CAD/GIS Interoperability

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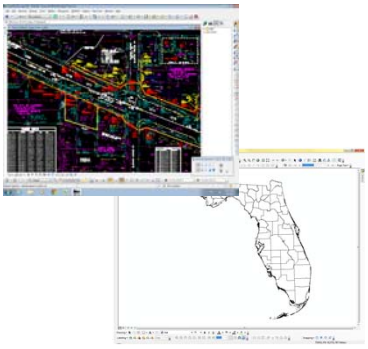
Presentation Overview

- ✓ Background
- ✓ Research
  - TTI's Research Overview
- ✓ CADD to GIS
  - Interoperability
    - Requirements
    - Goals
    - Tools
  - Summary

Background

The Florida Department of Transportation (FDOT) requires standardized electronic delivery of Design Plans through CADD.

With the advancement of the GIS Enterprise View (GEV) utilizing the FDOT Enterprise GIS Framework and the technology upgrades to CADD platforms supporting the interoperability between these environments, a path for sharing data has evolved so that users in both environments can benefit.



Background

- In 2011 started looking for a way to put everything Right of Way (ROW) related into our new enterprise GIS framework looking backward to historic records
- We had some success in manipulating the CADD line work for ROW acquisitions into a GIS environment, but the work was tedious and time consuming
- Utilities (a highly desired data set) would be even more tedious

Research

- Brought in Texas A&M Transportation Institute (TTI) to examine our current system, practices and processes
- We wanted them to develop a strategic implementation plan to manage ROW parcels and utility data
- Including a process, workflow and a tool to hopefully **"automate"** bringing this historical data (CADD line work) into a GIS environment and to give it intelligence
- This research project is now complete

TTI's Research Overview

- They conducted site visits and interviews with staff in Surveying and ROW Mapping, ROW Administration and Utilities in three FDOT Districts concerning
  - ✓ Business processes
  - ✓ Systems
  - ✓ Information concerning management of ROW and Utility data
- Collected CADD Files and Documents with recorded work flows and product development routines

TTI's Research Overview

- Developed detailed lists of levels, cells, and attributes of our CADD mapping standards to include version releases and annual FDOT CADD standards changes
- Developed database tables, routines, and menus, that extract CADD information that would be desired in the GIS environment

TTI's Research Overview

Recommendations:

- Use of existing survey and GEOPAK data to generate parcel shapes in MicroStation for later use in other applications including GIS
- Database approach for managing design libraries and levels in MicroStation in order to link information in addition to attribute data such as projects and related documents
- Steps for integrating existing parcel and utility data into FDOT's enterprise GIS framework

GIS to CADD

- We anticipate that we will one day want the ability to reference all or some amount of historical layers such as
  - ✓ Survey Control,
  - ✓ Parcels,
  - ✓ Aerials,
  - ✓ ROW,
  - ✓ Roadway,
  - ✓ Easements,
  - ✓ Utilities, and Permit Agreements

GIS to CADD

- Technology is moving in the direction of being able to deal with these types of items in a “feature” based environment
- This information could be of great value in areas of informed decision making or those that may create high amounts of public record requests
- Both Bentley and AutoCAD platforms now have the functionality to directly support referencing of GIS data into the CADD environment and visa versa

CADD to GIS "Interoperability"

So…..

- How can we integrate CADD Survey/Engineering data that's symbolized specifically to create a set of design plans for construction so that elements of that design can be visualized/attributed and thereby successfully used in a Geographic Information System?

CADD to GIS Interoperability Requirements

- Before we can begin to answer that question we must first have an understanding of what it is that GIS requires in order to visualize and geospatially query information
  - ✓ GIS uses relational tables of records that are geospatially aware
  - ✓ Along with linked attribute data
- In short---

Attributes Data Intelligence

- So that means that we must somehow create outputs in the CADD environment to meet these requirements

CADD to GIS Interoperability Requirements

- By incorporating GIS workspaces into our current workflow
- Harnessing the tools available in our latest licensed CADD products (MicroStation Power GeoPak/Map & AutoCAD Geospatial) giving us the ability to generate GIS compliant data
- That is data that is both
  - ✓ Geospatially aware, and
  - ✓ Has attributes

CADD to GIS Interoperability Goals

- Use existing licensed products (both CADD and GIS)
- Reach out and determine all potential stakeholders to data
  - ✓ There may be some who traditionally were not interested or didn't have a need to mine CADD data from design plans as they were not CADD users and the data had no intelligence

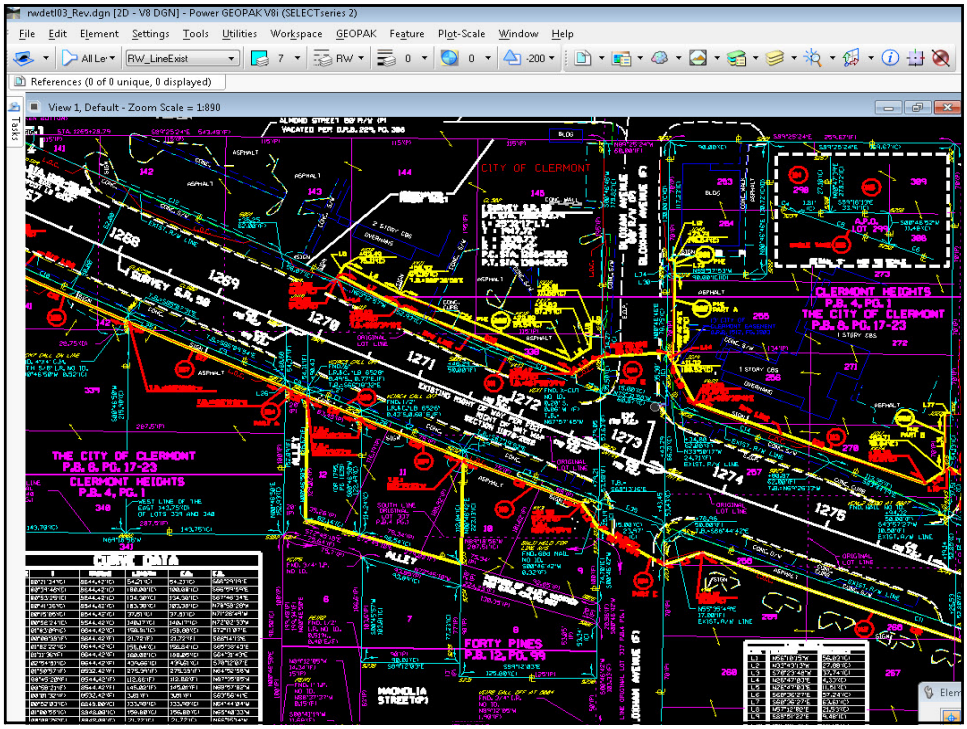
CADD to GIS Interoperability Goals

- User assessment to identify initial need and priority of GIS features
  - ✓ Start small
    - Right of Ways
    - Parcels (both right of way and excess)
    - Alignments
- Determine workflows, and
- Build tools and workspaces in FDOT CADD platforms for creating these GIS features

