

# Conversion of Lincoln Water CAD to ArcGIS – Lessons Learned

Presented by

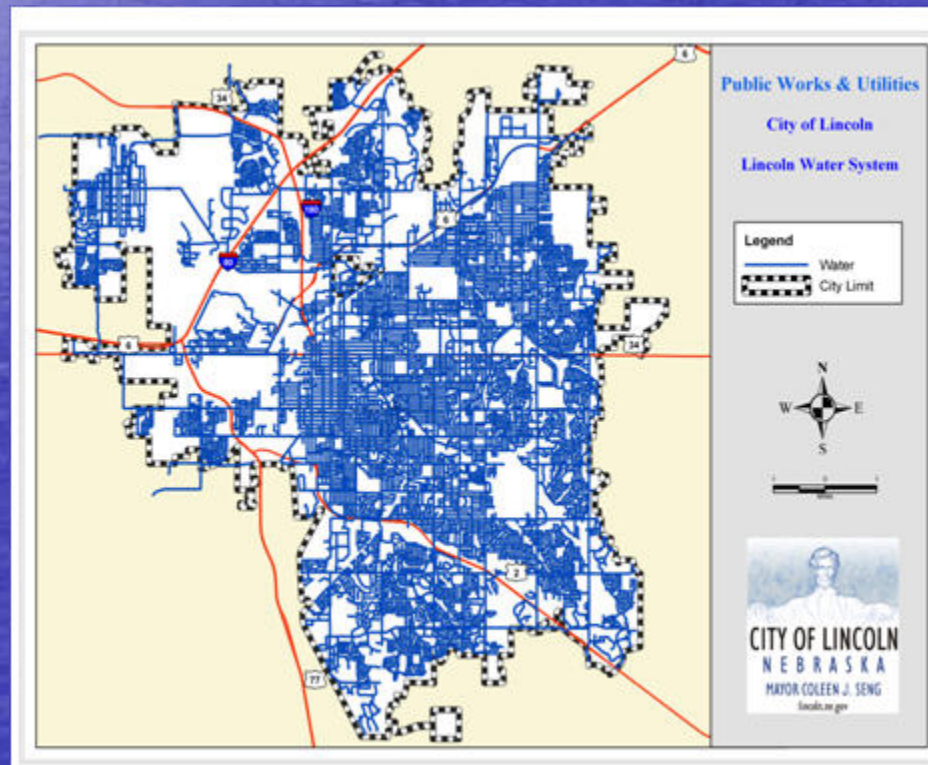
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Lincoln Water System

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# Statistics of the Water System

- Over 1200 Miles of Water Main, serving over 240,000 people
- Average Distribution System Growth of 2.4% per year
- 488 miles of main added between 1975 – 2008
- 60% of System built prior to 1974. Mains built in 1888 are still in service!



## Reasons for Converting from CAD to GIS

- Needed an Asset Inventory for Condition Assessments
- Facility Master Plan Recommendation in 2002
- Share Data with other City/County Departments
- Increase ability to interact with GIS Community
- Meet Strategic Plan Goals
- Transition from Paper Based to eTechnology
- Improve Productivity, Reduce Costs and move to Mobile Field Devices

