Simplifying CADD/GIS Integration within KYTC

Jeremy Gould

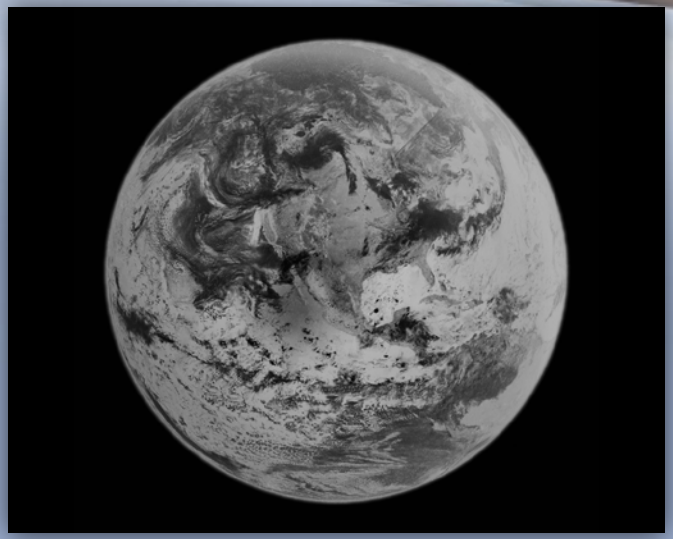
KYTC Office of Information Technology

Topics

- CAD vs. GIS
- KYTC Current Integration State and Challenges
- Technology Prospects and Advancements Worth Noting
- KYTC Custom Solutions\Tools for Interoperability
- Mobile GIS/CAD with CarryMap
- Summary

CAD vs. GIS

VS



CAD

Engineering software, usually used to develop detailed drawings of how a civil service should be constructed
(DESIGN ROADS)

GIS

Software used to manage this civil service and answer questions about its attributed data
(MANAGE ROAD DATA)

CAD vs. GIS

- Common Ground
  - Both systems contain spatial information (whether it be graphic elements or spatial attribute data)
  - Both systems are used to solve problems about the earths land and resources

KYTC Integration Challenges

- GIS
  - Multiple GIS formats and storage locations for different needs
    - Enterprise Spatial Databases
      - SDE
      - Oracle
      - SQL
    - File/Personal Geodatabases
    - Shapefiles
    - Other (KML,CSV…etc)
  - Inability of ArcGIS to cleanly read Microstation DGN's
    - KYTC CAD Standards

KYTC Integration Challenges

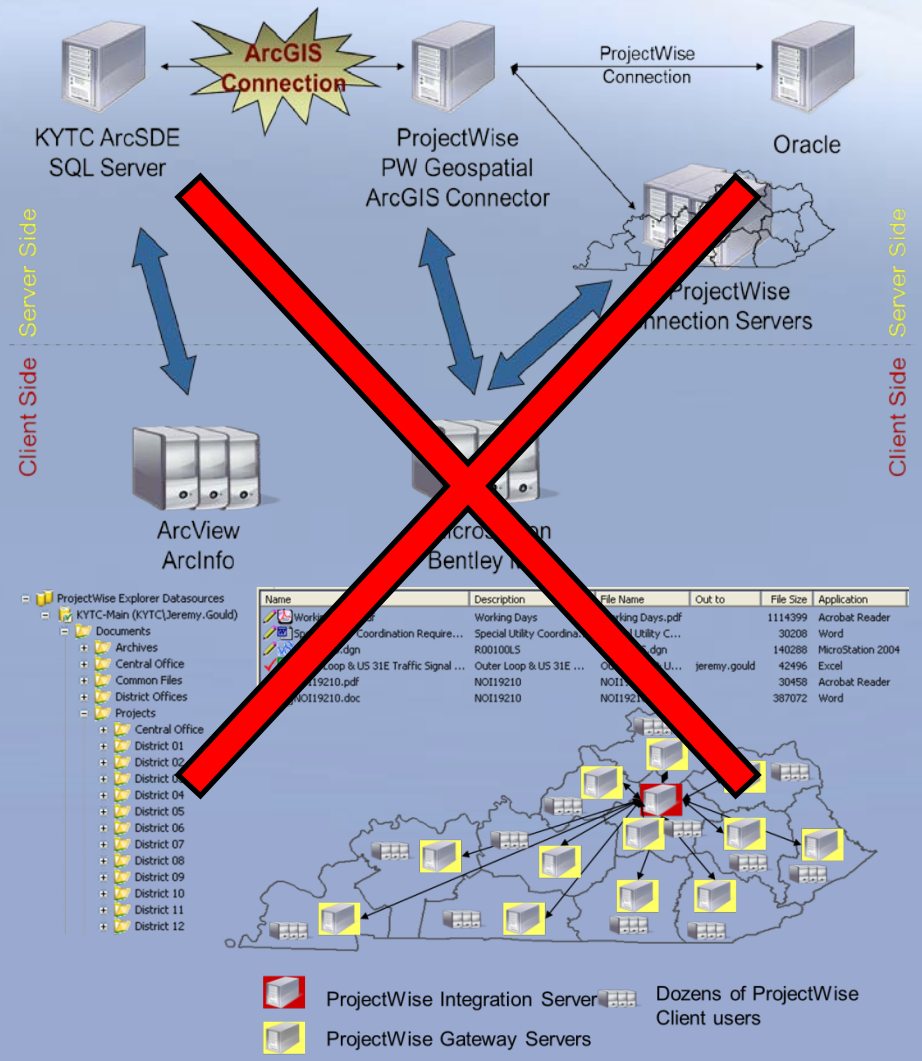
- CAD
  - 80%-90% of project work is done off site by consultants
  - Deliverables are Electronic (DGN) Project Plan Sheets
    - Multiple plan sheets for one project
    - Much of RAW information needed is stored in InRoads, NOT Microstation
    - No intelligence within the DGN file (attribute information)
  - Project Storage within KYTC
    - Projectwise houses files (when delivered from consultants)
    - Minimal standardization to query project data
  - Project Design Life Cycle
    - Design (DGN) data is needed at different stages of the project
    - Final product should be As-Built plans (currently in different formats)
  - Projections/Project Datum Factors