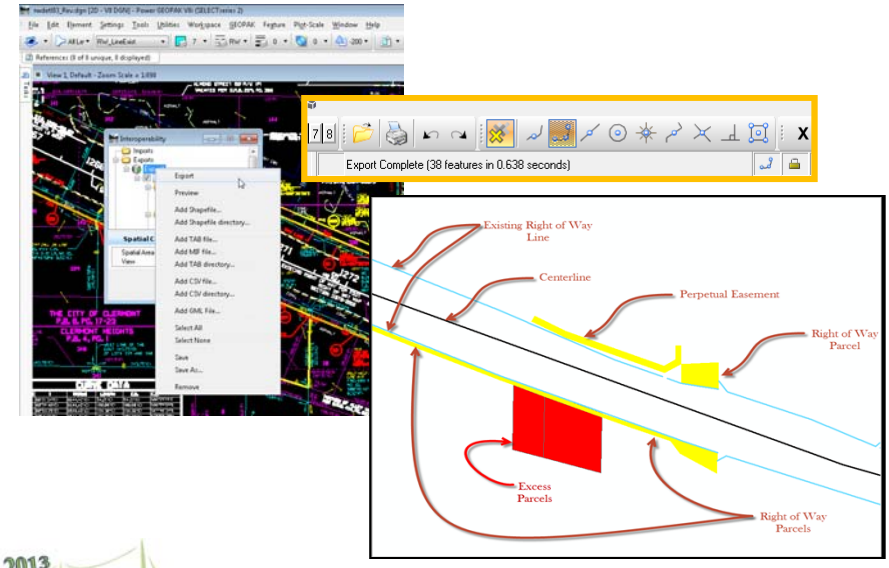
CADD to GIS Interoperability Tools

- Following are examples showing tools CADD designers can use to create
  - ✓ GIS compliant features (intelligent features), or
  - ✓ To promote existing CADD elements to GIS features with associated attribute data

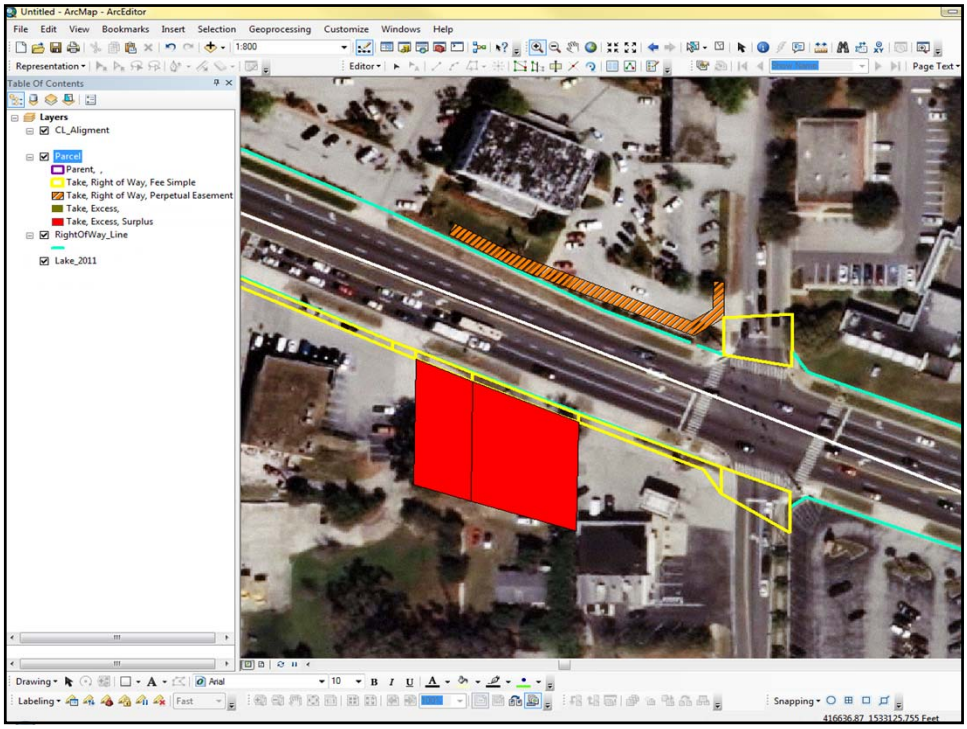
(Shown is the Bentley platform using MicroStation Power GeoPak/Map, but AutoDesk has similar functionality.)