# Evaluated Existing Procedures

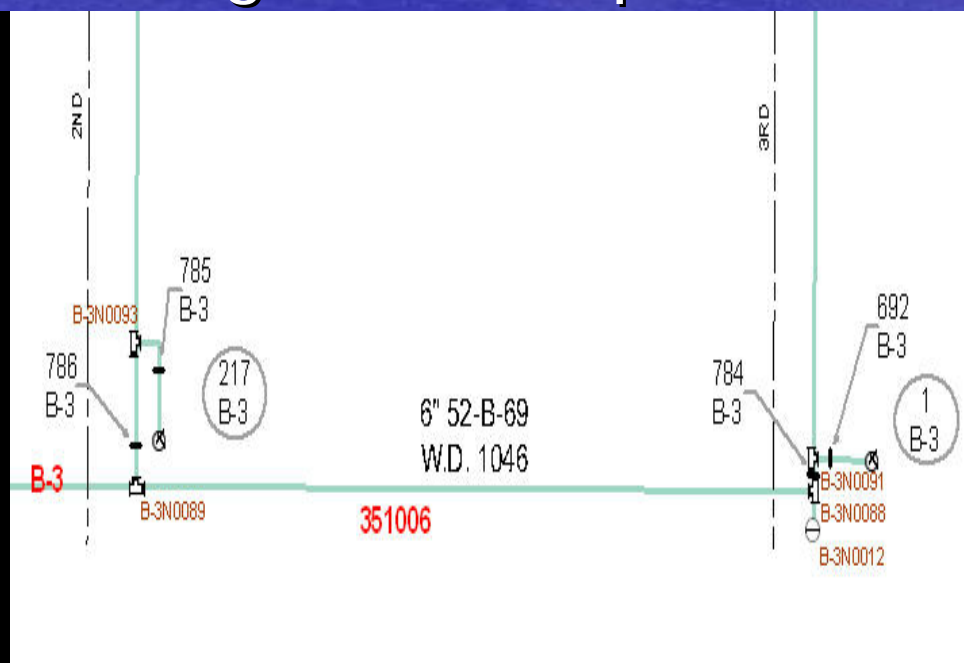
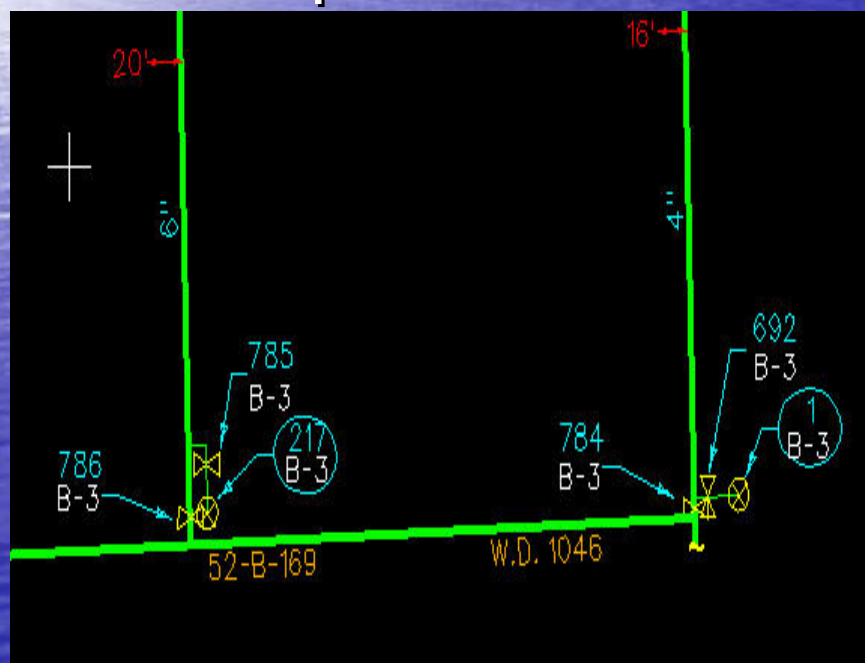
- Staff Interviews & Procedure Flowcharts
- Water Records & Asset Management
- System Maintenance & Construction
- “One Call” Utility Location System
- CIP & Replacement Project Management
- Regulatory & Quality Sample Locations
- Distribution System Performance Metrics

# Questions to Ask when Performing Preliminary GIS Design

- Water Utility Data Model Templates
- Contact other Utilities to learn from them
- Beware of Non-Upgradeable Customization
- Examine your Current Workflow –
  - Who enters the Data?
  - Who is responsible for Coordinating Changes?
  - What improvements would staff like to see?
- Investigate the desired synergy between your GIS and your Asset/Work Order Management System.

# Contract to Convert Digital Data to ArcGIS – Aug. 2004 to Dec. 2005

- Determined that Fittings representing Tees, Crosses, Reducers, etc. needed to be incorporated in the GIS and given a unique ID.



# Upgradeable Custom Tools

The image displays two screenshots of a software application window titled "Find".

**Left Screenshot:**

- Tab: STR
- Buttons: Hydrant, Valve
- List: 231006, 231007, 231008, 231105, 231106, 231107, 231108, 240905
- Text: 9.1 Build 13
- Text: Right-click a row to show context menu.
- Table:
 

ID	Value
451	231006
- Text: One object found

**Right Screenshot:**

- Tab: Hydrant
- Buttons: STR, Valve
- Form: Plat ID (B-5), Hydrant ID (345)
- Text: 9.1 Build 13
- Text: Right-click a row to show context menu.
- Table:
 

ID	Value
10386	B-5 345
- Text: One object found
- Context Menu:
  - Flash feature
  - Zoom to feature(s)
  - Identify feature(s)
  - Set Bookmark
  - Select feature(s)
  - Unselect feature(s)
- Buttons: Find, Stop, New Search, Cancel

# Custom LNK Create Feature Tool

Task: LNK Create Feature Target:

Export to DGM Merge Net Features Remove

Create Feature 9.1 Build 23

- PW\_WATRDIST.wSystemValve
- PW\_WATRDIST.wDimensionLines
- PW\_WATRDIST.wPressurizedMain
- PW\_WATRDIST.wWaterStructure
- PW\_WATRDIST.SectionGrid
- PW\_WATRDIST.PlatMapGrids

PW\_WATRDIST.wPressurizedMain

Field	Value
Subtype	DistributionMain
Main Diameter	16
Material	PVC
LifecycleStatus	Proposed
COMPTYPE	41
FACILITYID	<null>
INSTALLDATE	3/14/2007
PLAT_ID	B-5
UNITID	<null>
MAINCOMP1	<null>
UNITID2	<null>
MAINCOMP2	<null>

Diagram labels: 619 B-5, 621 B-5, 145 B-5, 73 B-5, 346 B-5, 12" 117-A-66 PJ700078, PVT B-5, 624 B-5, 6" B-5, 320 B-5, 241006, 620 B-5, 144 B-5, 345 B-5, PW\_WATRDIST.wPressurizedMain : Edge B-5, 623 B-5, 6" 26-A-2



# Custom Hydrant Placement

Task: LWS Create Hydrant Target:

Export to DGN Merge Net Feature

Change Version...

### Create Hydrant Build 51

Hydrant Information

Plat

Unit

Valve Information

Plat

Unit

Fitting Information

Plat

Unit

Facility Status

Proposed

Active

First Segment Length

Second Segment Length

# Export to DGN

Tool uses Safe Software FME Engine

Task: Create New Feature Target:

Export to DGN Merge Net Features Remove Bad Anno

**Export To DGN 9.1.82**

Export by the 0 graphics  
 Export by Grid - 1 selected

Overlap 300'

W - Water Write Grid DGN's to

f:\[WDSR01\SYS]

240907  
 240908  
 241005  
 241006  
 241007  
 241008  
 241105  
 241106  
 241107  
 241108  
 250905  
 250906  
 250907

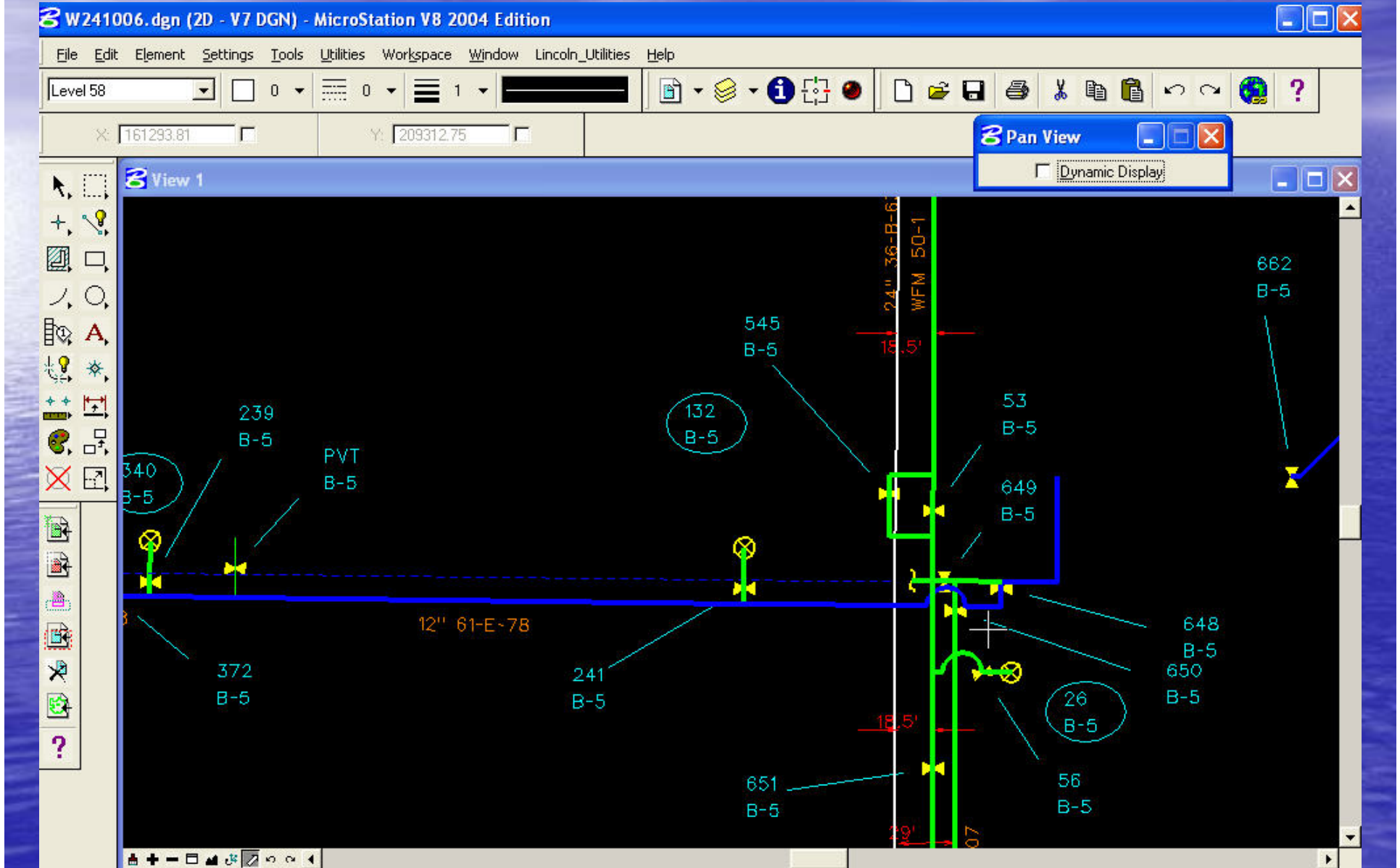
Seed File C:\Contractor Requests\Ptarmigan Software