KYTC Integration Challenges

- Training
  - General differences between CAD and GIS
  - How to use any existing solutions within the software
  - Notification and use of custom tools
- Security
  - Managing and sharing secured data

Bentley ArcGIS Connector
ABANDONED

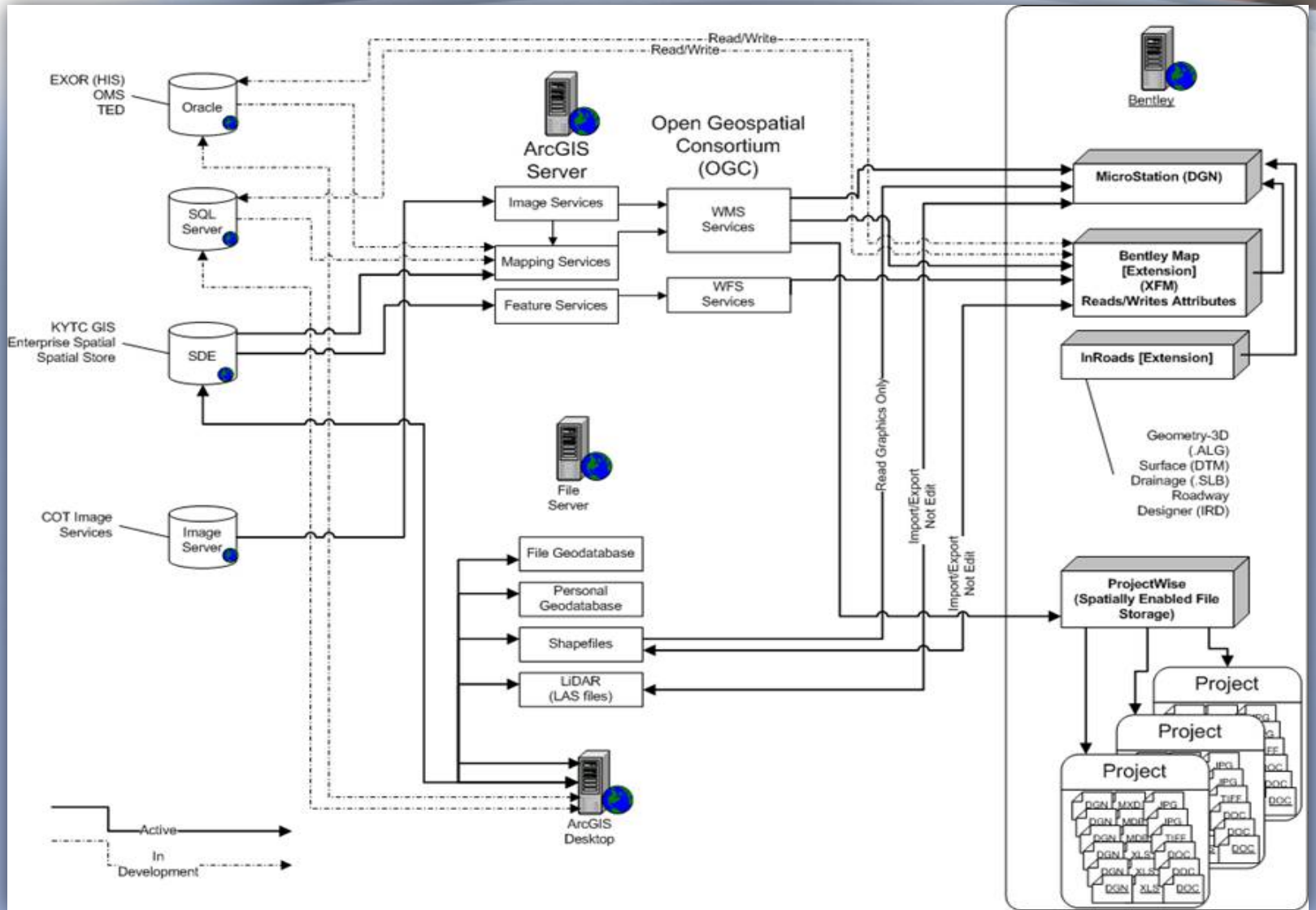
- No buy in from users
  - Workflow did not fit
  - Too many steps
- Did not provide all needs
- No real big improvements
- Maintenance/overhead of product
- Newer avenues



Technology Prospects and Advancements Worth Noting

- Adoption of OGC (Open Geospatial Consortium) standards
  - Microstation can read WMS (Web Mapping Services)
  - Bentley Map can read WFS (Web Feature Services)
  - ArcGIS can serve up WMS and WFS
- Both ArcGIS and Bentley Map can read/write to Oracle/SQL Spatial
- Shapefiles
  - Microstation can read shapefiles
  - BentleyMap can read/write to shapefiles