CADD Components Exported as GIS Features

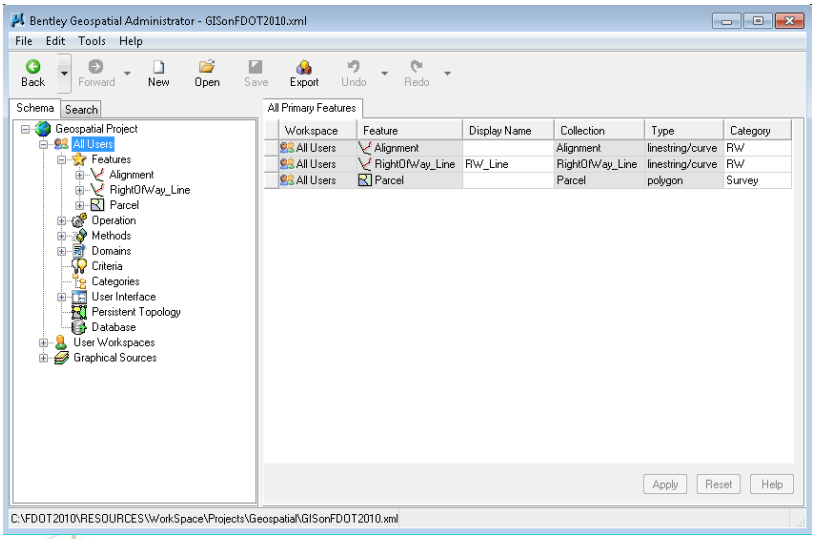


2013 Design Training Expo



Baby Steps

- Using Bentley Geospatial Administrator
  - ✓ Build GIS workspace
    - Create features
      - Parcels (polygons)
      - Right Of Way Lines (line)
      - Alignment (line)
    - With Attributes (intelligent data creation)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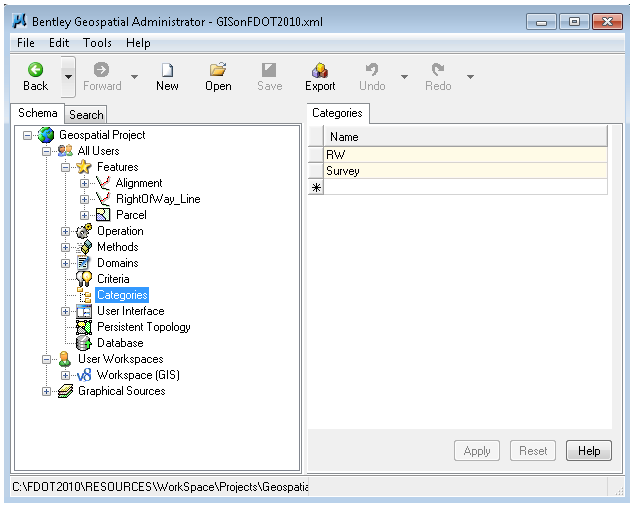
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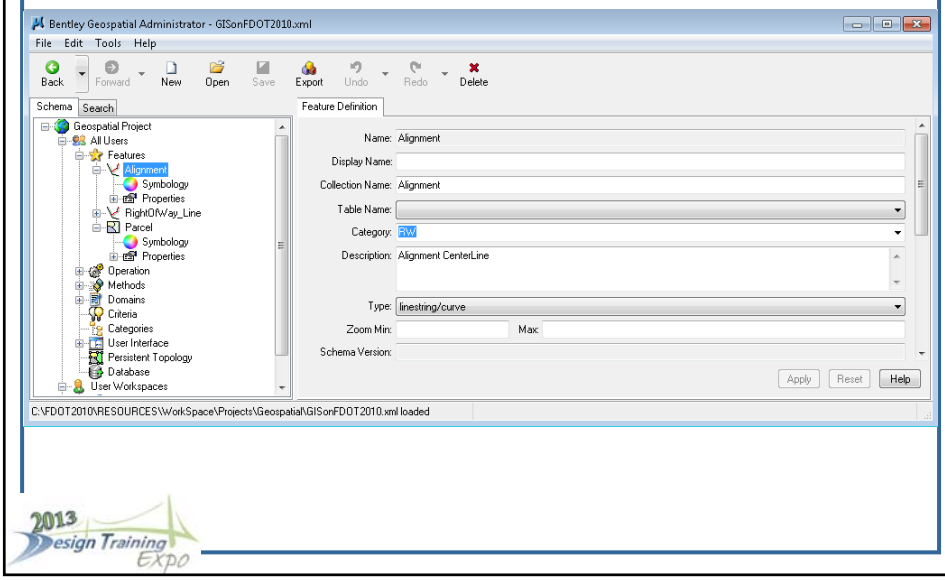
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User Interface
Persistent Topology
Database
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Feature Definition
Name: Alignment
Display Name:
Collection Name: Alignment
Table Name:
Category: ROW
Description: Alignment CenterLine
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Zoom Min: Max:
Schema Version:
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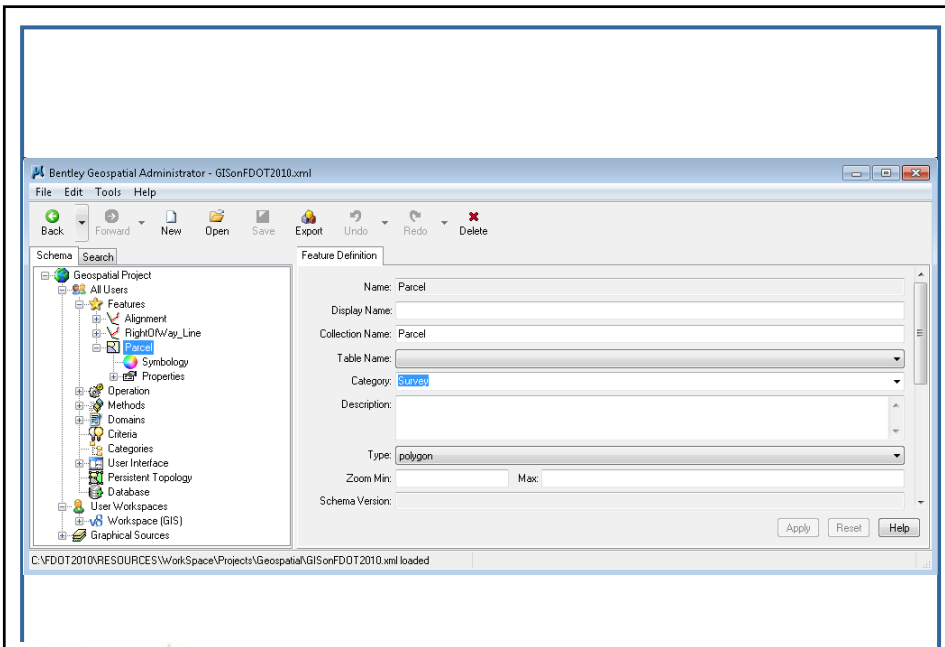
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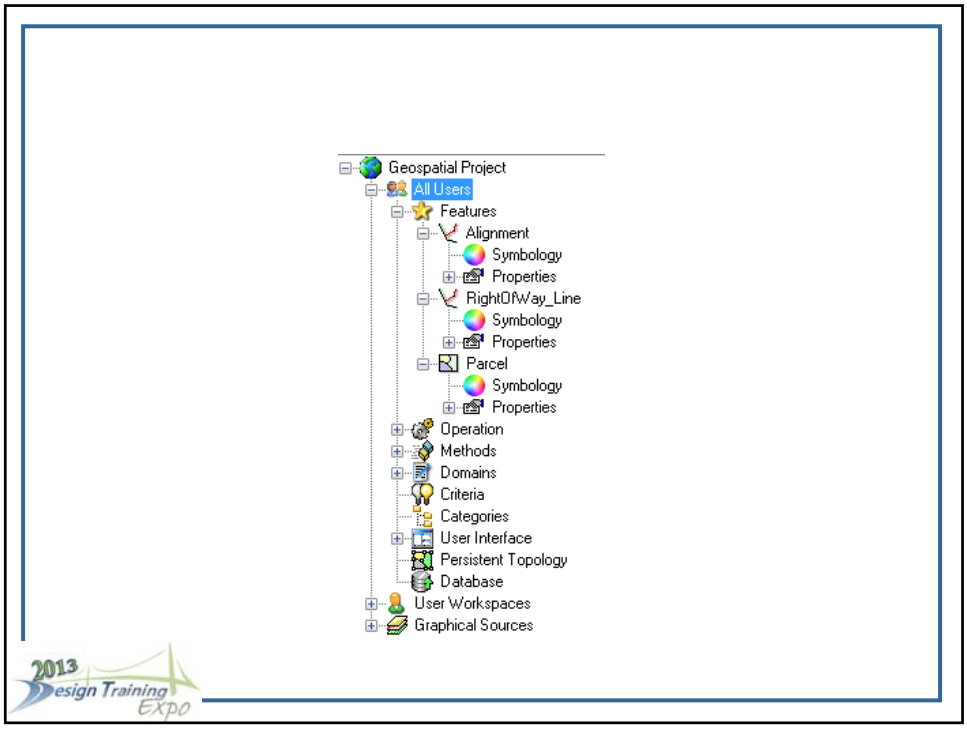
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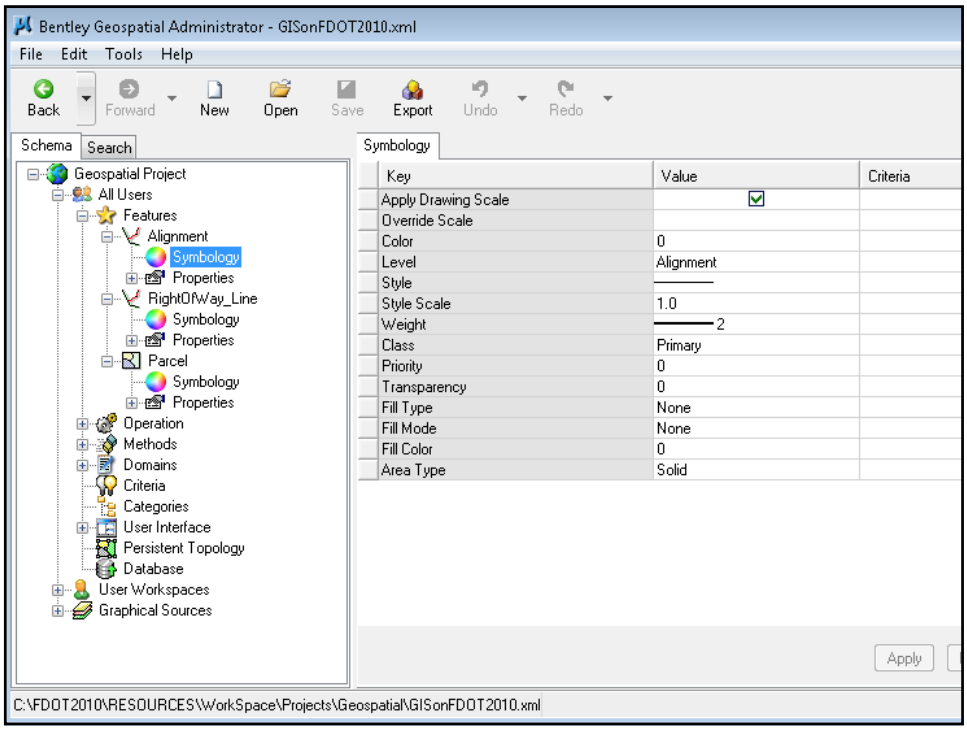
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Apply Drawing Scale
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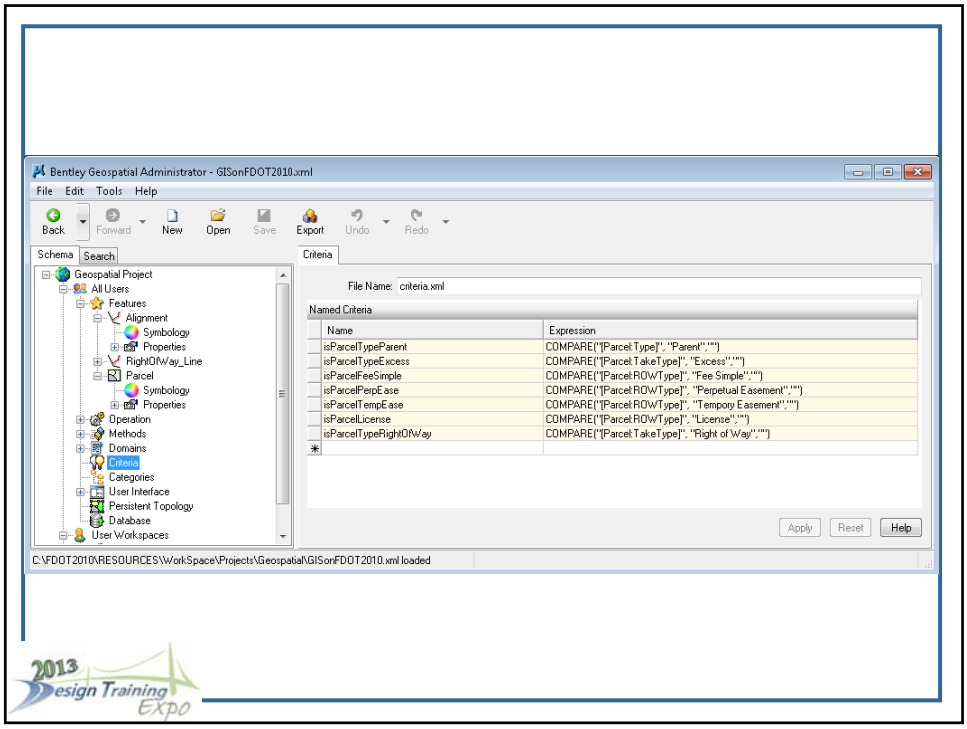