Cell Library C:\Contractor Requests\Ptarmigan Software

Exporting W\241006.dgn (1 of 1)

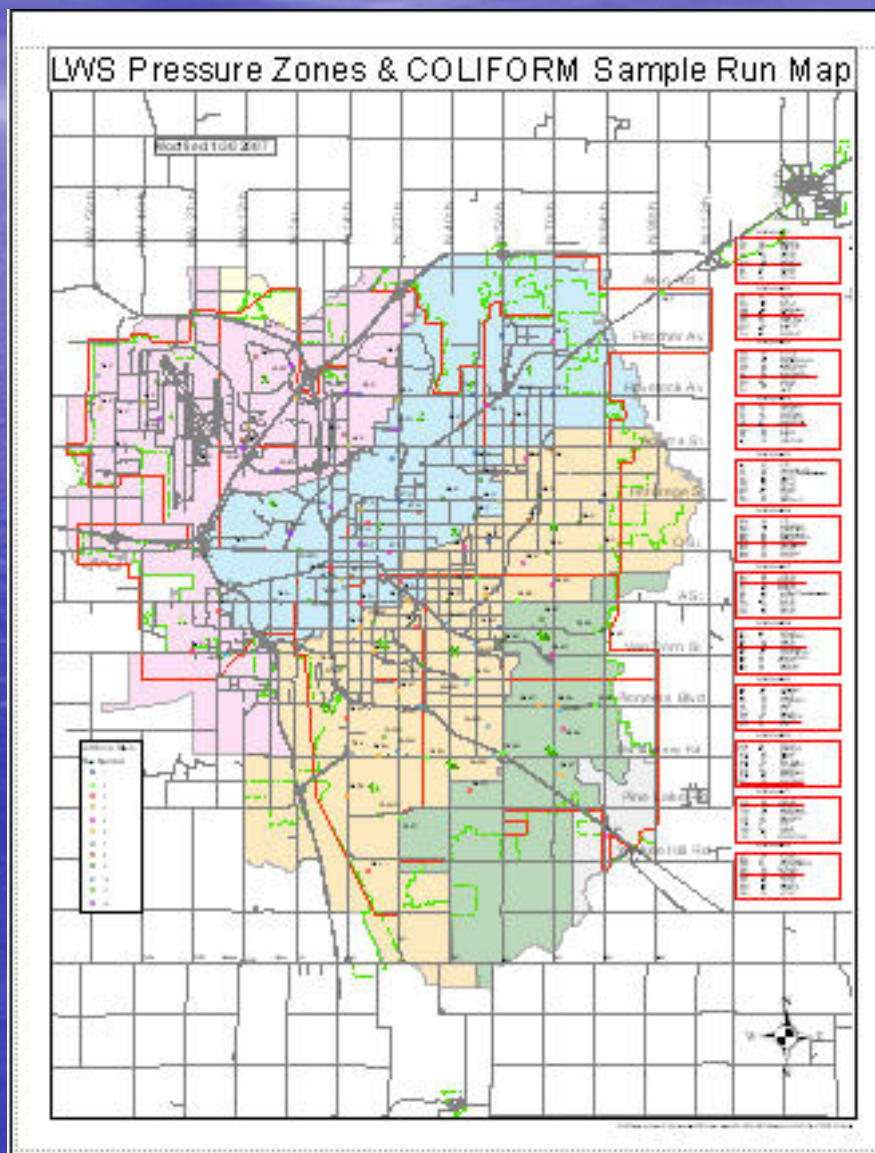
PW\_WATRDIST.Hydrant100Anno (Layer 5 of 31)

