



The Geodatabase : An Introduction

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Getting Started

The Geodatabase: An Introduction

- **This is an intro session**
- **Please hold questions until the end**
- **Please silence cell phones**



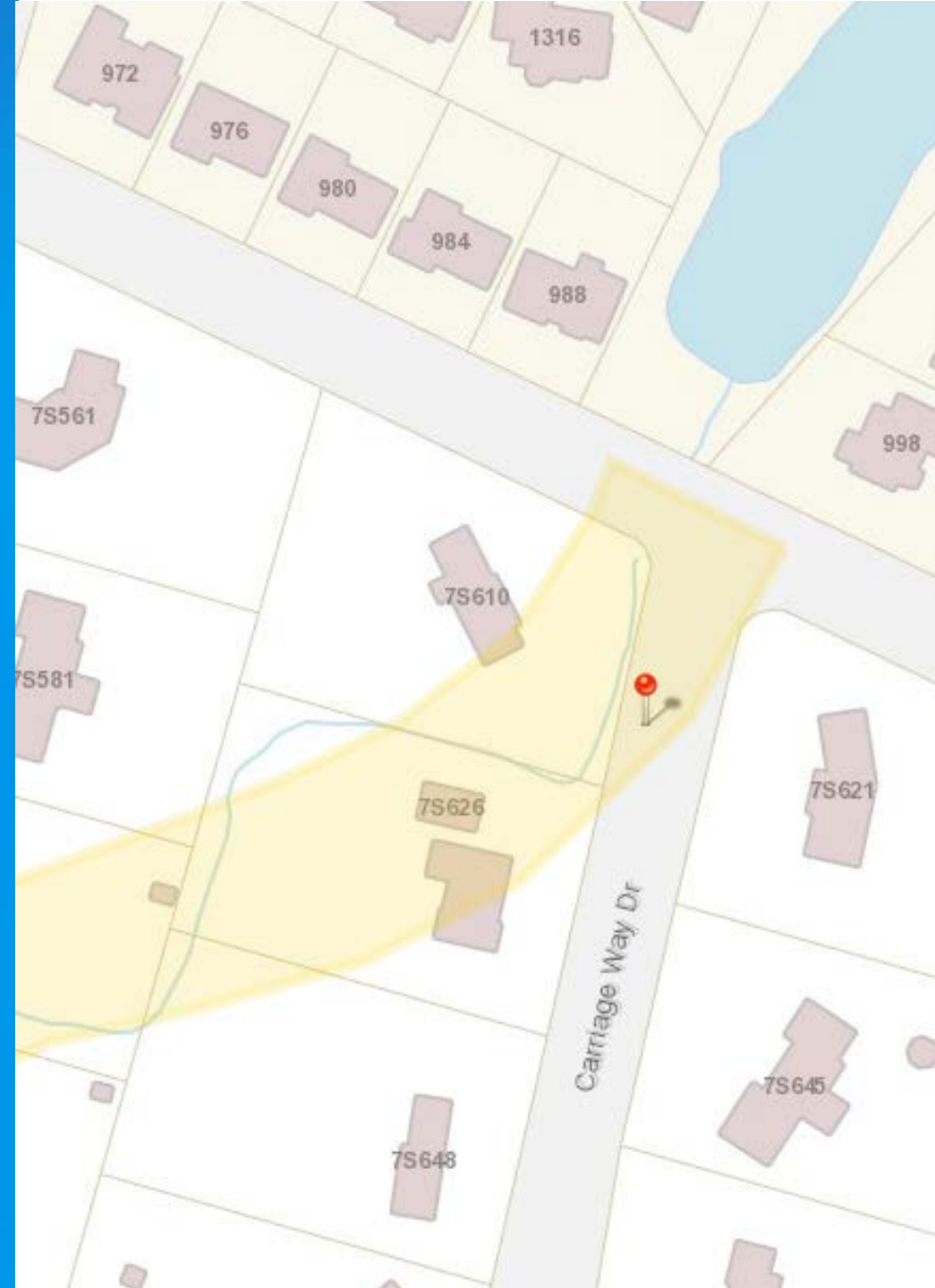
The Geodatabase : An Introduction

- **Geodatabase Overview**
- **Inside the Geodatabase**
- **Advanced Behavior**

Working with Geodatabases

Demo # 1: Kaitlin

- Hazardous Information WebApp



Geodatabase Overview

- What is and why use the geodatabase?
- The geodatabase as part of the ArcGIS platform
- Types of geodatabases
- Data management and editing

What is the Geodatabase?

Geodatabase Overview

- **A collection of geographic datasets of various types**
 - **A comprehensive model for representing and managing GIS data**
- **Scalable storage model supported across the platform**
- **You can programmatically access geodatabase functionality**

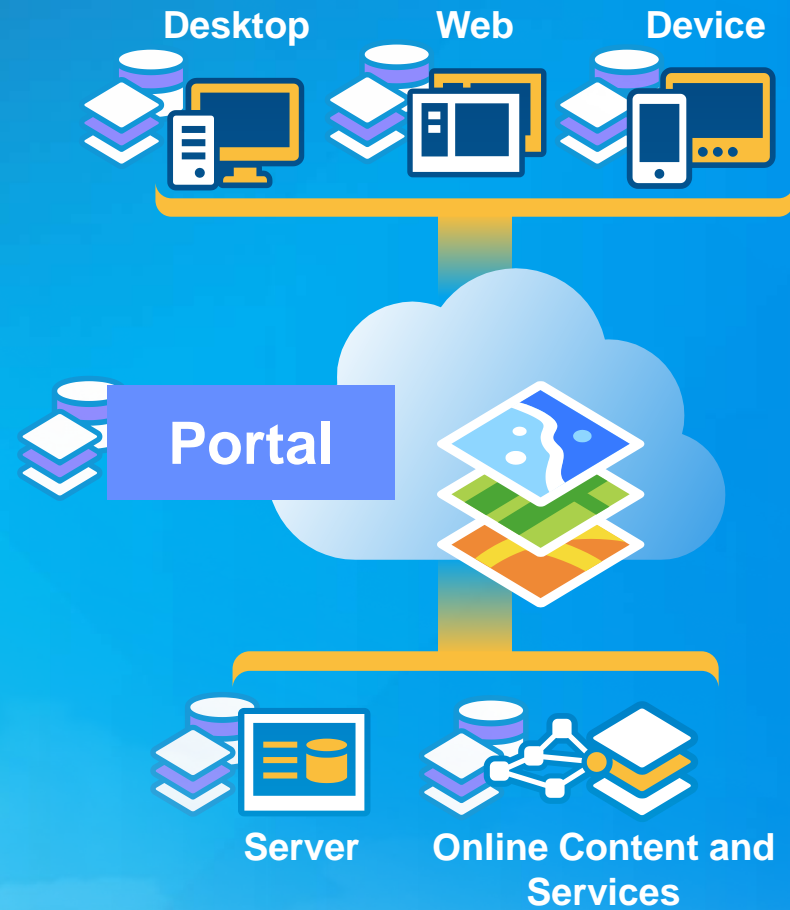
Why use the Geodatabase?