KYTC CAD – GIS Diagram



KYTC Custom Applications\Models

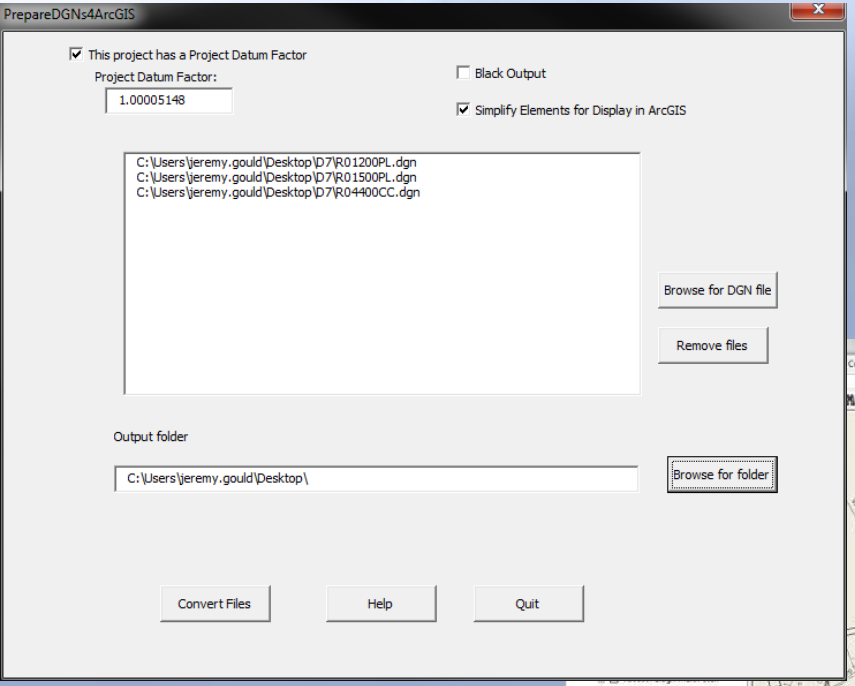
- CAD to GIS
  - PrepareDGNforArcGIS
  - Apply Coordinate System to DGN file(s)
  - CarryMap Preparation Tool
- GIS to CAD
  - KYRaster
  - KYLiDAR
  - Crash Data
  - KYVector (coming soon)

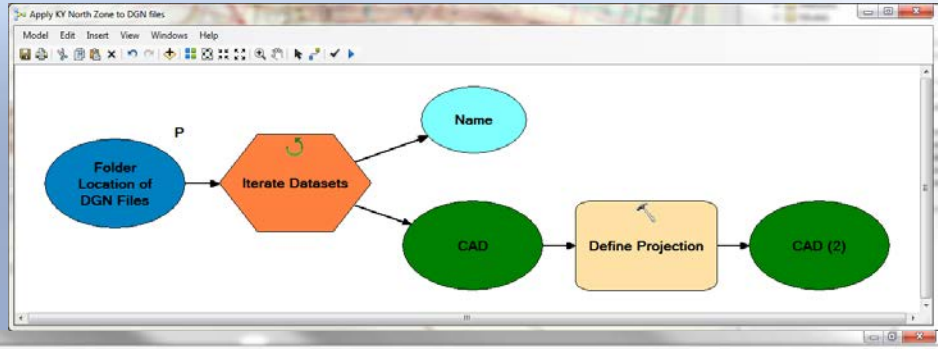
CAD to GIS

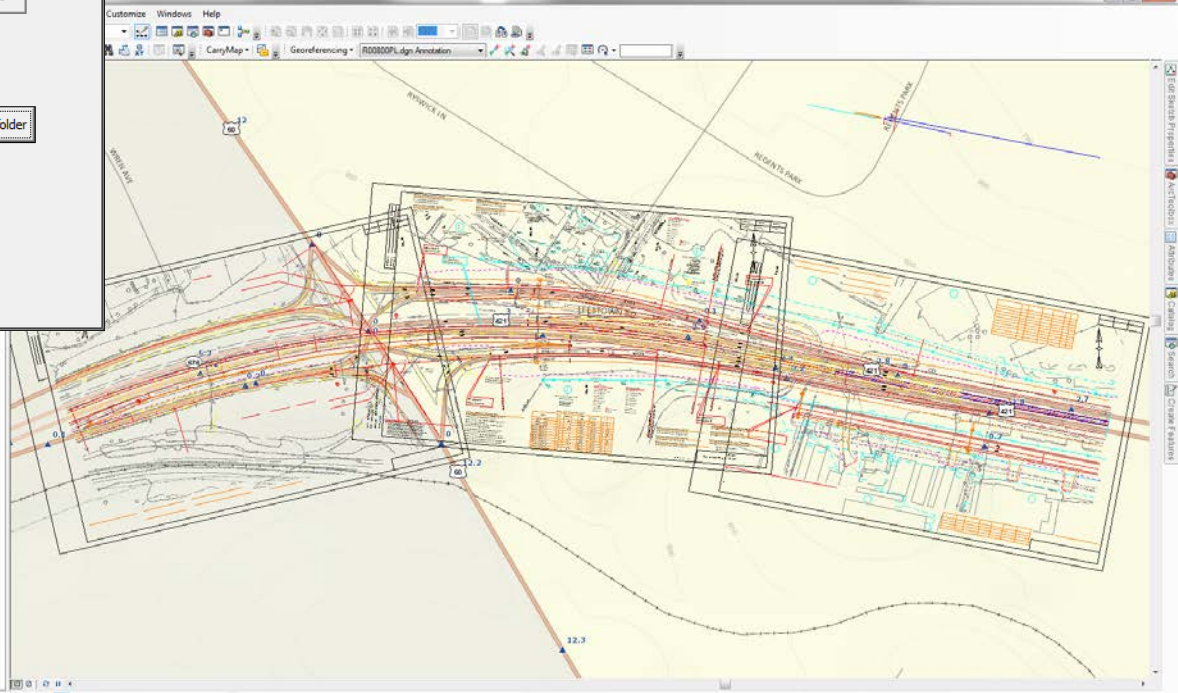
- PrepareDGNs4ArcGIS
  - Prepares DGN files for a “clean” reference into ArcGIS
    - Cleans up deleted elements and writes new file
    - Applies the Project Datum Factor (optional)
    - Simplifies (drops) KYTC custom line styles (optional)
- Apply Coordinate System to DGN file(s)
    - ArcGIS Model to simplify applying the correct projection to the DGN files
- CarryMap Preparation Tool (for DGNs)
    - ArcGIS Model to import DGN files into a ArcGIS File Geodatabase
      - Feature Class per plan sheet (named accordingly)
      - Imports only “level name” attribute data