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Criteria
File Name: criteria.xml
Named Criteria
Name
Expression
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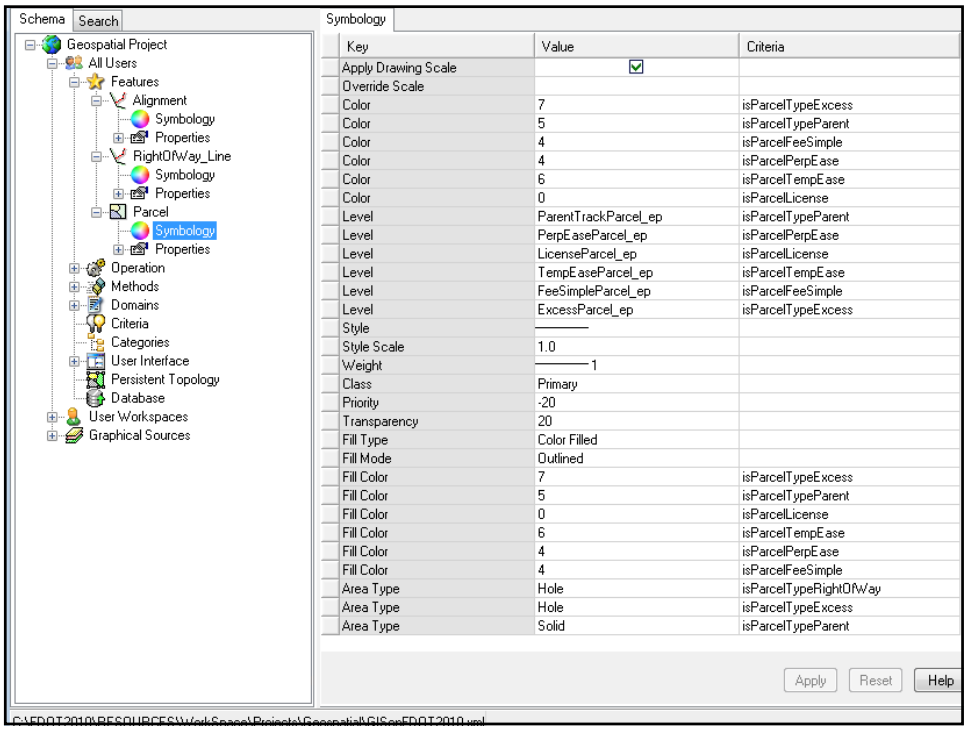
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Override Scale
Color 7 isParcelTypeExcess
Color 5 isParcelTypeParent
Color 4 isParcelFeeSimple
Color 4 isParcelPerpEase
Color 6 isParcelTempEase
Color 0 isParcelLicense
Level ParentTrackParcel_ep isParcelTypeParent
Level PerpEaseParcel_ep isParcelPerpEase
Level LicenseParcel_ep isParcelLicense
Level TempEaseParcel_ep isParcelTempEase
Level FeeSimpleParcel_ep isParcelFeeSimple
Level ExcessParcel_ep isParcelTypeExcess
Style
Style Scale 1.0
Weight 1
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Fill Mode Outlined
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Fill Color 0 isParcelLicense
Fill Color 6 isParcelTempEase
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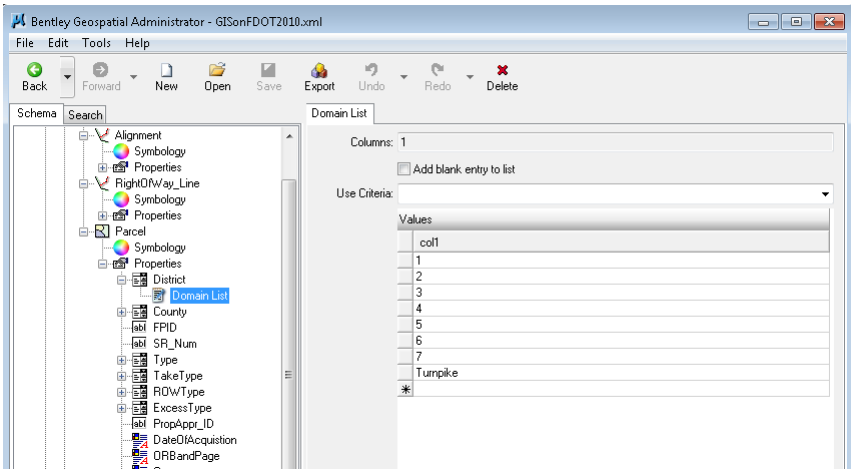
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Properties
District
Domain List
County
FPID
SR_Num
Type
TakeType
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ExcessType
PropAppr_ID
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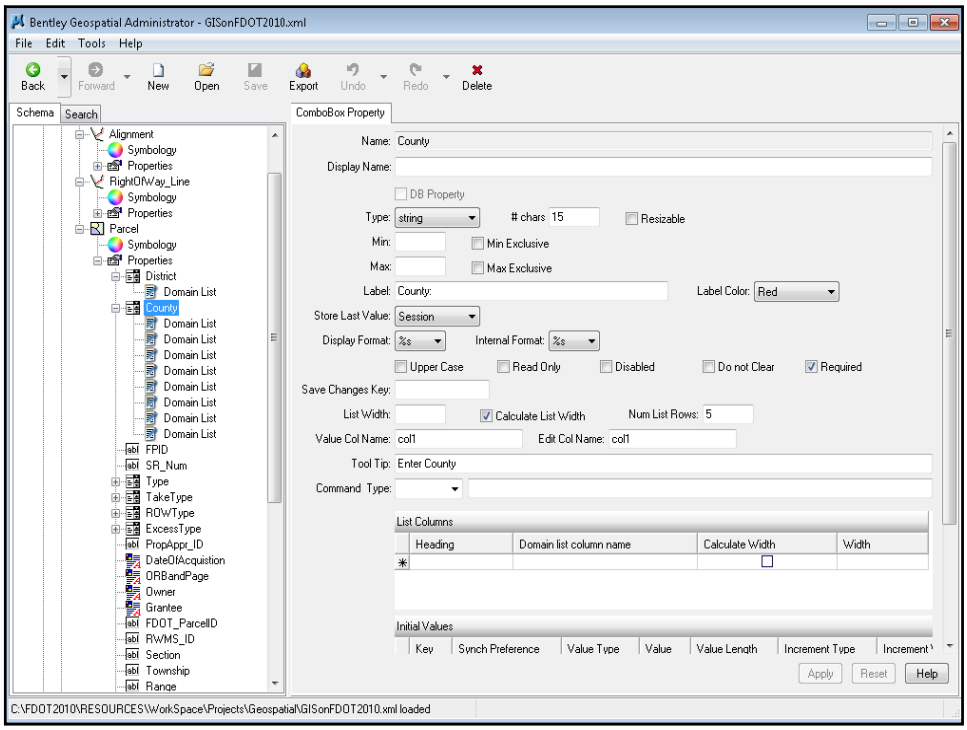
Values
col1
1
2
3
4
5
6
7