Geodatabase Overview

- **It's simple!**
- **Robust, customizable framework**
 - **Build and manage your own specific GIS solution**
- **Increased functionality over other data models**
- **Best way to use the complete ArcGIS platform**


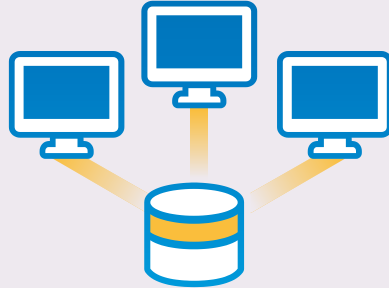
The Geodatabase as part of the ArcGIS Platform

Geodatabase Overview



Types of Geodatabases

Geodatabase Overview

	File Geodatabase	Enterprise Geodatabase
OS Platform	Cross Platform	DBMS dependent
Number of Users	Single Editor or Multiple Readers	Multiple Editor and Multiple Readers
Storage Format	System files in a file folder	Oracle, SQL Server, PostgreSQL, Informix, DB2
		

Geodatabase Data Management

Geodatabase Overview

- **Catalog window**
 - Define feature classes, datasets, relationships
 - Import and convert data from other formats
- **ArcGIS Online**
- **Use an Esri Solution**
 - Industry specific data models available online



Editing

Geodatabase Overview

- **Datasets in the geodatabase are editable**
 - i.e. Modify building footprints in parcel management
 - i.e. Add water mains to a water network
- **Editing in ArcGIS uses a transaction model**
 - A series of edit operations constitutes a 'transaction'
- **Editing with an Enterprise Geodatabase**
 - Versions or "snap-shots" of the data

Creating a Geodatabase

Demo # 2: Kaitlin

- Using the Catalog
- Create a Geodatabase
- Load existing data
- Editing data

Summary

Geodatabase Overview

- **What is and why use the geodatabase?**
- **The geodatabase as part of the ArcGIS platform**
- **Types of geodatabases**
- **Data management and editing**

Inside the Geodatabase

- Dataset Types
- Dataset Rules

Inside the Geodatabase

What can you store?

- **Datasets that represent real-world information**
 - Tables, feature classes, mosaics
 - Feature datasets
 - Relationship classes
 - Annotation and Dimensions
- **Datasets have associated rules**
 - Domains
 - Subtypes
 - Relationship Rules

Objects

Datasets Types in the Geodatabase

- Each row in the table is a unique object
- Each row has the same fields (called attributes)
- Does not need to have a geographic representation

Table

Owner

OBJECTID*	ACCOUNT	SALE_DATE	DEED_BOOK	SALE_PRICE	Owner_Name
1	00588954	3/2/2000	14256	57000	Doyle, Joanne
2	00591963	12/20/2000	14669	75000	Smith, Christine
3	00592331	5/23/2001	14927	75861	Beard, Collin
4	00593273	4/14/2000	14310	67500	Williams, Miranda
5	00598119	9/23/2000	14550	56000	Welbon, Conrad
6	00598267	4/19/2000	14310	36439	Paulman, Joyce
7	00598585	5/8/2001	14977	37448	Roberts, Patricia Ann
8	00598887	12/8/2000	14646	34439	Moldes, Bradford
9	00599107	11/5/2000	14645	41439	Jones, Lori
10	00599174	4/13/2001	14830	29439	Elrod, Deborah Strack

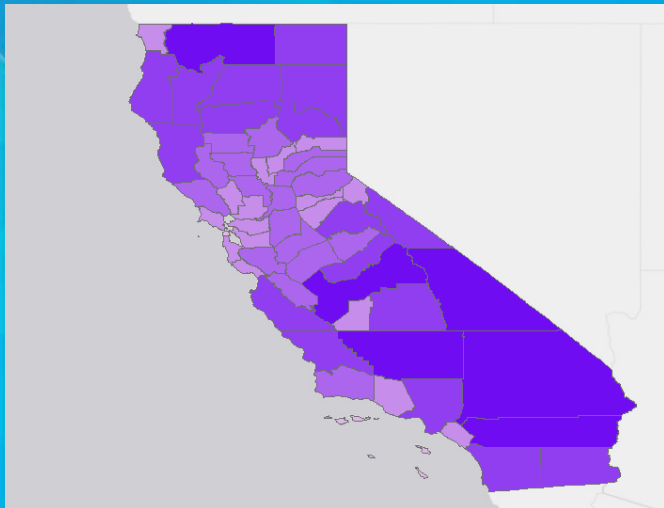
0 (0 out of 100 Selected)

Owner

Feature Classes

Datasets Types in the Geodatabase

- A feature is an object with a spatial representation
- Extends the relational model
- Like a table, each row has the same fields
- A feature class is a collection of features



Table

CA_Counties

OBJECTID *	SHAPE *	StateID	CountyID	County Name	SHAPE_Length	SHAPE_Area
1	Polygon	06	093	Siskiyou	7.154696	1.775331
2	Polygon	06	015	Del Norte	2.851002	0.28441
3	Polygon	06	049	Modoc	4.538583	1.175683
4	Polygon	06	023	Humboldt	4.881946	0.996595
5	Polygon	06	105	Trinity	6.044118	0.884485
6	Polygon	06	089	Shasta	5.50247	1.062681
7	Polygon	06	035	Lassen	5.97156	1.302114

0 (0 out of 68 Selected)

CA_Counties

Advanced Feature Classes and Features

Datasets Types in the Geodatabase

- **Multipart Features**



Table

US_States

OBJECTID *	Shape *	STATE_NAME	DRAWSEQ	STATE_FIPS	SUB_REGION
1	Polygon	Hawaii	1	15	Pacific
2	Polygon	Washington	2	53	Pacific
3	Polygon	Montana	3	30	Mountain