CAD to GIS

- PrepareDGNs4ArcGIS







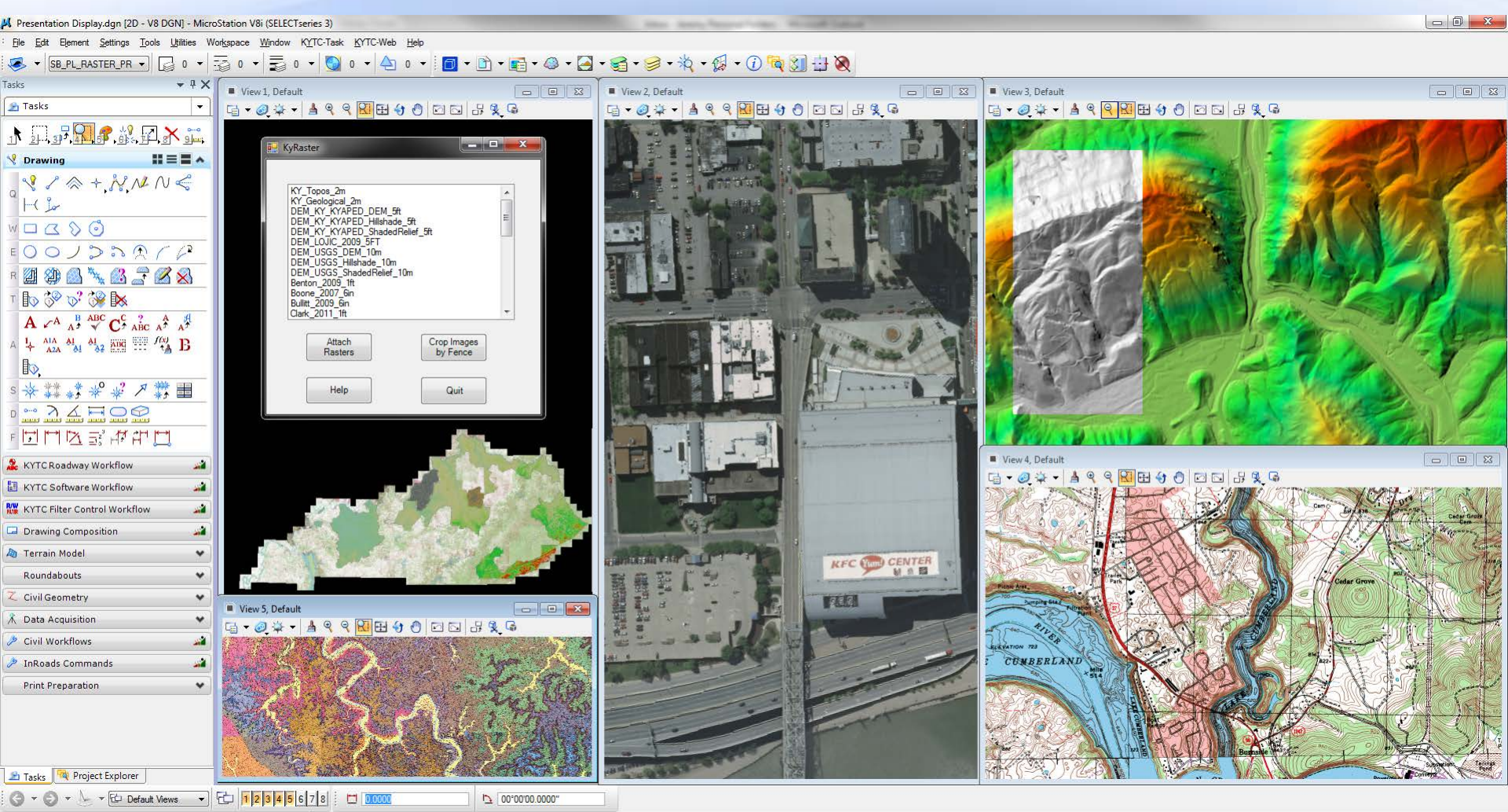
Reliable and Spatially Correct Import to ArcMap

GIS to CAD

- KYRaster
  - Provides a list of WMS (Web Mapping Services) available from the Commonwealth of Kentucky's (COT-DGI) ESRI Image Server that can be attached directly and streamed in dynamically within Microstation
  - Currently there are 36 WMS to choose from
    - Imagery, topo's, elevation, hillshades
  - (Optional) Extracts and attaches raster (.TIFF) to Microstation via user defined area
  - Logs extractions to feature class via WFS (Web feature Service) and REST endpoint