Turnpike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Display Name:
DB Property
Type: string
chars 15
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Min:
Min Exclusive
Max:
Max Exclusive
Label: County:
Label Color: Red
Store Last Value: Session
Display Format: %s
Internal Format: %s
Upper Case
Read Only
Disabled
Do not Clear
Required
Save Changes Key:
List Width:
Calculate List Width
Num List Rows: 5
Value Col Name: col1
Edit Col Name: col1
Tool Tip: Enter County
Command Type:
List Columns
Heading
Domain list column name
Calculate Width
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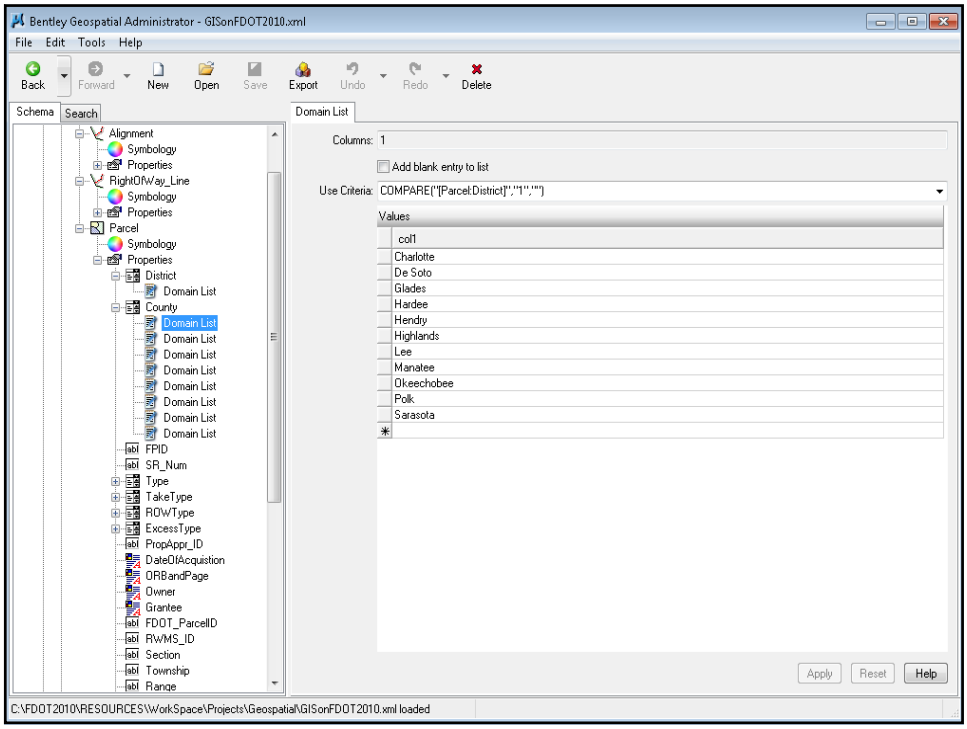
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Charlotte
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Glades
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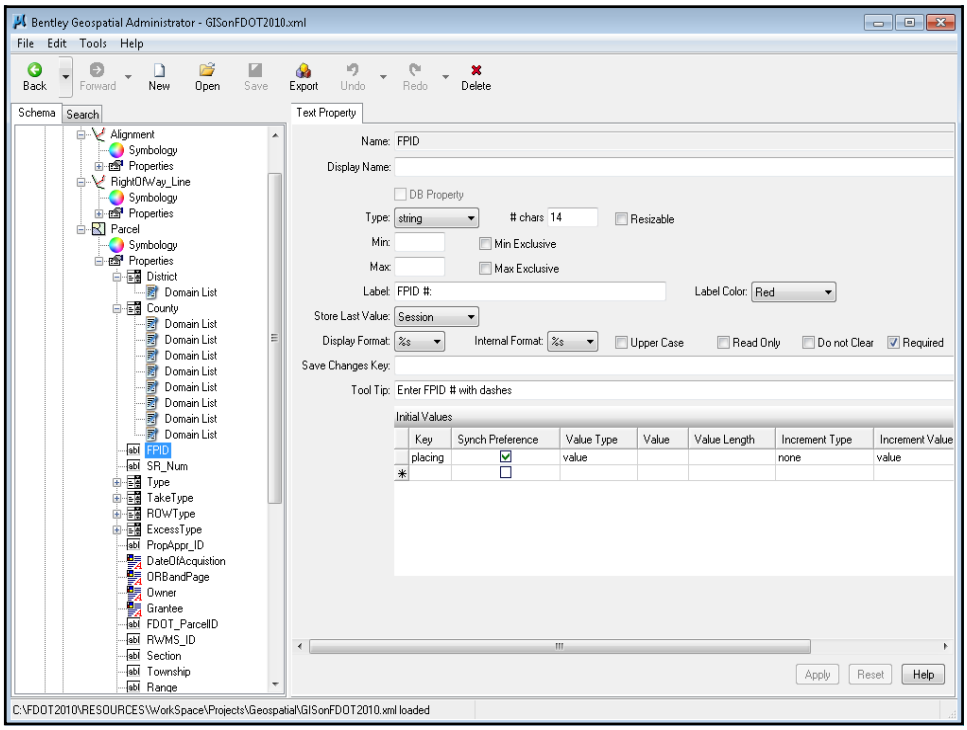
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Display Name:
DB Property
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Resizable
Min:
Min Exclusive
Max:
Max Exclusive
Label: FPID #:
Label Color: Red
Store Last Value: Session
Display Format: %s
Internal Format: %s
Upper Case
Read Only
Do not Clear
Required
Save Changes Key:
Tool Tip: Enter FPID # with dashes
Initial Values
Key
Synch Preference
Value Type
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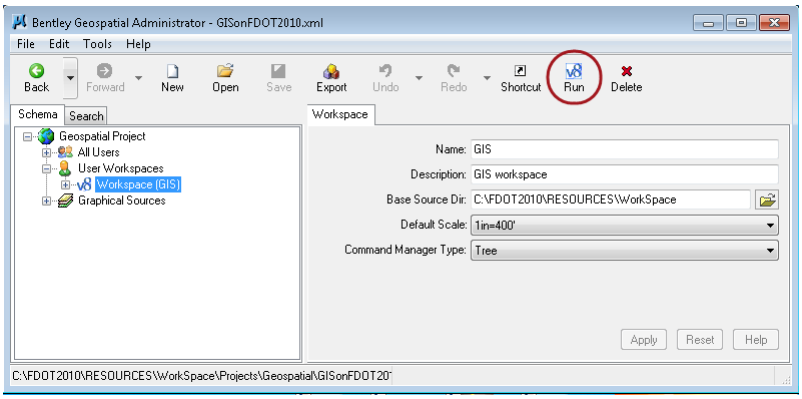