1 (1 out of 51 Selected)

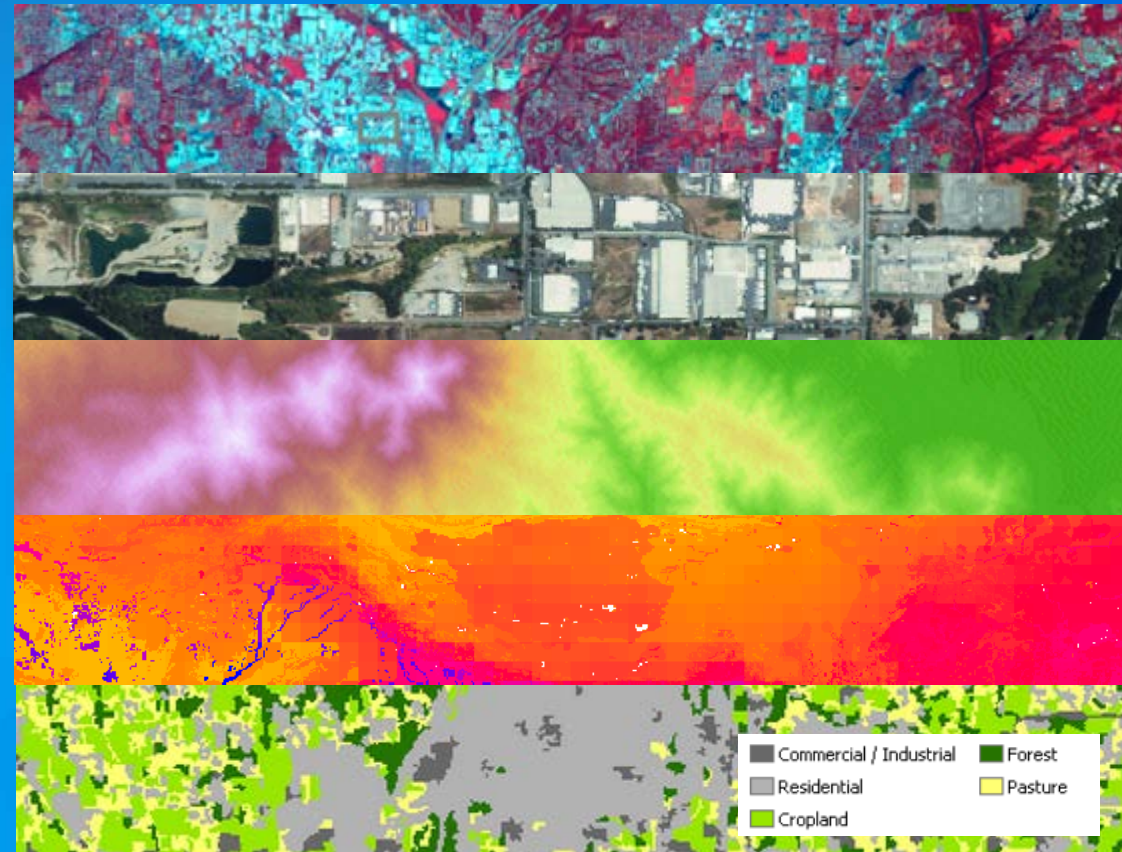
US_States

- **Text and surfaces**
- **Flexible coordinates**
 - XY, Z, M

Mosaics

Datasets Types in the Geodatabase

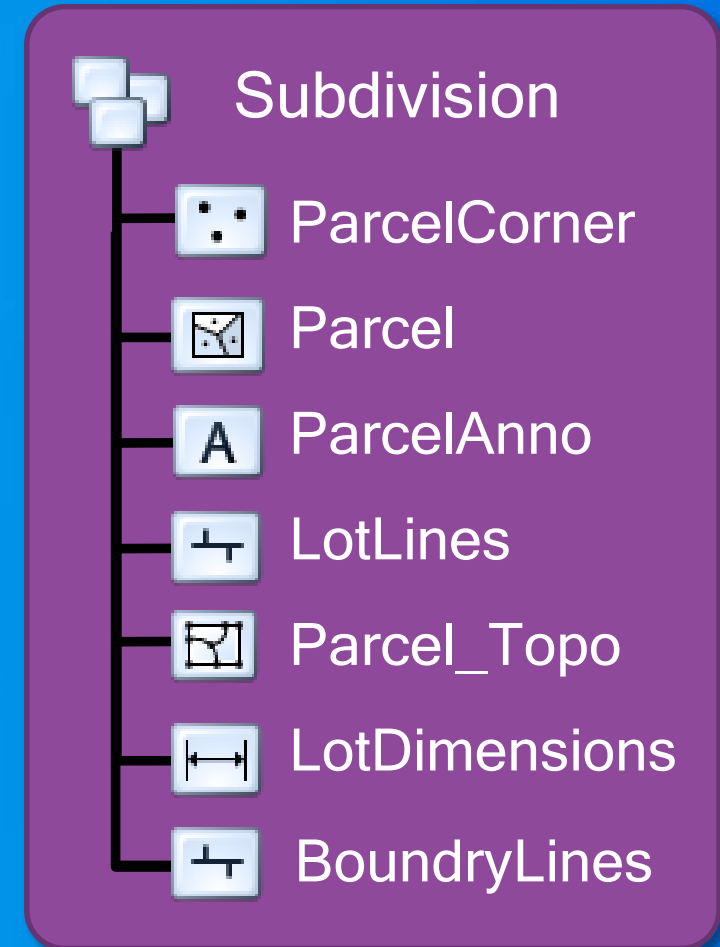
- Support for many different Raster formats
 - GRID, Tiff, MrSID etc...
- Mosaic dataset
 - Manages multiple rasters
 - Stored as a catalog, viewed as a mosaic
 - Advanced querying and processing



Feature Dataset

Datasets Types in the Geodatabase

- **Contains a group of datasets**
 - All have the same spatial reference
- **Necessary for functionality like:**
 - Geometric Networks
 - Topology
 - Terrains



Maintaining Data Integrity

Dataset Rules in the Geodatabase

- **To help promote data correctness:**
 - **Attribute rules**
 - **Domains**
 - **Subtypes**
 - **Relationship rules**
 - **Connectivity rules**
 - **Topology rules**
- **Stored on objects as part of the geodatabase**
- **Can programmatically perform custom validation**