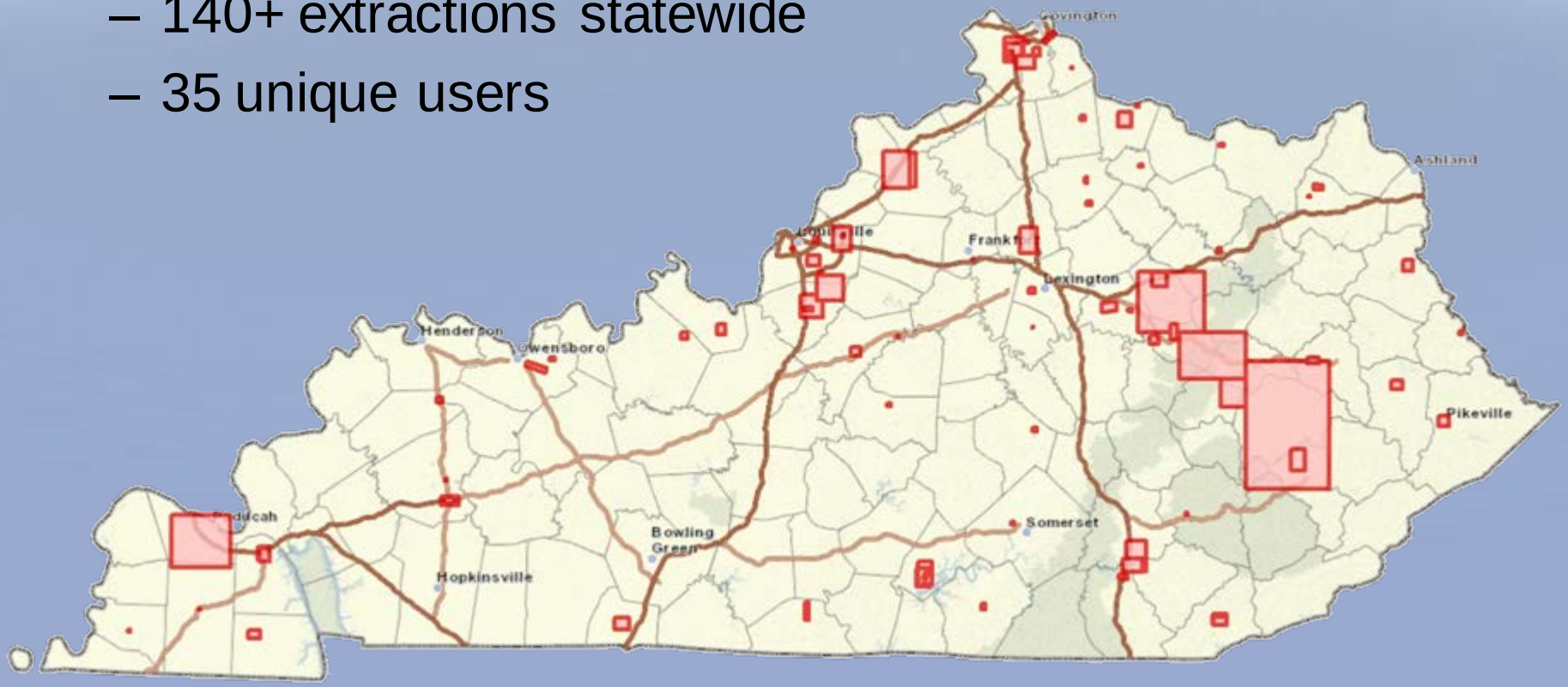
GIS to CAD

- KYRaster



GIS to CAD

- KYRaster
  - In production ≈ 6 months
  - 140+ extractions statewide
  - 35 unique users

