers is displayed in a tree structure, which is particularly useful for projects with many layers loaded.



Select All: Makes all layers in list selectable.

Clear All: Clears all layers and makes them not selectable.

Show Pathname: Shows the source path name in the layers list.

Clear Selected Features: Clears all currently selected features in the ArcMap map document. Same as the clear select on the MX-Edit toolbar.

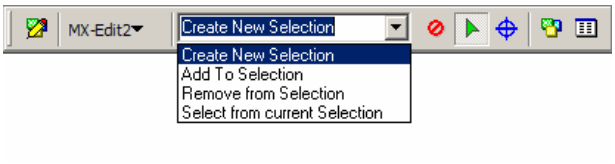
Set Selection Color: Changes the selection color.

Selection Method: Sets the selection method for dealing with new or existing selection sets. The selection method on the MX-Edit toolbar is the same.

Close: Closes the form

Selection Methods

When using the selection tool, selection methods can be applied to define how to handle existing selection sets. This settings affects both the standard ArcMap selection tool and the one on the MX-Edit toolbar. It is placed on the MX-Edit toolbar for easy access to this commonly used function during editing sessions.



Create New Selection: Creates a new selection, replacing any existing selection

Add To Selection: Appends new selected features to the existing selection set.

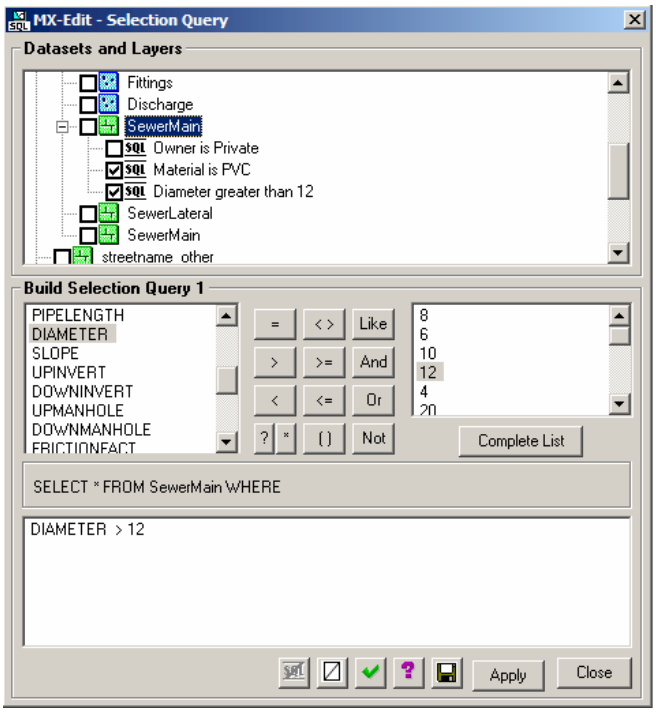
Remove from Selection: Removes or subtracts new selections from the existing selection set.

Select from Current Selection: Creates a subset or intersection of the existing selection set.

Selection Query

During an edit session, a user may switch between selection sets or have set queries that are repeatedly used to find missing data or feature categories. With the standard ArcGIS query tools, a user cannot save these queires and run them later. The MX-Edit query selection tools allow SQL queries to be created, saved and organized by feature class. These queries are saved within the MX-Edit configuration file at the machine level.

Saved queries can be recalled either from the Selection Query interface or from within the Feature Editor form. Saved quesries can be run either individually or combined with other saved querie using the AND operation between SQL commands.



Deletes the selected saved SQL query

Clears the SQL command

Checks the SQL command as valid syntax

Lists reserved key words that cannot be used in SQL command

Saves SQL command to the MX-Edit settings filt

Apply: *Runs the selected SQl commands. All selected are applied.*

Attribute Edit Form

The Feature Attribute Editor interface is the heart of MX-Edit. The customized interface that can be tailored to make editing more efficient and effective, you might consider it as a ramped up Object Inspector. Using the customization options, a custom edit form can be designed and saved for each feature class of a Geodatabase or layers in shapefiles. These customization settings are stored in settings files within MX-Edit and recalled each time the data is loaded in ArcMap. All Feature Editor forms are generated on the fly using the stored feature class settings. When Geodatabase domains are linked to attribute fields, a combo-box control is used to provide a drop down list of the valid domains. IMPORTANT: All fields maintain the integrity of the defined Geodatabase.

MX-Edit has the power of designing efficient order and display of attribute fields for truly customized edit forms. As with the Standard Edit Toolbar, geodatabase with defined subtypes, geometric networks or relationship classes cannot be edited using ArcView. Proper ArcMap license are required depending on the design features of a geodatabase.