Drafting GIS Features

- Then using Bentley Map (remember I am showing MicroStation Power GeoPak/Map) you have new geospatial tools like:
  - ✓ Interoperability tools
    - Map Manager
      - Lets you attach files and features from any supported graphical source (such as vector maps and raster images) and manage feature display
    - Feature tab
    - Command Manager
      - Allowing you to place, edit, promote, analyze and browse features

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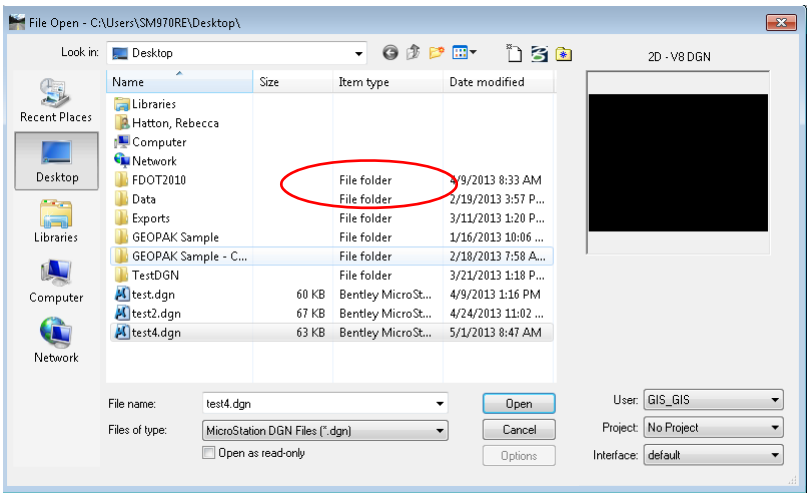
File Open - C:\Users\SM970RE\Desktop\
Look in: Desktop
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Recent Places
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FDOT2010 File folder 4/9/2013 8:33 AM
Data File folder 2/19/2013 3:57 P...
Exports File folder 3/11/2013 1:20 P...
GEOPAK Sample File folder 1/16/2013 10:06 ...
GEOPAK Sample - C... File folder 2/18/2013 7:58 A...
TestDGN File folder 3/21/2013 1:18 P...
test.dgn 60 KB Bentley MicroSt... 4/9/2013 1:16 PM
test2.dgn 67 KB Bentley MicroSt... 4/24/2013 11:02 ...