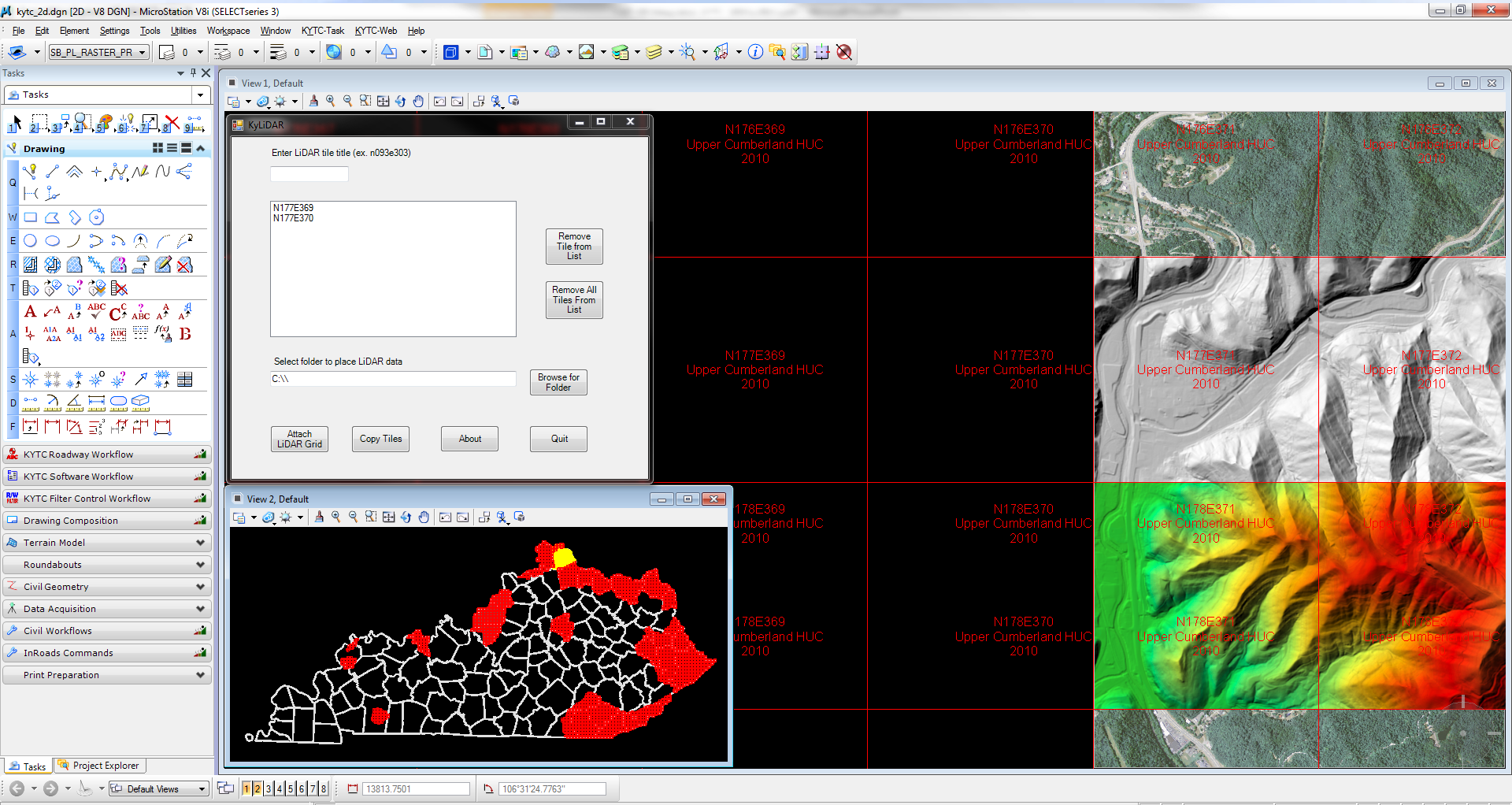


GIS to CAD

- KYLiDAR
  - Attaches a WMS (Web Mapping Service) grid of LiDAR tiles
  - User enters LiDAR tiles desired for download into a list and provides a download location
  - RAW LiDAR files (.LAS) files are downloaded for use in Microstation/InRoads

GIS to CAD

- KYLiDAR

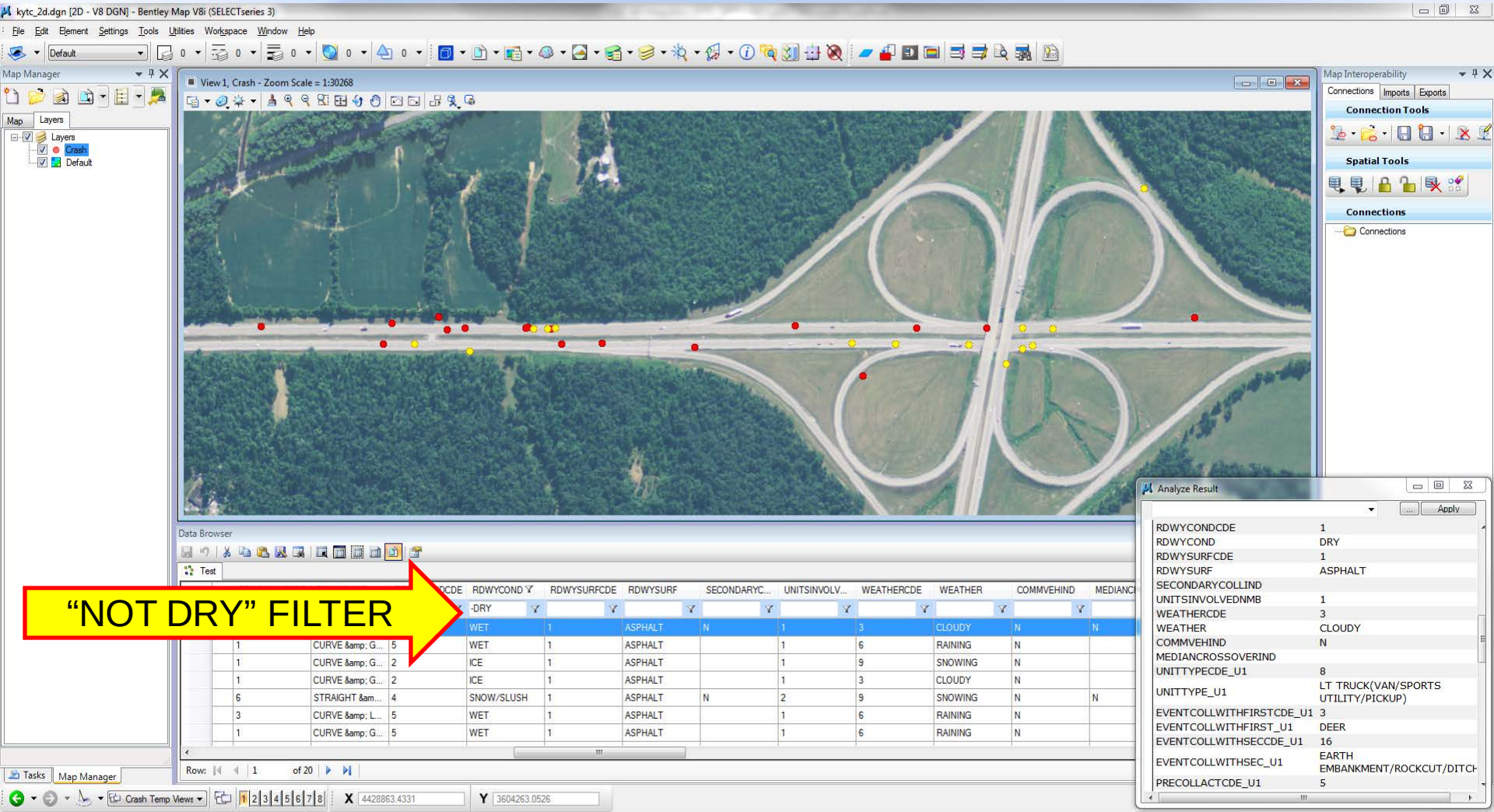


GIS to CAD

- Crash Data
  - Imports Crash information (location and attributes) into Bentley Map from a .CSV file
    - CSV file contains Lat/Long and is projected to KY Single Zone on the fly