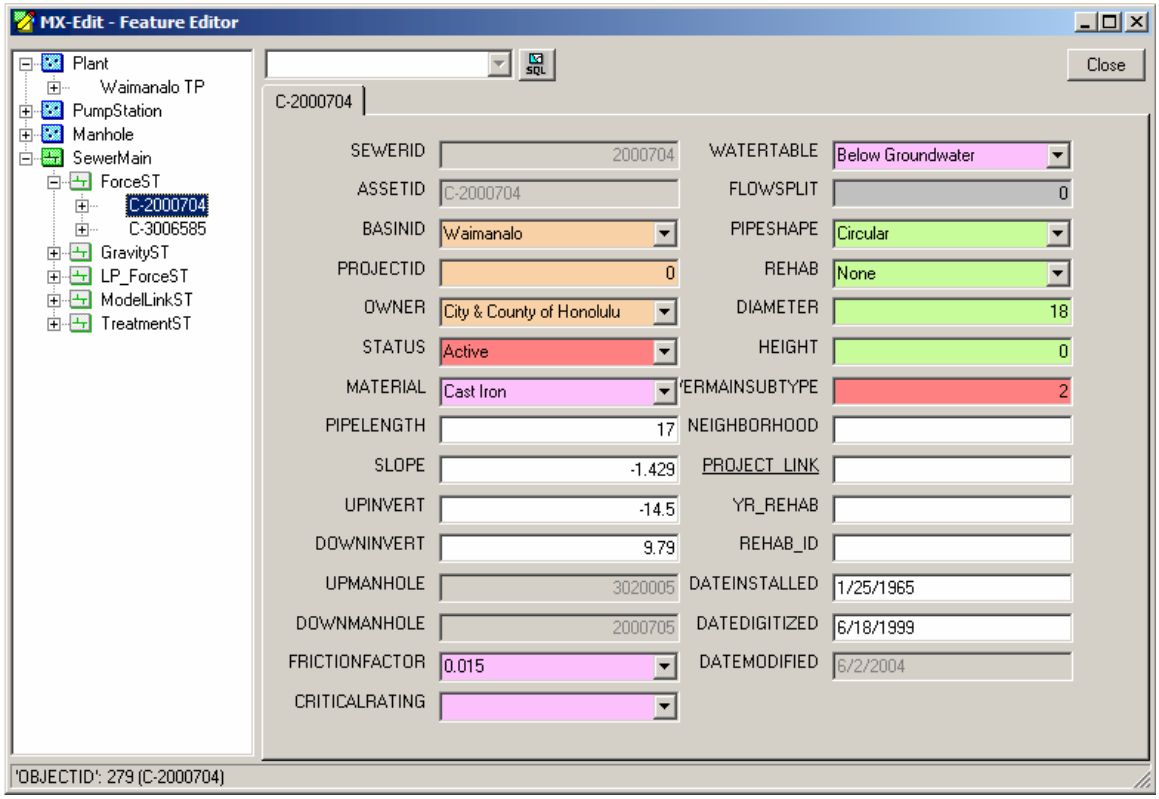
The MX-Edit customization tools provide basic features that in combination can design efficient and cost effective features editing forms. The basic customization features are:

- Form Layout
- Field Display Order
- Field labeling and font control
- Field control colors
- Powerful classified selections
- Marking edit features as completed
- Recalling saved queries

The MX-Edit toolbar is organized with the most commonly used tools for attribute editing. Although the standard clear selection and selection tools also work with MX-Edit these tools are also placed on the MX-Edit as to create a tool collection of most commonly used tools. The 'Feature Editor" form is opened using the toolbar button circled as shown below:

Example Form:

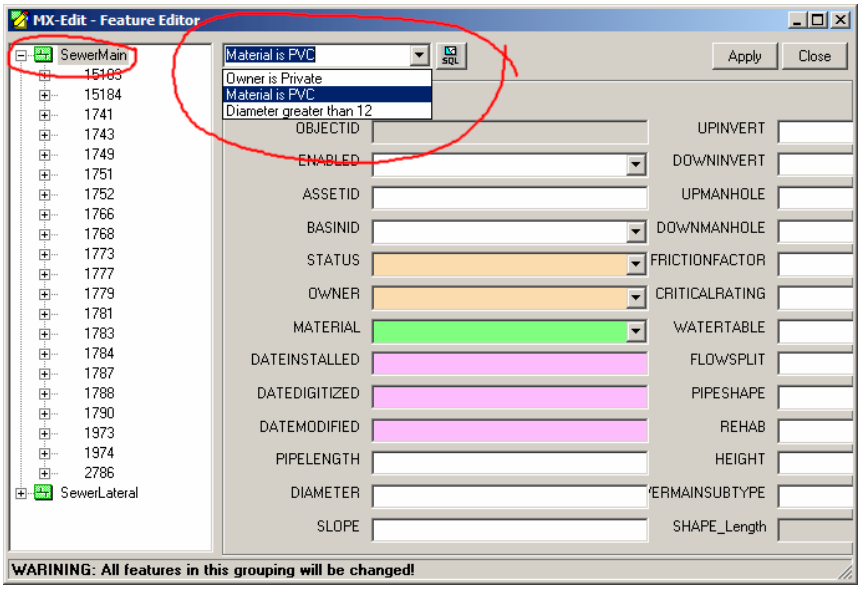
A customized form for can use a combination of color, fonts, visible, locked and field order to create a form that is efficient for the task at hand.



Recalling Saved Queries

Stored queries defined in the Selection Query tool can be easily recalled within the Feature Editor. This allows the editor to setup queies to locate data that needs to be changed, data with null or incomplete data or any other query from with the Feature Editor. The editor can quickly switch between saved queries until all data has been edited. The selected can even be updated in mass using the Mass Edits capability.