test4.dgn 63 KB Bentley MicroSt... 5/1/2013 8:47 AM
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Files of type: MicroStation DGN Files (*.dgn)
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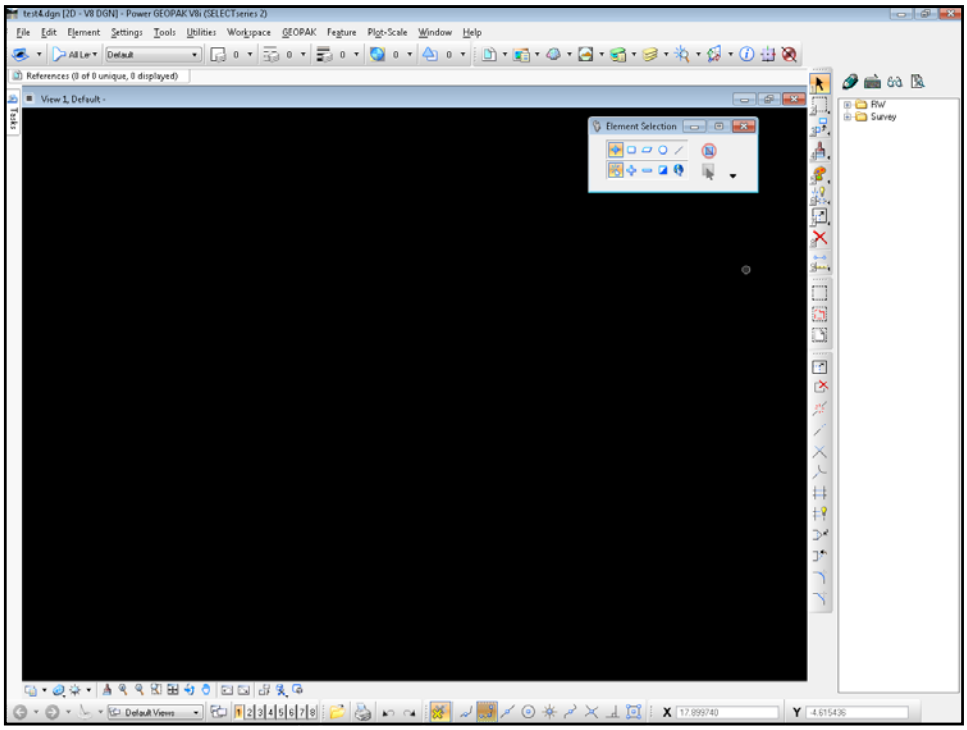
Open
Cancel
Options
User: GIS_GIS
Project: No Project
Interface: default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View 1, Default
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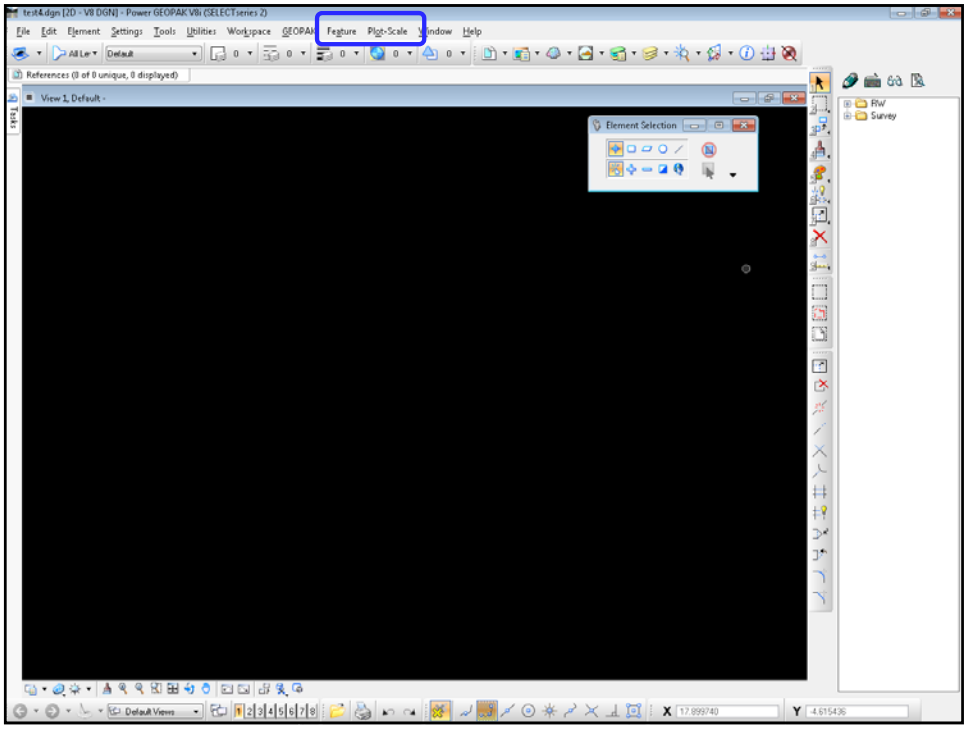
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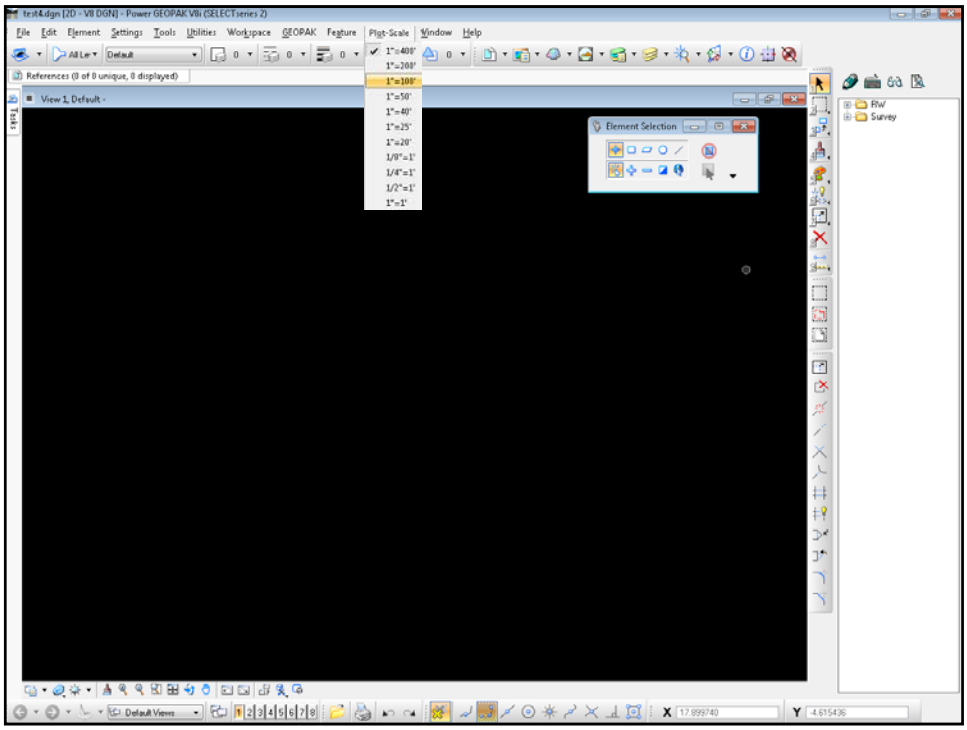
Survey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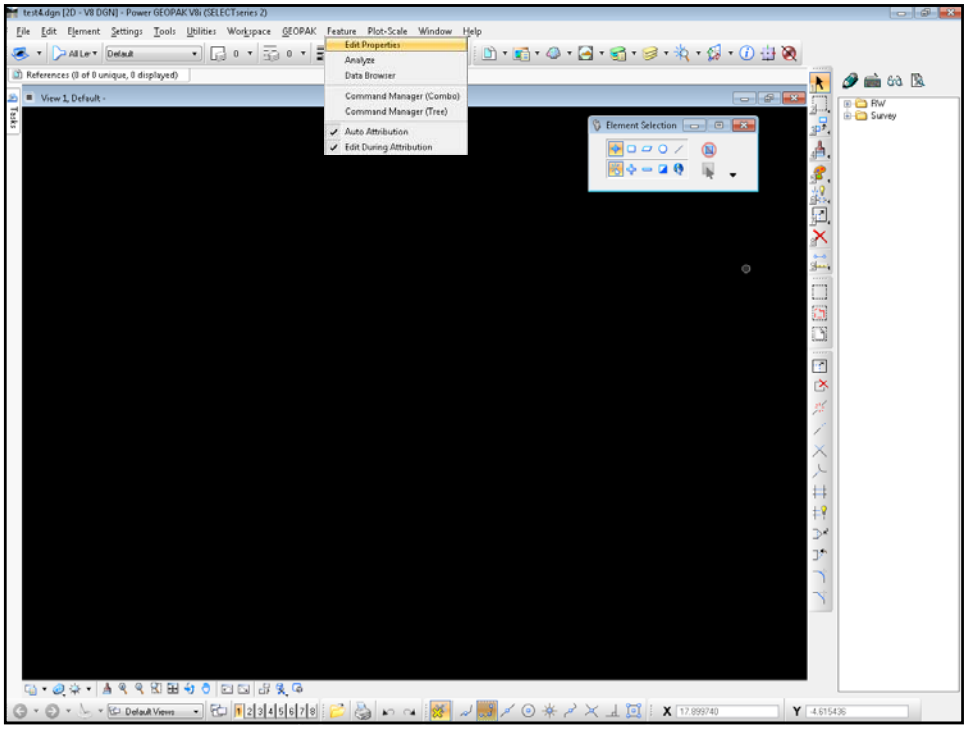
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Command Manager (Tree)
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View 1, Default
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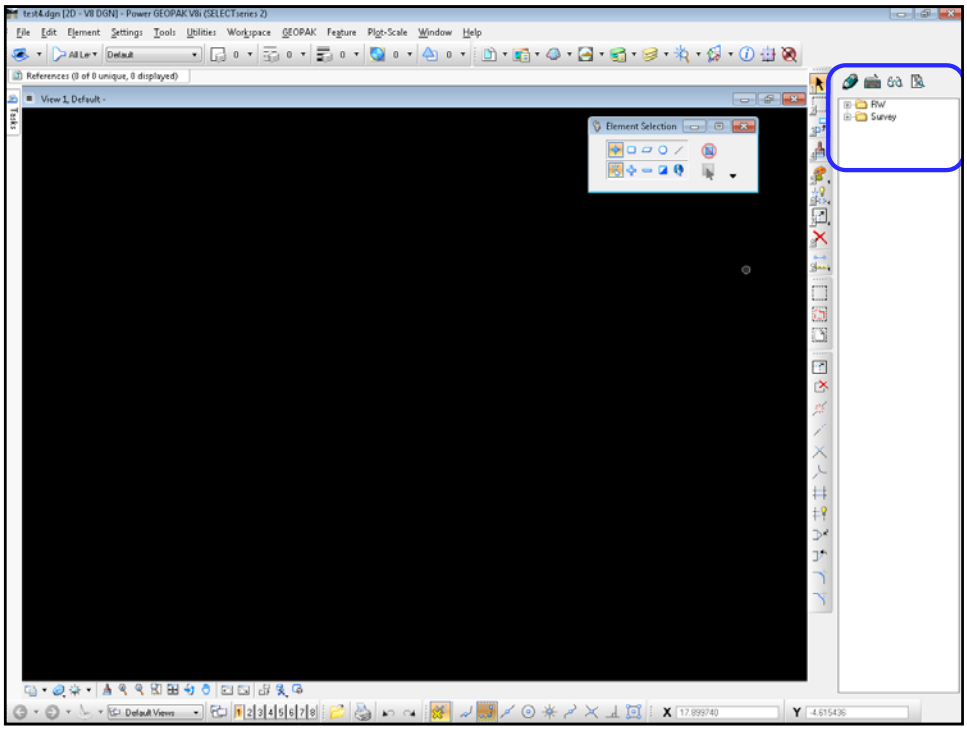
Survey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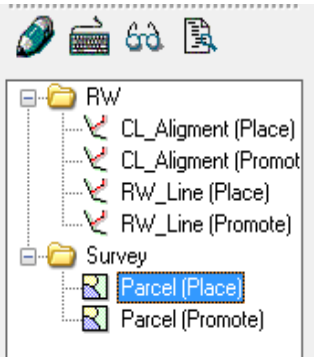
View 1, Default
Element Selection
RW
Survey