Domains

Dataset Rules: Attribute Rules

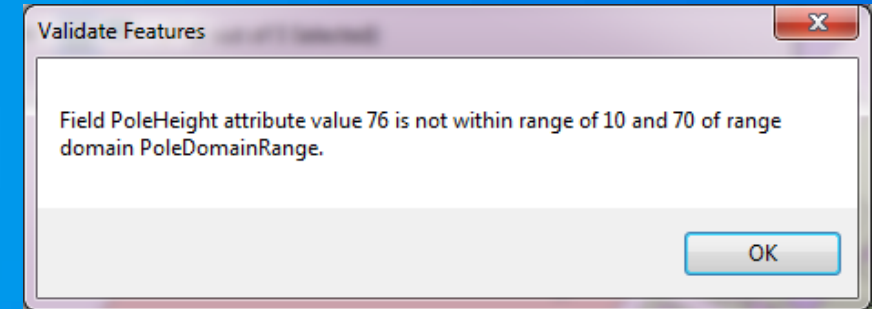
- **Describes the allowable values in a field**
 - **Used to ensure attribute integrity**

Domains

Dataset Rules: Attribute Rules

- Describes the allowable values in a field
 - Used to ensure attribute integrity

- Two types of domains:
 - Range : values between a min and max
 - The pole height is between 10 – 70
 - Coded Value : values chosen from a set list
 - The LandUse attribute may be [Commercial, Industrial or Residential]



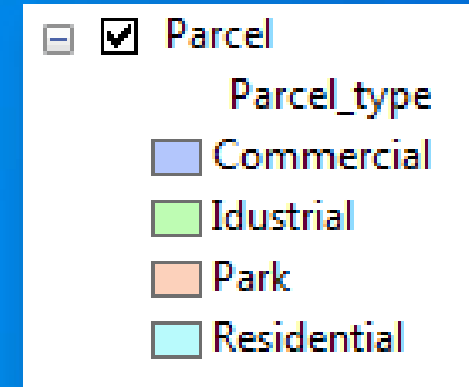
OBJECTID*	SHAPE*	SiteID	PoleHeight	ParcelID	LandUse
1	Point	0234	10	743422	Commercial
2	Point	0436	10	733121	Industrial
3	Point	0765	76	234251	<Null>
4	Point	0002	59	234674	Commercial
5	Point	0041	34	980765	Industrial

(0 out of 5 Selected)

Subtypes

Dataset Rules: Attribute Rules

- Categorize objects or features into groups
 - Share the same attributes
- Select an integer field to base the subtype on
 - Can have different default values and domains for each field
 - Can define behavior rules between subtypes



Feature Id	Geometry	TYPECODE	FNODE_	TNODE_	LPOLY_
1	Polyline	3	1	2	0
2	Polyline	1	3	4	0
3	Polyline	3	5	6	0
4	Polyline	3	7	8	0
5	Polyline	3	9	10	0
6	Polyline	3	11	12	0
7	Polyline	1	13	14	0
8	Polyline	3	15	16	0
9	Polyline	3	17	18	0
10	Polyline	3	19	20	0
11	Polyline	1	21	22	0



Subtype code
Service Laterals
Hydrant laterals
Service Laterals
Service Laterals
Service Laterals
Service Laterals
Service Laterals
Hydrant laterals
Service Laterals
Service Laterals
Service Laterals
Hydrant laterals

Relationship Classes

Dataset Rules: Relationships

- Association between objects
 - Objects may participate in multiple relationship classes
- Simple relationships and Composite relationships
- Associate rules with relationship classes
 - Each Parcel can have between 1 to 3 Buildings

OBJECTID *	PARCEL_ID *	METROSCAN
2230	5587	905 W La Cadena Dr
2447	5586	961 W La Cadena Dr
2289	5585	929 W La Cadena Dr
804	5569	889 W La Cadena Dr
2189	5533	865 W La Cadena Dr



ParcelToBuilding

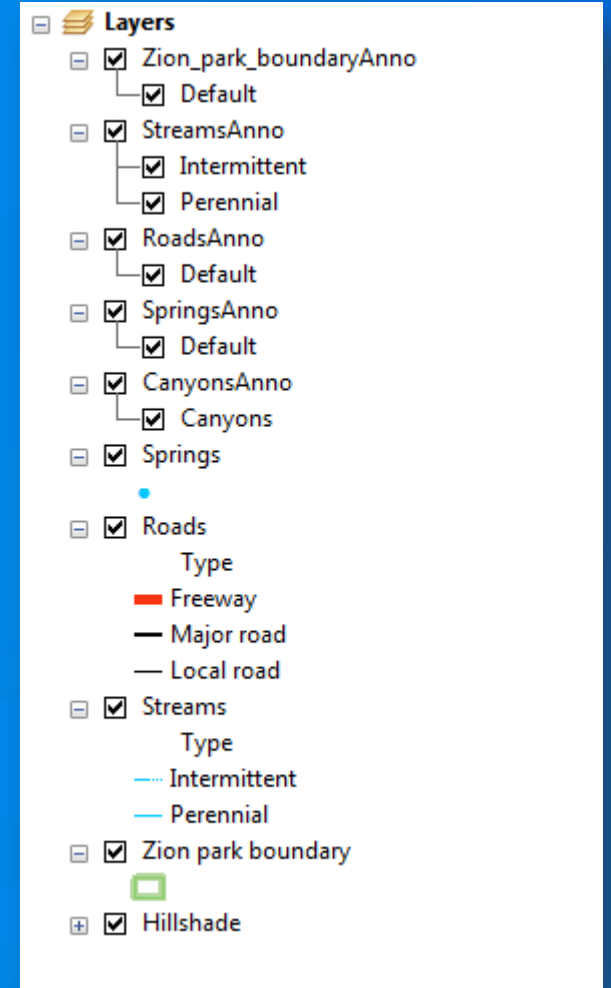
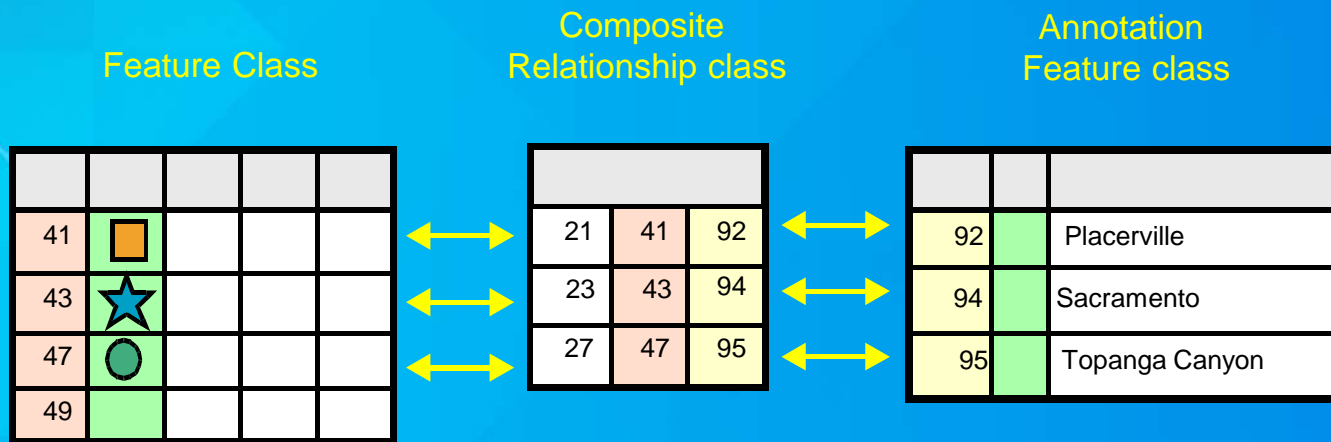