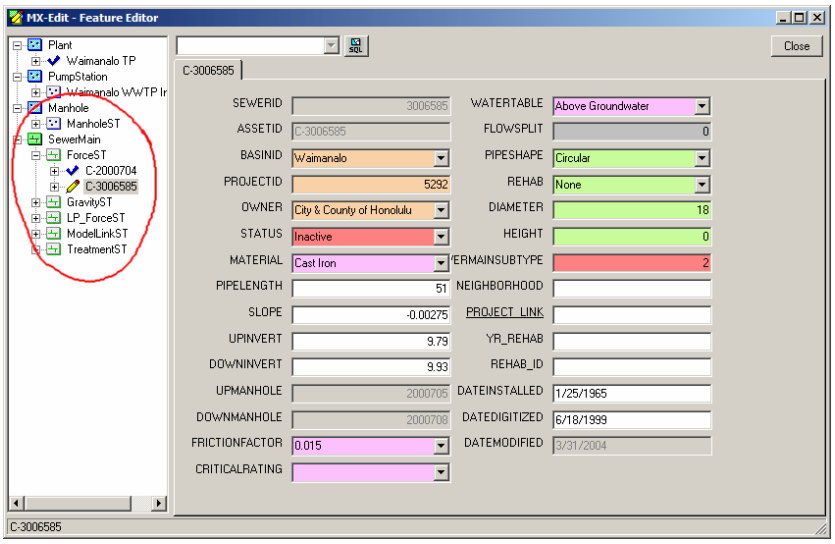
The saved SQL queires show up in the query drop down list when the feature class category is selected, not at the individual feature record level.



Runs the selected saved SQl query for the feature class category

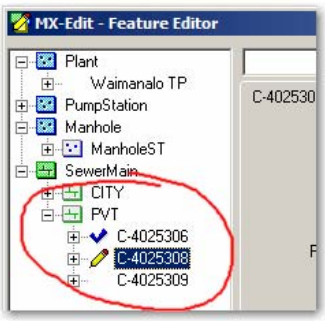
Using Classified Selections

Using classified feature selections adds a whole new dimension of selection sets to Geodatabase data. Now you can make selections using any of the standard ArcMap selection tools or those within MX-Edit and apply a level of classification in the MX-Edit feature tree. This allows you to group data in categories that are of interest of editing. For example, suppose you need to change the ownership of all sewer laterals in a geographic area. You could set the "Classified Selection" in the Settings Form Options to group the selection based on ownership of the sewer laterals. You could then select from the screen all features within an area. In the 'Feature Selection" form the selected sewer laterals are clearly separated by ownership. The private (PVT) lines can then be changed from "Private" ownership to "City" using the mass update capabilities. Using the same example below, suppose that all force main sewers need to be edited, the classified selection could be set to be based on the SewerMain FeatureSubType as defined in the GeoDatabase design.



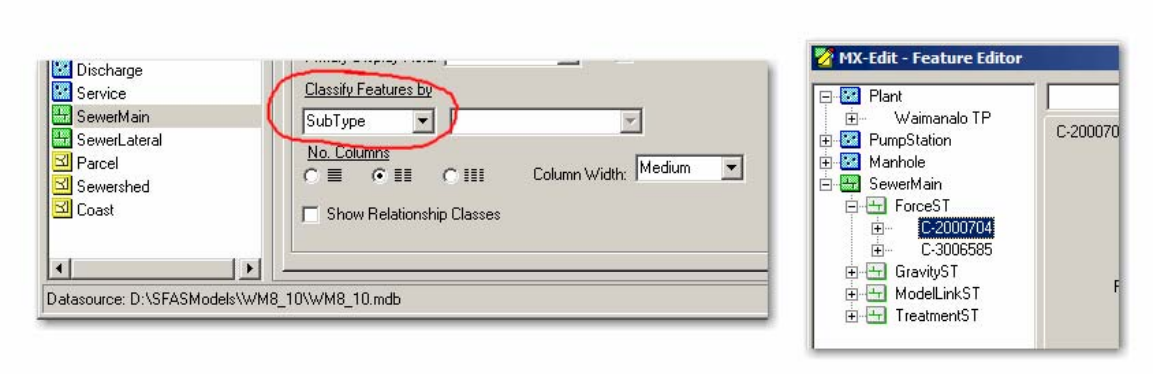
Classified Selection by Field Name

To group the feature selection set to based on a value in a Field, select the field option and then a field to classify on. This set in the Settings Form Option.