# Result of Export to DGN

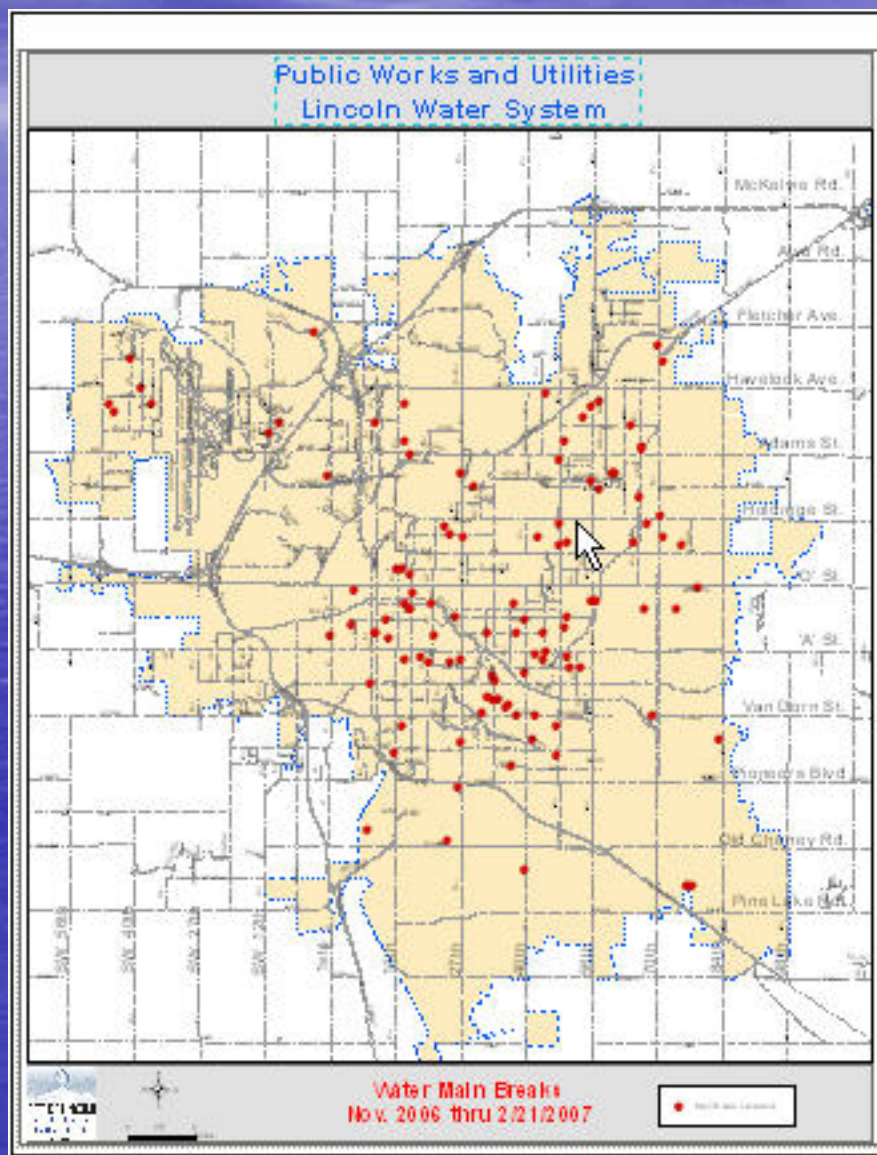




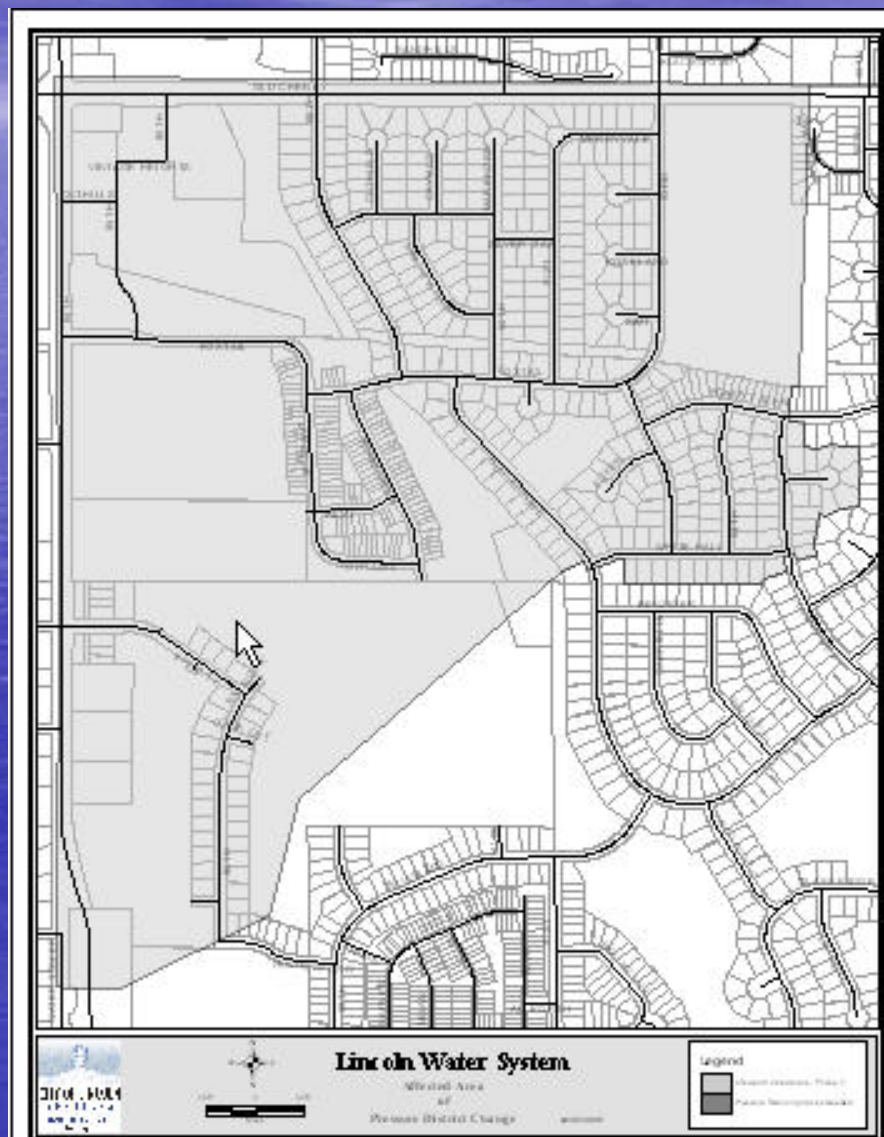
# Regulatory Compliance



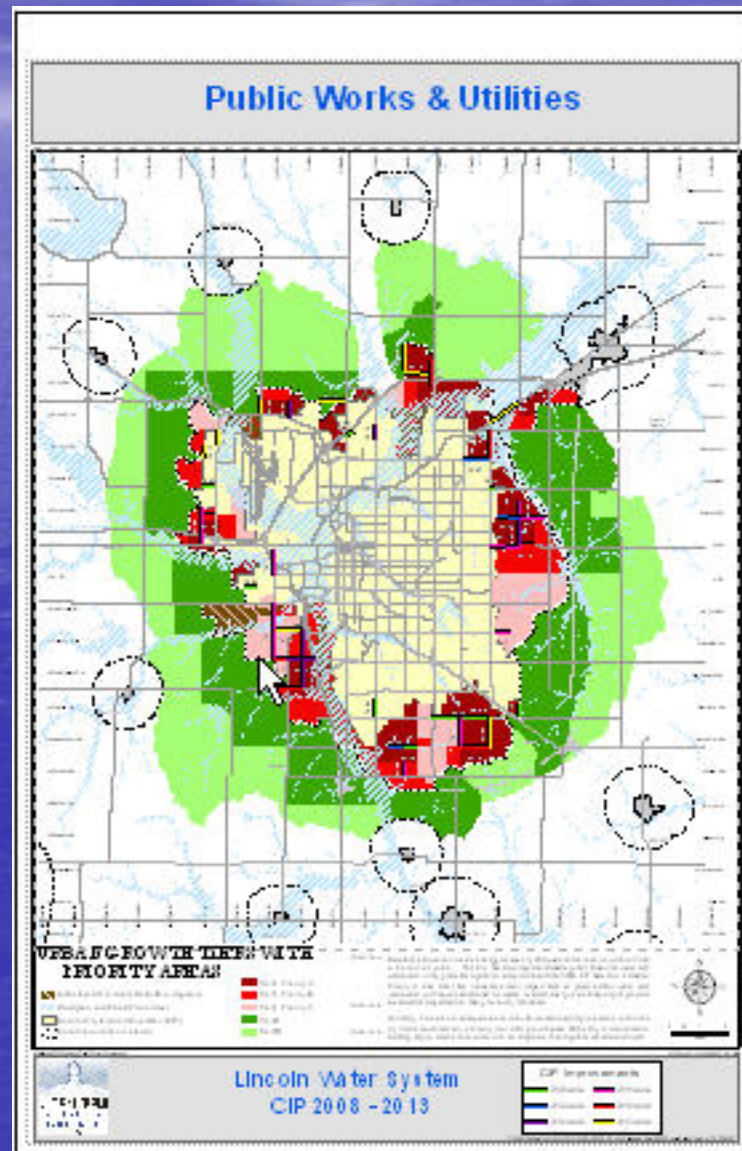
# Main Break Analysis



# Customer Notification



# CIP & Plans for City Growth





# Hydraulic Modeling

Using MWHSoft, H2OMap

The screenshot displays the H2OMap Water GIS interface. The main window shows a hydraulic network with nodes (green circles) and pipes (blue lines). The nodes are labeled with IDs such as 645, 647, 649, 651, 648, 646, 653, 657, 653, 652, 658, 657, and 698. A pipe with a diameter of 1400 is visible. The Control Center on the left shows the Map Legend with categories for Text, JUNCTION (MOTYPE), TANK (MOTYPE), and PIPE (MOTYPE). The Run Manager window is open, showing the Output Source as '\*Active\*:Fireflow' and the Reference as 'RUN31, Fireflow Simulation'. The Report Manager window is also open, displaying a table of results for the Fireflow simulation.

ID	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (mgd)	Residual Pressure (psi)
1 637	98.70	1,392.78	3.60	56.35

The Attribute Browser window on the right shows the properties for Junction 637, including its ID, Description, Demand4, Pattern4, Demand5, Pattern5, Demand6, Pattern6, Demand7, Pattern7, Demand8, Pattern8, Demand9, Pattern9, Demand10, Pattern10, Information, Installation Year (2000), Retirement Year (9998), Zone (Bel), Elevation (1165.00), Phase, PRE\_ZONE, TOP50\_ADDR, TAZ\_NO, and Output.