OBJECTID *	Shape *	Building_type	Parcel_ID_*
3598	Polygon	Industrial	5587
3601	Polygon	House	5470
3608	Polygon	House	5479
3619	Polygon	House	5204
3629	Polygon	House	5008

Annotation

Datasets in the Geodatabase

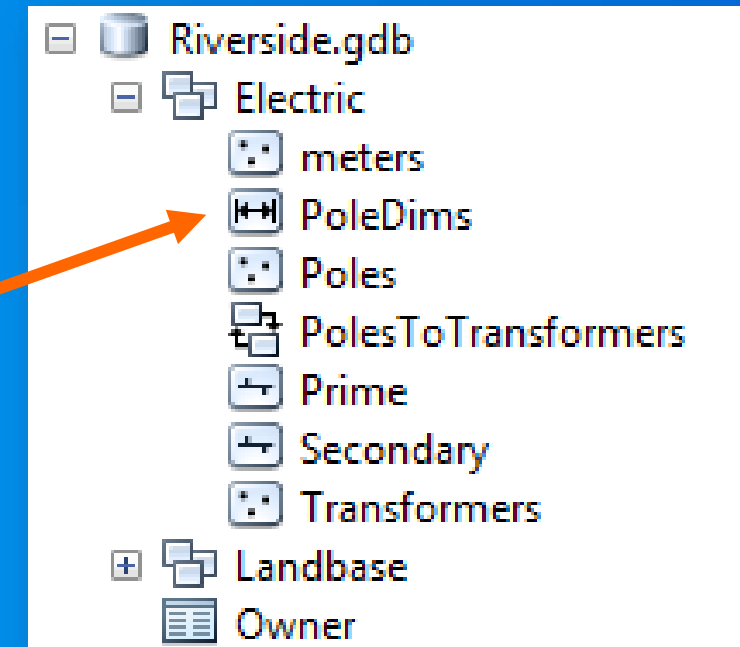
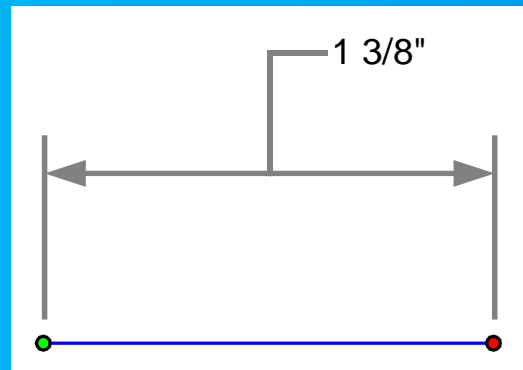
- Annotation feature classes
 - Placing text and graphics on the map
 - Feature linked or non-feature linked
- Composite relationship manages link
- Visible scale range



Dimension Features

Datasets Types in the Geodatabase

- An annotation that displays distances on a map
- Graphic features stored in a dimension feature class
 - Can be created automatically from features
 - Set of editing tools
 - Define a style, description of symbology



Exploring with a Geodatabase

Demo # 3: Sarah

- Feature Classes
- Subtypes
- Domains
- Relationship Classes

Summary

Inside the Geodatabase

- **Dataset Types**
 - **Objects, Feature Classes, Mosaics**
 - **Feature Datasets**
 - **Annotation and Dimensions**
- **Dataset Rules**
 - **Domains**
 - **Subtypes**
 - **Relationship Classes**