Classified Selection by Geodatabase FeatureSubType

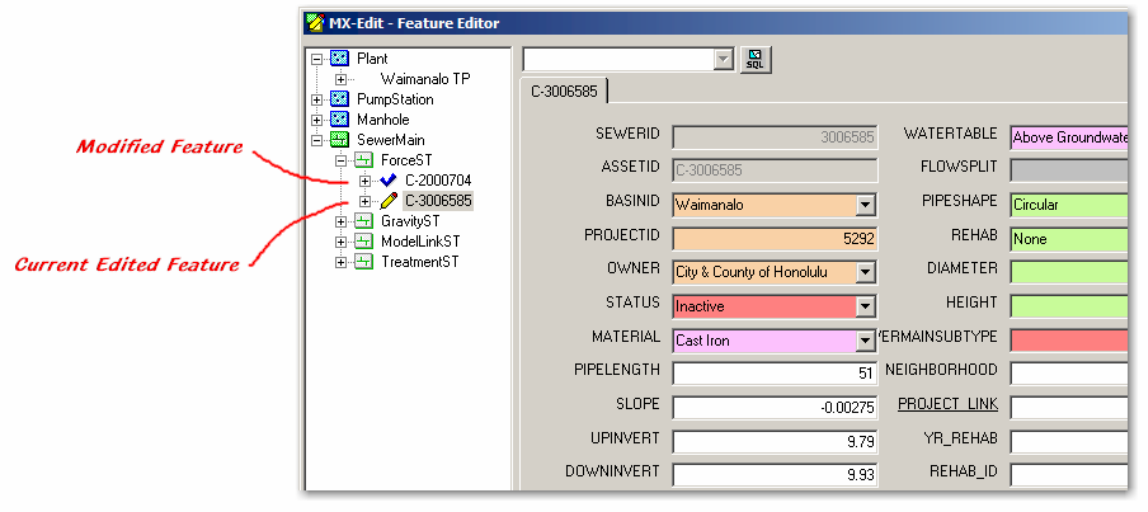
To group the feature selection set based on a feature subtype, select the subtype option. This option is only available when there are subtypes defined for a feature class. This set in the Settings Form Option.


Discharge
Service
SewerMain
SewerLateral
Parcel
Sewershed
Coast
Classify Features by
SubType
No. Columns
Column Width:
Medium
Show Relationship Classes
Datasource: D:\SFASModels\WM8_10\WM8_10.mdb
MX-Edit - Feature Editor
Plant
Waimanalo TP
PumpStation
Manhole
SewerMain
ForceST
C-2000704
C-3006585
GravityST
ModelLinkST
TreatmentST
C-200070

Tracking Edits

One of the time savers while editing is the ability to visualize and track edits made. When a value in one of a feature's fields is changed, a pencil icon is displayed next to that feature. This is a visual cue that a value was modified or changed. As you move to another feature for editing, the pencil changes to a blue check mark, signifying that the attributes of the feature class was edited and changes were saved. Using these visual tracking cues, a selection set can be more efficiently edited while ensuring that all desired features of a selection set were edited.

For example, in the screen shot below, all selected force main SubTypes of the SewerMain feature class need to be edited. You can select all sewer mains in a geographic area and let MX-Edit to a Classified Selection. Each force main could then be edited and marked as modified until all desired force main sewer lines have been edited. This reduces the chance of oversight or remembering which features you have edited. These small time savers add up to large cost savings, particularly in large database editing projects.

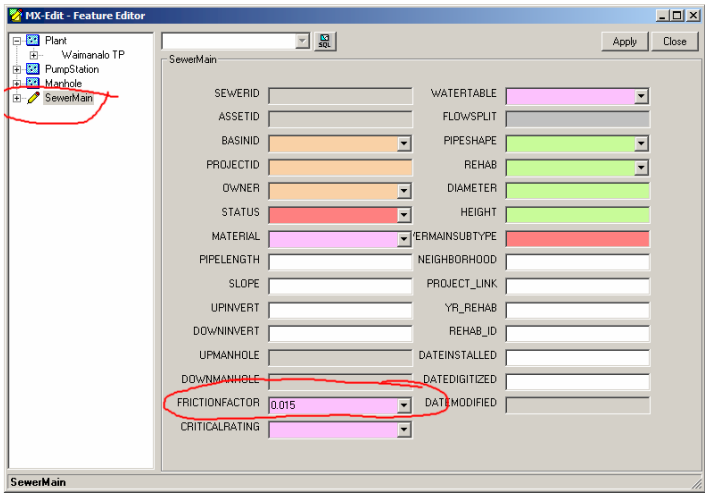


Making Mass Updates

One of the most time saving features of MX-Edit is the ability to organize feature selection sets and then perform mass edits to selection sets or classified selections sets. This is not possible within the standard ArcMap editing tools with the alternative being SQL update scripts outside of ArcMap.

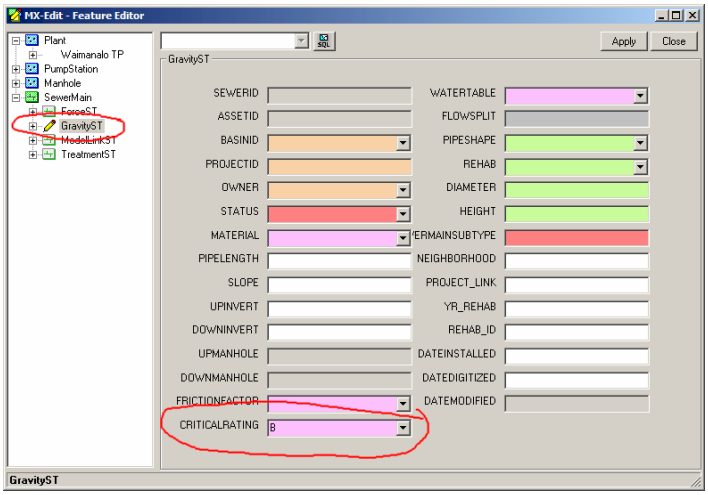
Mass Updates to Feature Class Selection

After selecting the features to be edited, within the Feature Editor the feature layer (top level) can be selected for editing. The edit form is blank when in mass edit mode. Any edits made while selecting the a entire feature class will be performed on all selected features of that class. A warning message is displayed for the user to confirm this mass update when the cursor is moved to another item on the selection tree.