GIS to CAD

- Crash Data

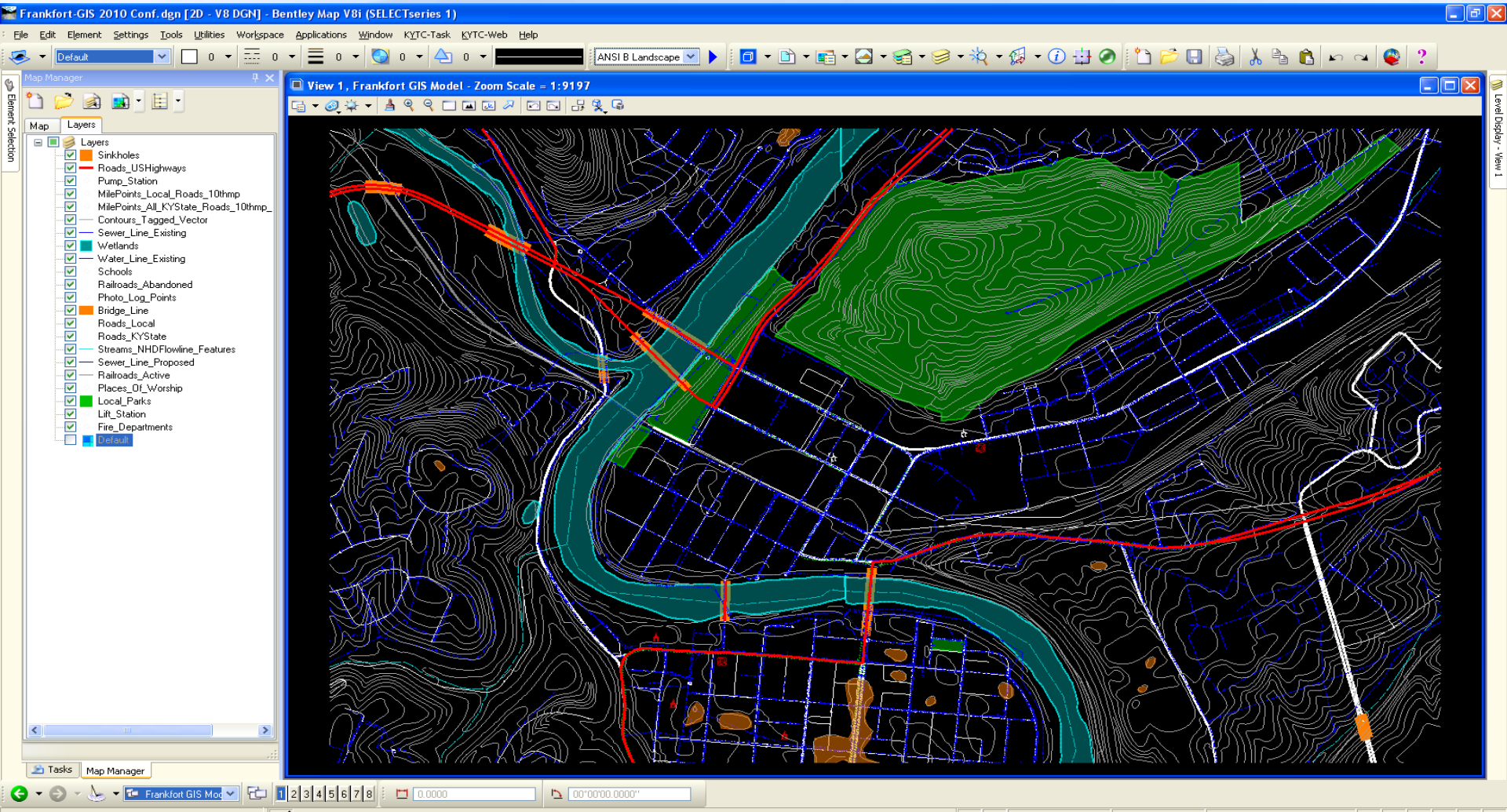


GIS to CAD

- KYVector (coming soon to users)
  - Imports ArcGIS SDE Vector data (graphical elements and attribute data) into Bentley Map that is served up by ArcGIS Server WFS (Web Feature Service)
  - User defines area and imports data
    - Bentley Map XFM format

GIS to CAD

- KYVector (coming soon to users)



GIS to CAD

- KYVector (coming soon to users)

Frankfort-GIS 2010 Conf.dgn [2D - V8 DGN] - Bentley Map V8i (SELECTseries 1)

File Edit Element Settings Tools Utilities Workspace Applications Window KYTC-Task KYTC-Web Help

View 1, Frankfort GIS Model - Zoom Scale = 1:1304

Tasks

GIS Workflow

GIS Tools

- Select Geographic Coordinate System
- Map Manager
- Import/Export GIS Shapefile
- Zoom to Scale
- Analyze Feature
- Edit Feature
- Data Browser