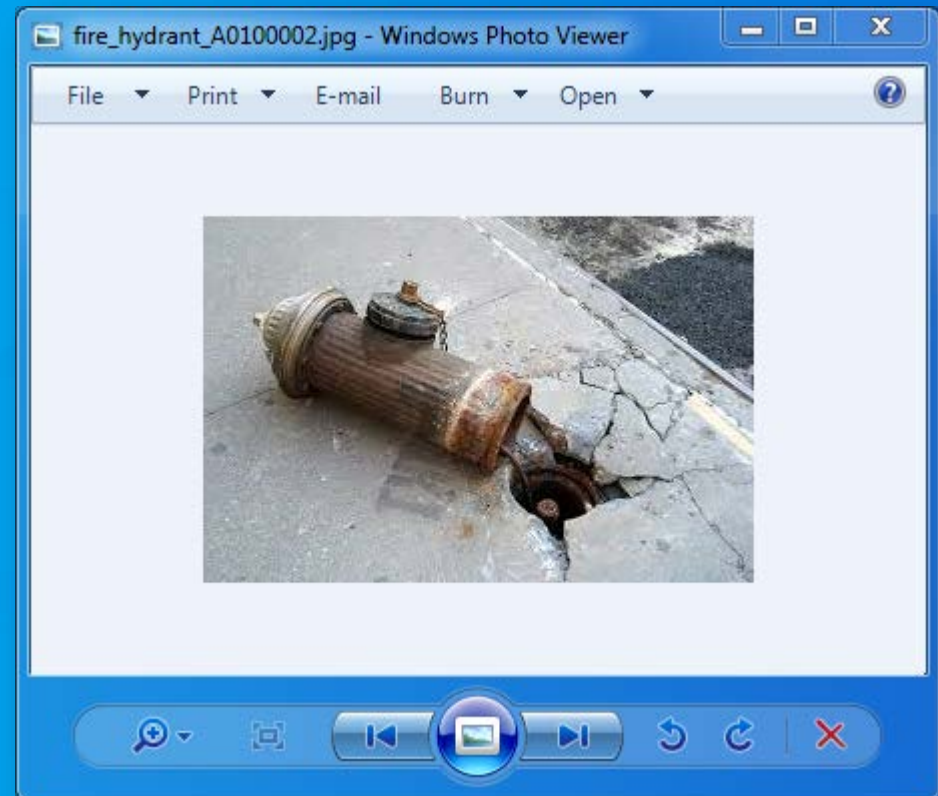
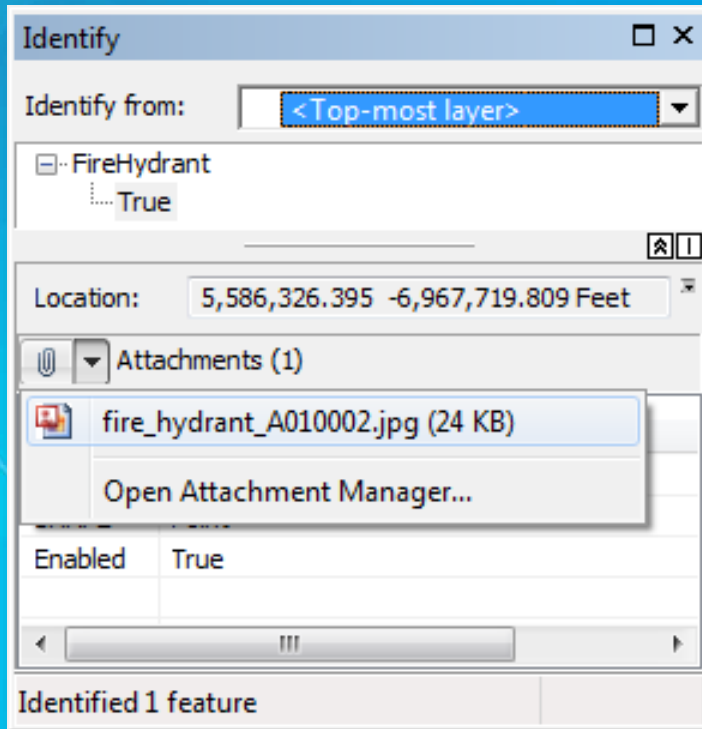
Advanced Behavior

- Attachments
- Geometric Networks
- Network Datasets
- Topology

Attachments

Advanced Behavior

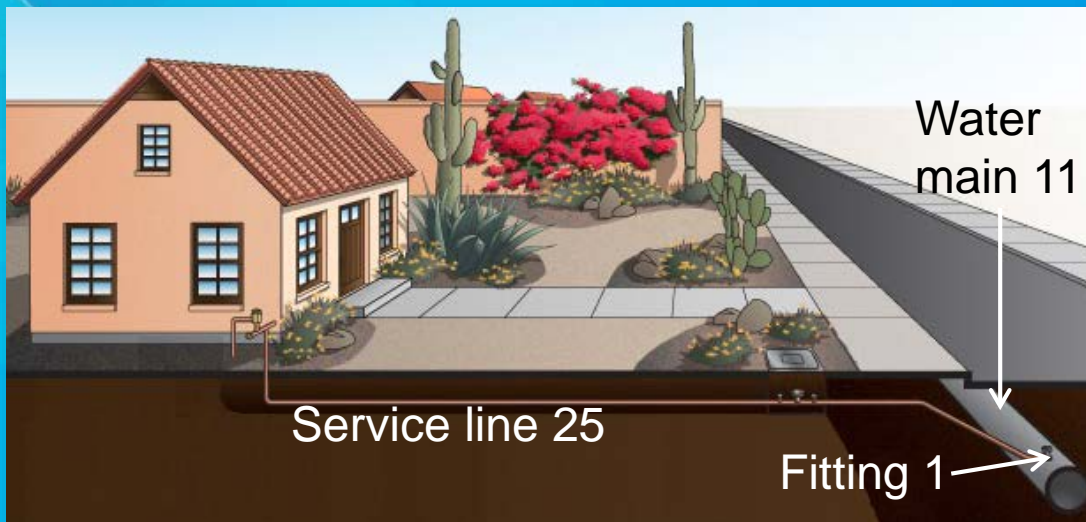
- Associate any type of file with a feature
- Can see attachment through the feature Identify tool
 - File types recognized by the OS, can be viewed in ArcMap



Geometric Networks

Advanced Behavior

- Uses edges and junctions to model network systems
 - Electric, gas, water, sewer, telecommunications, etc.
- Connectivity between features in the network
 - Based on geometric coincidence
 - May use connectivity rules
 - Connectivity is maintained on the fly



Water mains (Lines)

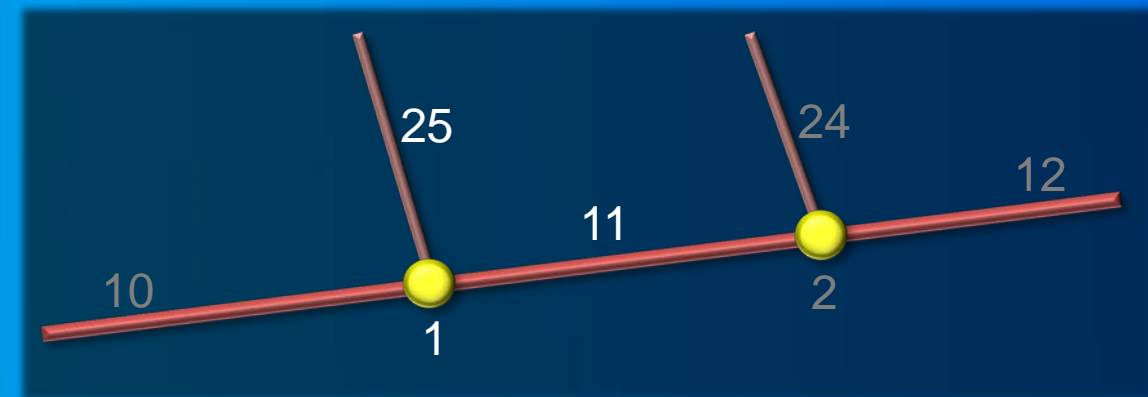
OID	Shape	Diameter	Material
10		8	Concrete
11		10	PVC
12		8	Concrete