Mass Updates to Classified Feature Class Selections

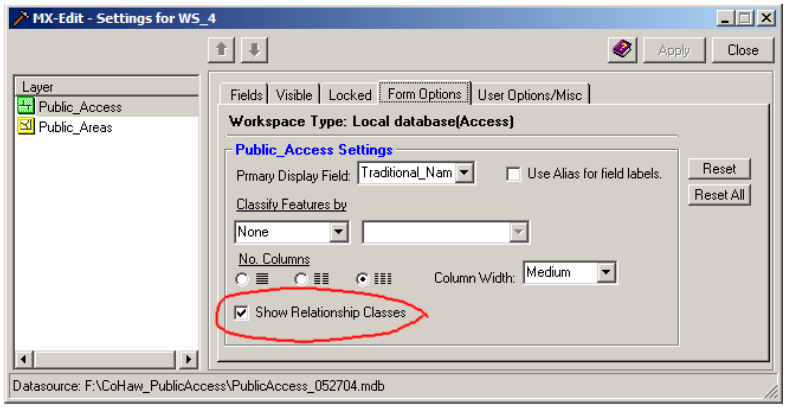
After selecting the features to be edited, within the Feature Editor a classified selection can be selected for editing. The edit form is blank. Any edits made while selecting the classified selection feature class will be performed on all selected features of that classification. A warning message is displayed for the user to confirm this mass update when the cursor is moved to another item on the selection tree.



Editing Related Tables

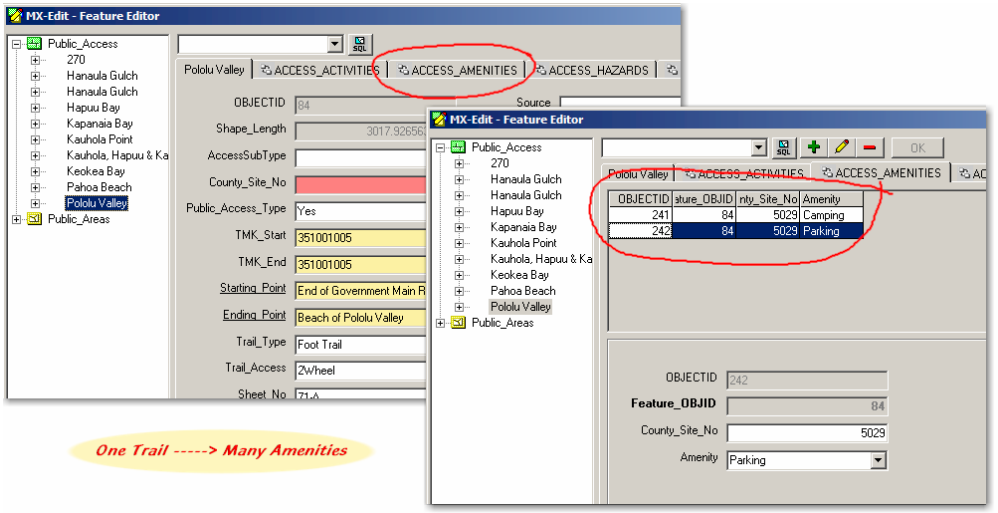
Tables defined by relationship classes with one-to-many relationships to feature classes can be edited within MX-Edit. MX-Edit can allow you to add and edit database records to related tables, making it more efficient and quicker to maintain related tables. ArcMap editing tools does not allow you to edit linked tables with the standard editing tools. This is a big time saver since one-to-many relationship tables can be edited at the same time as the feature class. MX-Edit uses the relationship classes defined within geodatabases to build related editing forms.

If relationship classes are defined in a geodatabase, editing of these tables can be turned on by enabling this feature within the Settings dialog. This must be done for each feature class within the database.



If enabled, the selected features in the Feature Editor will build, at run time, editing forms for all related tables. These will be shown as additional tabs on the Feature Editor. The use of related tables in a GIS makes for a very efficient and normalized database design. Without good tools to edit these related tables, these tables must be edited and maintained independent of the GIS feature. This manual method of editing related tables may cause data errors and non-matching records to appear in a database.

The primary field that defines in the related table, is populated in the related table. In some cases it might be useful to add other related fields, such as the Feature ObjectID. This might be done as an added measure to ensure a link to the feature.



 Used to execute stored SQL queries

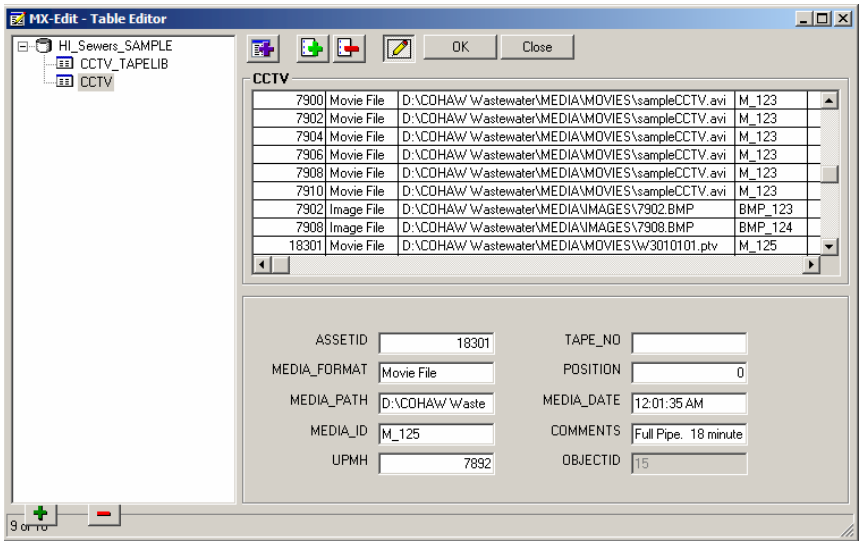
 Adds new record to related table, and builds a entry form.