# Mobile Field Crew Applications

ExtendoFlex, Courtesy of Precision Mounting Technologies



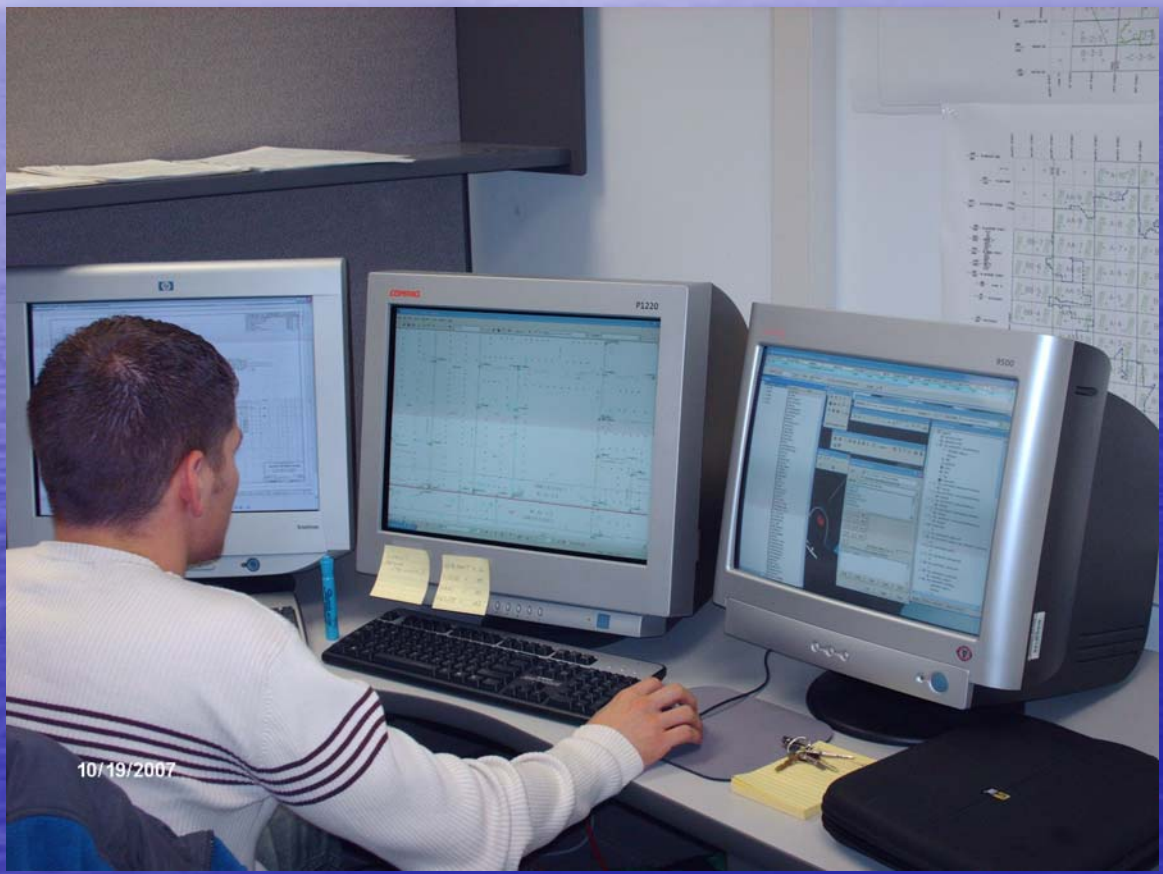
# GIS Statistics

- 61,500 Main Segments
- 10,700 Hydrants
- 25,000 Valves
- 19,200 Fittings
- 15,100 Dimension Lines
- 84,400 Annotation Text Segments
- 150 Miscellaneous Features, i.e. Water Structures, RTU's, Power Poles, Meter Pits etc...

# Remaining Challenges

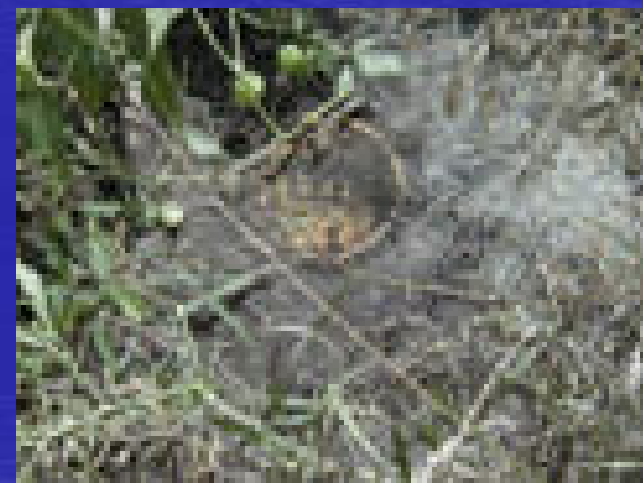
- Training Staff to Maintain the GIS
- Revising Internal Procedures –
  - “The old way vs. The NEW way”
- Performing QA/QC corrections
- Connecting to Hansen CMMS System
- Ongoing attribution of the GIS with additional data, including scanned record drawing files
- Adding Real Time Data Acquisition (GIS+GPS)

# GIS Maintenance



10/19/2007

# Where is the Valve Box?



GPS helps us find this faster!

# GPS Data from Field

Courtesy of Trimble Navigation Limited



# Scanned Drawings Attached to GIS

The image displays two software windows side-by-side. The left window is ArcMap, showing a GIS map of a street layout with various features and a 'Hyperlinks' dialog box. The right window is Microsoft Office Document Imaging, showing a scanned technical drawing of a water profile.