Water fittings (Points)

OID	Shape	Equip ID	Valve Type
1		816-32	T203
2		816-45	Y53

Water service (Lines)

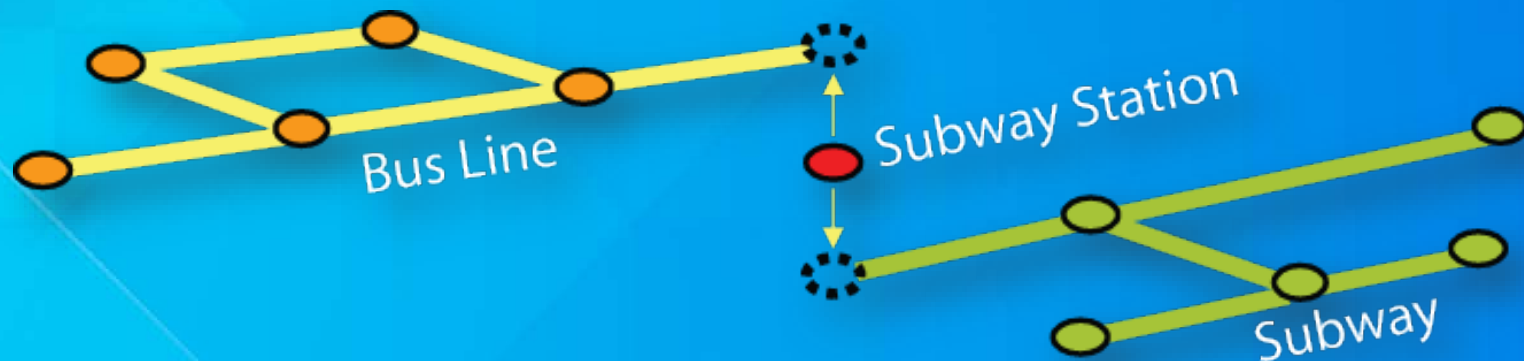
OID	Shape	Service ID	Material
24		1001	Cast iron
25		1002	Copper



Network Datasets

Advanced Behavior

- Models transportation networks using edges and junctions
- Account for characteristics such as travel time, restrictions and speed
- Multimodal scenario capabilities
 - Points span multiple connectivity groups
 - Used to create connectivity between lines in different groups

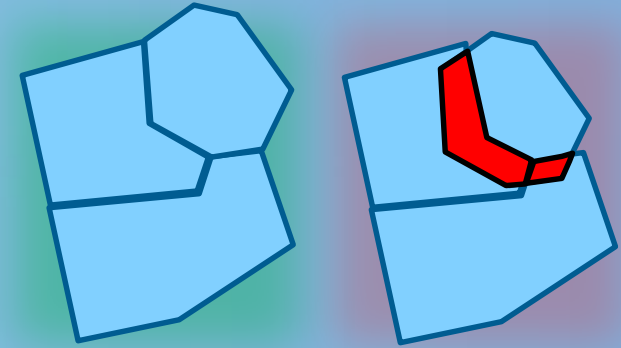


Geodatabase Topology

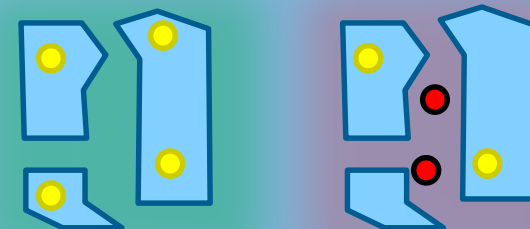
Advanced Behavior

- Topology manages how features share geometry
- Enforces data integrity using rules
 - Define rules to constrain how features share geometry
 - Validate features against rules
- Topological errors
 - Rule violations are expressed as red features