 Switches the related table to Edit mode. By default the table is locked until this toggle is switched to edit mode.

 Deletes the record selected on the table view.

Table Editor Form

Tables registered within a Geodatabase can be edited using the MX-Edit Table Editor with a more for based interface. To edit tables with this tool, you must registered them within a ArcCatalog. This registration allows ArcMap to view and use non-spatial tables. After registrering a table, an OnjectID field is added by the ArcCataog registration process.



 Load registered geodatabase tables into the Table Editor

 Add record to the selected table and edit build form

 Delete selected record fromt he data grid

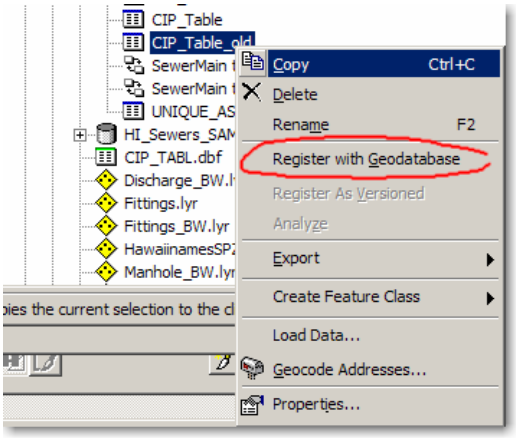
 Toggle to enable editing on a table.

OK: Saves the changes to the table

Close: Closes the Table Editor dialog

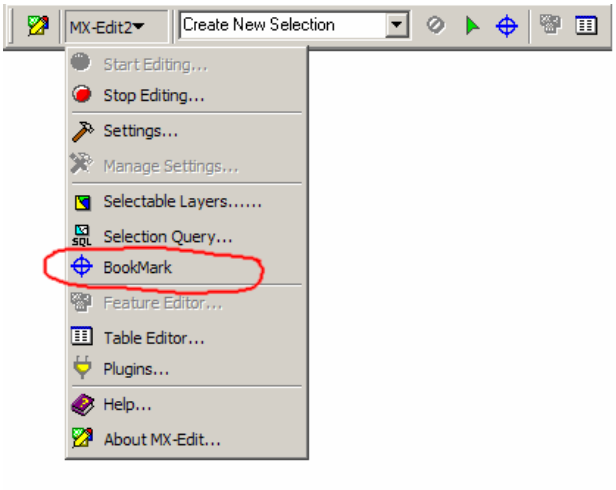
Loading Tables

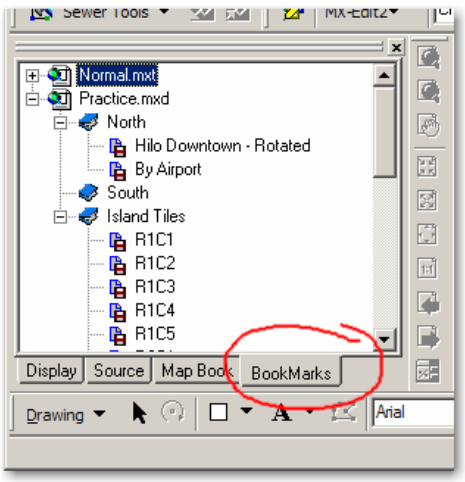
Tables to be edited using the MX-Edit Table Editor must be registed as a Geodatabase table. This is done within the ArcCatalog product. Select the table to be registered and right click the mouse button. This will bring up a menu that will allow you to register with Geodatabase. An ObjectID will be added to the table as an indexed field.



Enhanced Bookmarks

During any ArcMap project, the user can be constantly switching between map extents, particularly during editing sessions. The ability to create and organize saved map extents that can be recalled saves time. The enhanced bookmark feature within MX-Edit allows a user to create and organize bookmarks including saved map rotations. The bookmarks can be easily accessed with the MX-Edit dialog or from an added context menu at the bottom of the ArcMap table of contents. The bookmarks are stored within the MX-Edit user settings, attached to a database with system configuration files.





Bookmarks - Normal.mtx

The default bookmarks that are created with the standard ArcMap bookmark feature is also listed within the MX-Edit bookmark interfaces. Groups can be created under the ArcMap project or the other enhanced capabilities within the bookmarks created by the standard tools. These are saved only with the saved ArcMap project file in the Normal.mtx file.

Bookmarks - Database Settings

Bookmarks created with the MX-Edit bookmark tools are saved with the database settings configuration file. These bookmarks are loaded each time a database is loaded, regardless of the saved project.