Analyze Result

Apply

Fire_Departments

Property	Value
OBJECTID	6794
ADDNAME	BGADD
ADDR_NUMBE	131
ATT_ISSUES	
ATT_SOURCE	FRANKFORT PLANT BOARD
CITY	FRANKFORT
COMMENTS	THESE ARE NON-PUBLISHED, NON-EMERGENCY NUMBERS FOR BUSINESS PURPOSES ONLY
CONTACT	KENNETH JOHNS
COVERAGE	FRANKFORT CORPORATE BOUNDARY
DATECREATE	633014784000000000
DATEMODIFI	633014784000000000
DIAL_911	YES
DISP_PHONE	502-875-8582
E911	YES
NAME	FRANKFORT CITY FIRE DEPARTMENT STATION # 2
PHONE	502-875-8529
RDNAME	HOLMES
RDPREFIX	
RDSUFFIX	ST
UpdateIndicator	2
XY_ISSUES	
XY_SOURCE	AERIAL
ZIP	40601

Tasks Map Manager

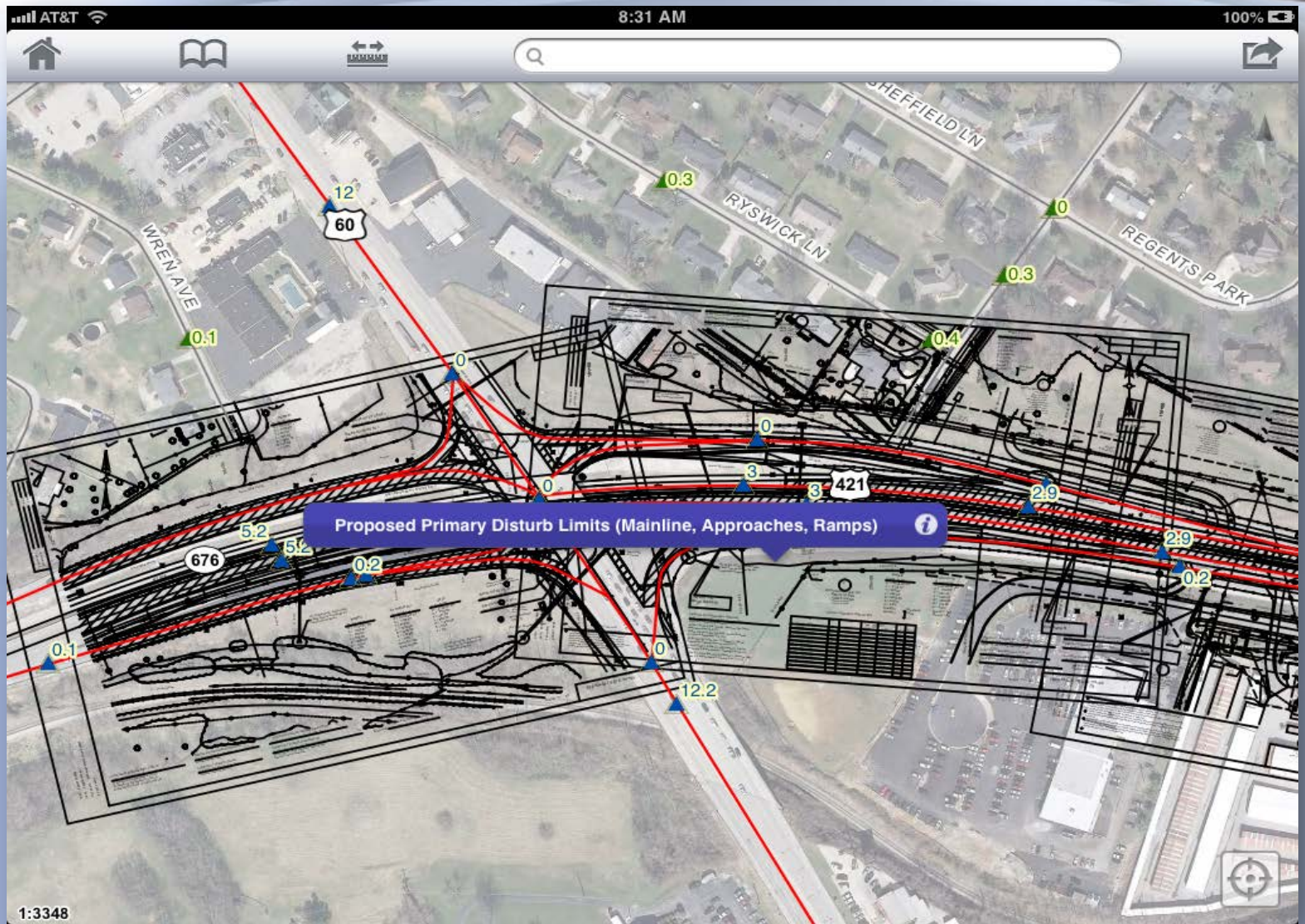
Analyze Feature > Identify element

Fire_Departments - Cell: FireDep: Cell Feature \ Line, Level: GIS_PL_FireDep_EX, Ref: 1 (Frankfort-GIS 2010 Conf.dgn)->GISFeatures (Frankfort-GIS 2010

Default

5173892.5037, 3962362.6636

Mobile GIS/CAD with CarryMap



In Summary

- Challenges
  - Future direction of
    - Data Storage (Spatial Databases/DGN files)
    - Interoperability of Data Formats
  - Coordinate Systems
  - Training
  - Security
- Successes
  - Adoption of OGC standards (Open Geospatial Consortium)
    - WMS
    - WFS
  - Custom applications leveraging existing tools

Questions