Rule: Must not overlap



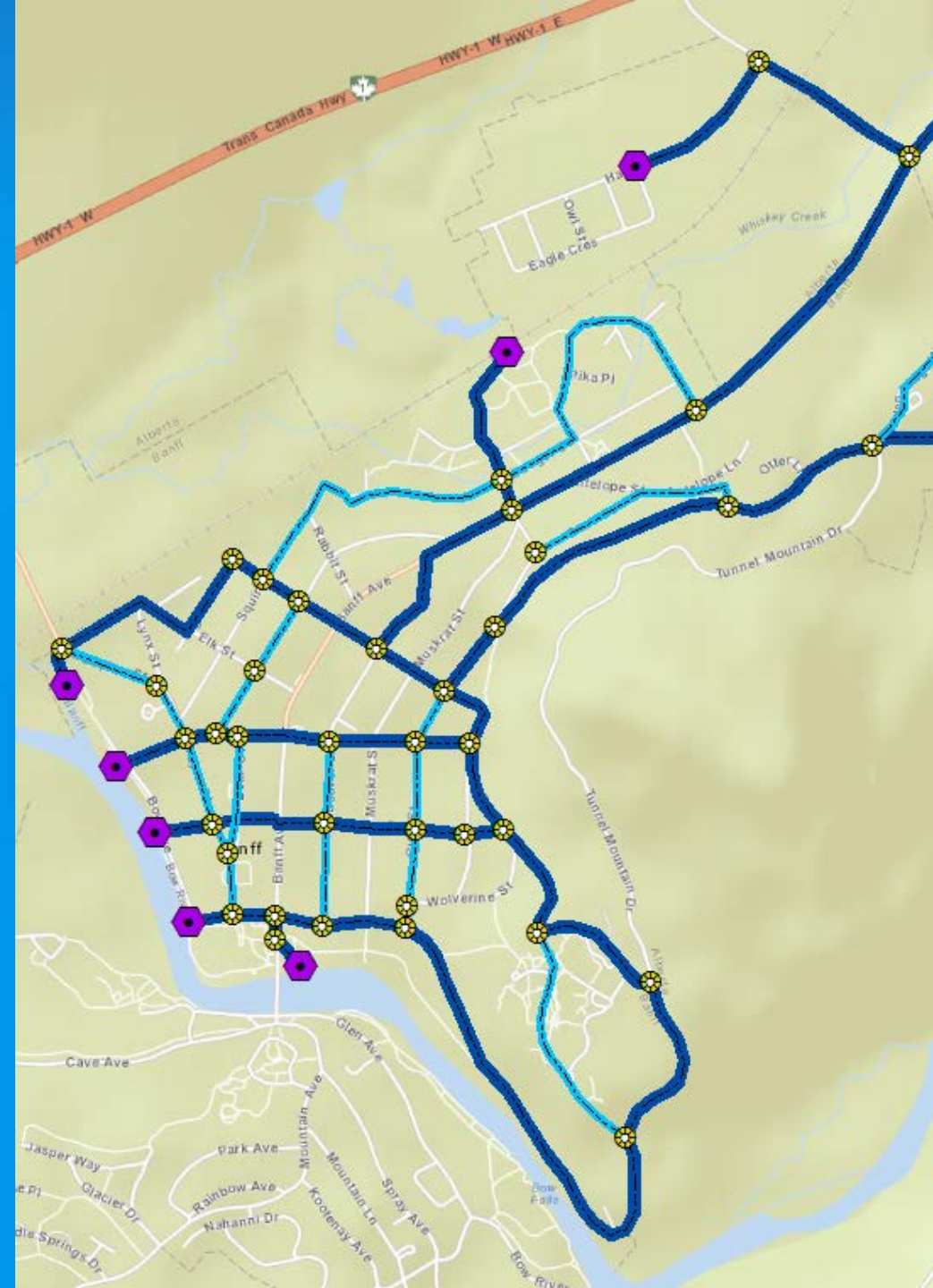
Rule: Must be contained



Advanced Geodatabase Behavior

Demo # 4: Kaitlin & Sarah

- Attachments
- Geometric Network
- Topology



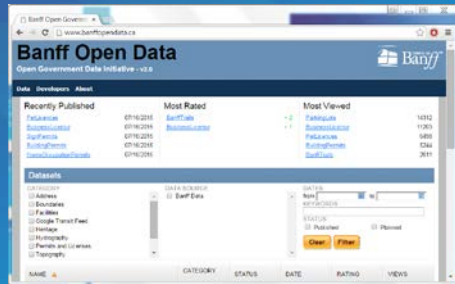
Summary

Advanced Behavior

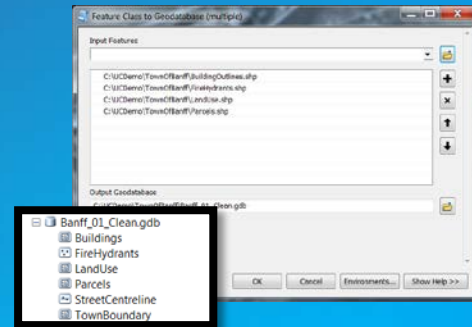
- **Attachments**
- **Geometric Networks**
- **Network Datasets**
- **Topology**

Demo Review

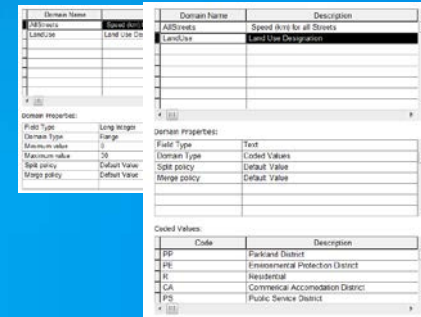
The Geodatabase : An Introduction



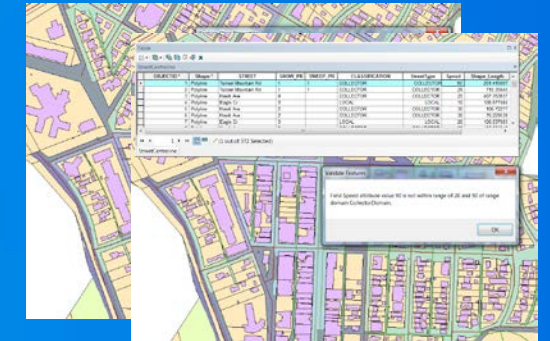
Downloaded free data as shapefiles



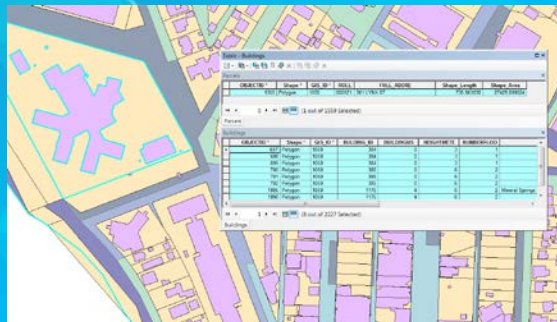
Imported data into a file geodatabase



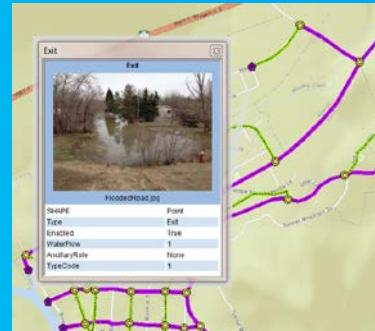
Created domains to constrain allowable values



Applied subtypes and domains to subtypes



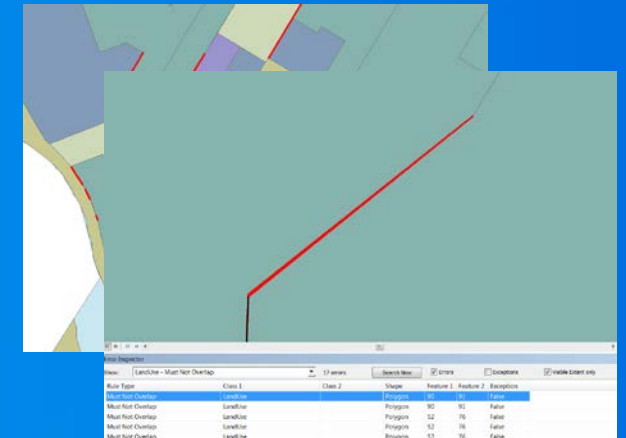
Created a relationship class to relate 2 feature classes



Attached a file to a feature class



Modelled water network data to trace flow



Created a topology to create rules to model geometric relationships



Understanding our world.