The enhanced Bookmark tools within MX-Edit are:

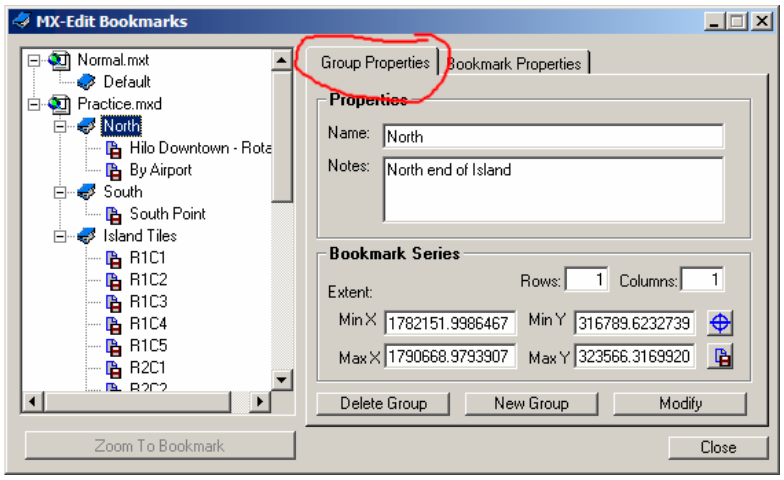
- Bookmark groups
- Bookmark user comments
- Saved map rotation for bookmarks
- Automatically create a series of bookmark tiles
- Easy access through ArcMap context menu

Bookmark Tools

The enhanced bookmarks are created and managed within the bookmark interface opened from the MX-Edit menu. The bookmarks are saved under the Normal.mtx saved with the ArcMap project or with the MX-Edit configuration settings for a database.

Group Properties

Bookmarks can be organized by region or any other organization. This is helpful in edit sessions with many bookmarks, such as a map tile series.



Name: The named assigned to the bookmark group

Notes: User comments about the bookmark group

Rows: Number of rows when creating a bookmark series of tiles

Columns: Number of columns when creating a bookmark series

Min X: Lower extent in defined map units when creating a bookmark series

Min Y: Left extent in defined map units when creating a bookmark series

Max X: Upper extent in defined map units when creating a bookmark series

Max Y: Right extent in defined map units when creating a bookmark series

Cursor to define the outer map extents when creating a bookmark series from the map view

Button to create the bookmark series using the number of rows, columns and the outer extents

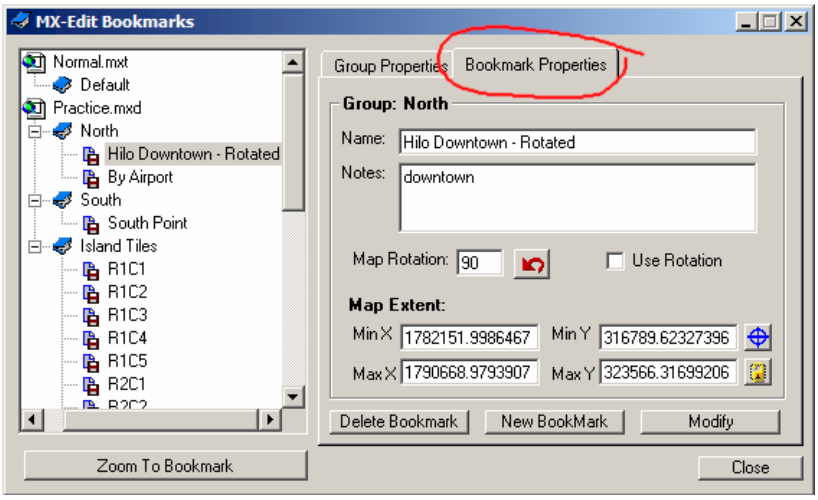
Delete Group: Delete the selected group and all child bookmarks

New Group: Create new group

Modify: Save settings for existing group

Bookmark Properties

Bookmarks can be created and managed under he bookmark properties tab.



Name: The name assigned to the saved bookmark

Notes: User comments about the bookmark

Map Rotation: The rotation of the saved bookmark in degrees (clock-wise)

Apply rotation to current map view

Min X: Lower extent in defined map units

Min Y: Left extent in defined map units

Max X: Upper extent in defined map units

Max Y: Right extent in defined map units

Cursor to define the map extents of a new or existing bookmark from the map view

Lock map extents from accidental changes

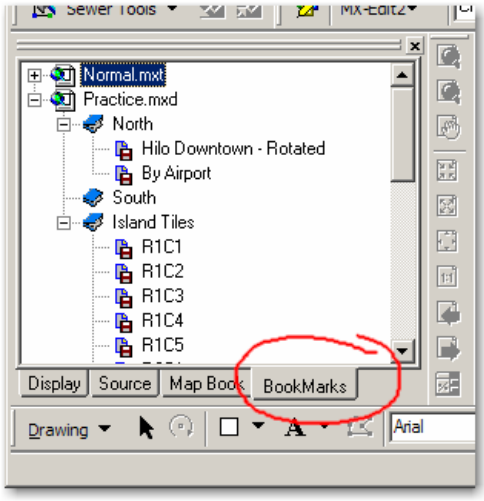
Delete Bookmark: Delete the selected group and all child bookmarks