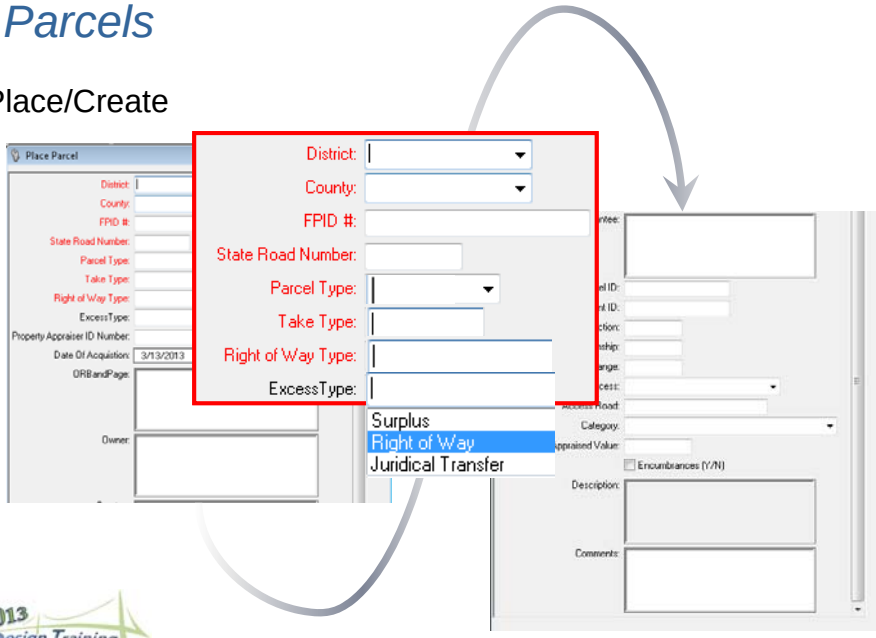
Command Manager in MicroStation



Note: Commands are categorized by discipline in this example, but could be categorized/organized in other ways.

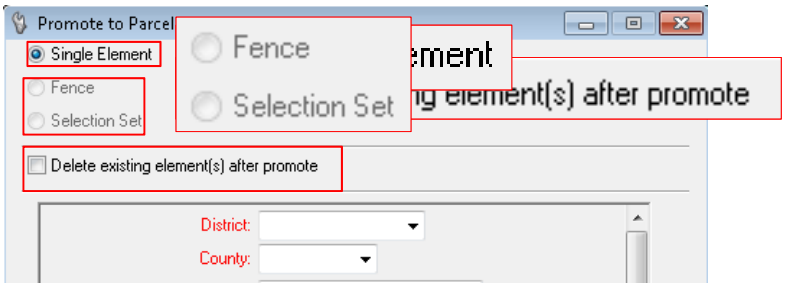
Parcels

Place/Create



Parcels

Promote Existing to Parcel



CADD to GIS Interoperability Summary

- FDOT is looking to develop a process/workflow that allows both our CADD and GIS environments to interchange/share data
- Benefiting our customers in both environments
- We see this information becoming a:
  - ✓ One stop shop for public records requests, and
  - ✓ Allowing better collaborative decision making tools with stakeholders,
    - whether through technical (data only in the form of tables or queries) or having a GIS/Thematic look (for display)

CADD to GIS Interoperability Summary

- ✓ Enhanced querying activities to quickly support FDOT's consultants, partners, and customers
- ✓ Knowing what is in our ROW by going to **ONE** place, with links to:
  - maps,
  - aerials,
  - documents and
  - metadata
- ✓ Resulting in cost savings in the areas of:
  - record management,
  - staff hours, and
  - informed decision making

Questions:

Contact:

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