New Bookmark: Create new bookmark under current group

Modify: Save settings for new or existing bookmark

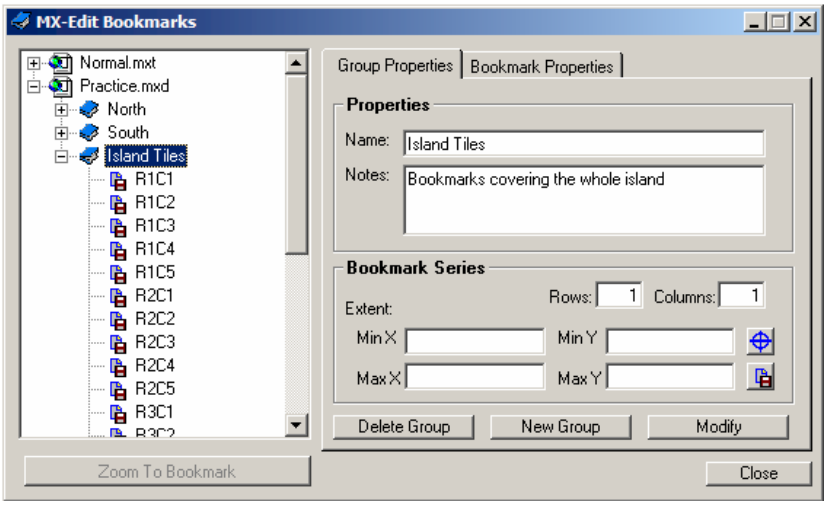
Bookmark Context Menu

Using the saved MX-Edit bookmarks or the standard (normal.mtx) bookmarks, a additional context menu below the ArcMap table of contents is added. This provides quick access to all the saved bookmarks. Double clicking on a bookmark will zoom the Map view to the saved map extents, including saved map rotations.



Creating Bookmark Series

The MX-Edit bookmark tools includes a feature to automatically create a tile system for a bookmark series stored under a bookmark group. Under the Group Properties tab of the Bookmark tool, a new group and bookmark series can be created. The tiles are named using the naming convention R<row number>C<column number>. For example a 5 x 5 tiles system will create bookmarks that R1C1, R1C2, R1C3, etc. These bookmark names and user comments can be modified within the Bookmark Properties tab. Map tiles are created by dividing the number of rows ad columns by the length of the X axis and the Y axis from the defined outer extents.



Rows: Number of rows when creating a bookmark series of tiles

Columns: Number of columns when creating a bookmark series of tiles

Min X: Lower extent in defined map units

Min Y: Left extent in defined map units

Max X: Upper extent in defined map units

Max Y: Right extent in defined map units

Cursor to define the outer map extents for creating a bookmark series from the map view

Button to create the bookmark series using the number of rows, columns and the outer extents

Increased Efficiency

MX-Edit was developed to work generically with any database with enhanced tools and interfaces. MX-Edit can load valid plugin DLLs to perform custom routines either real time as data is saved or as extension to that are customized for a particular database design.

Problems with Class Extensions

A similar concept can be applied within a geodatabase with a ESRI Class Extensions (see ArcGIS Help). Class extension allow custom routines or actions to programmed and compiled as DLLs to be attached to feature classes. Whenever a feature class is touched, these class extensions can run a custom script and action. The inherent problem with class extensions assigned to feature classes is that ALL users of the data must have the DLL installed on their computer. This is a serious problem with shared databases across a network. The Class Extension concept allows very powerful quality control and automated editing routines to be run as features are edited, but the shared database problem makes this awkward approach. The MX-Edit plugin concept allows custom editing routines to be developed and managed by MX-Edit without these problems.

Benefits of Custom Plugins

In structured databases requiring a high level of quality control checks and processes, MX-Edit plugins can be developed to perform automated data processing and controls. This is particularly beneficial in municipal agencies that maintain GIS database in a very structured environment. Some of the benefits of using custom MX-Edit plugins are:

- Get the benefits of Class Extensions without the installation and data distribution problems
- Perform automated updates to related data fields as features are modified
- Apply sophisticated routines at edit time using database connectivity rules
- Integrate geoprocessing routines within editing tools
- Perform mass updates or processes to database before posting data to SDE
- Run QA/QC routines before publishing data or posting to SDE
- Integrate any GIS process programmed in ArcObjects into editing tools

Using Plugins

Plugins are loaded into MX-Edit from the plugin manager after the plugins have been installed including all required libraries and components from a InstallSheild setup program. Once the plugins have been installed on a computer they will appear on the list of valid plugins that can be enabled or disabled as needed. Since plugins are typically developed for specific database structures, they can be turned off when working with other data. Additional documentation specific to the features of plugins are installed with the plugin. There are two categories of MX-Edit plugins; Edit time routines and Add-on Tools. MX-Edit plugins must be developed by Integrated Information Solutions on consulting or contract basis.

Edit Time Routines

Edit time routines are performed as features are edited through the MX-Edit Feature Editor. These may include automated updates to related data fields, QA/QC checks real time as data is modified or other required data processing that can be triggered as features are edited with the MX-Edit Feature Editor. They can be enabled or disabled as needed through the Manage Plugin dialog.

Add-on Tools

Add-on tools are additional applications, forms or routines that can be launched with the Run button. These are routines that are not run 'Real Time" as features are edited. A common use is to develop add-on processes to be run before data is finalized or posted to SDE. Any database process or spatial operation that can be programmed with ArcObjects can be included in MX-Edit plugins