**ArcMap Window:**

- Title bar: WDSAJR.mxd - ArcMap - ArcInfo
- Menu: File Edit View Insert Selection Tools Window Help
- Scale: 1:1,950
- Task: Create New Feature
- Tools: A toolbar with various GIS tools.
- Map: Shows a street layout with features like 'YANKEE HILL RD' and 'YANKEE'. Features are labeled with IDs such as C-1-S0007, C-2-S0086, C-2-S0022, C-2-S0020, C-2-S0019, C-2-S0018, C-2-S0017, C-2-S0016, C-2-S0021, and C-2-S0015.
- Hyperlinks Dialog:
  - Hyperlinks
  - \\New Scan Temp\Aperture by Drawing Number - Record Drawings\117-a\rrn\117-B-49\117-B-49 - Storm Drainage 42nd St n YH Rd.tif
    - \\New Scan Temp\Aperture by Drawing Number - Record Drawings\117-a\rrn\117-B-49\117-B-49 - Water Plan 42nd St n YH Rd.tif
    - \\New Scan Temp\Aperture by Drawing Number - Record Drawings\117-a\rrn\117-B-49\117-B-49 - Water Profile 42nd St n YH Rd.tif
  - Buttons: Jump..., Close
- Status Bar: 171,963.003146 173,499.31801 Feet

**Microsoft Office Document Imaging Window:**

- Title bar: 117-B-49 - Water Profile 42nd St n YH Rd .tif - Microsoft Office Document Imaging
- Menu: File Edit View Page Tools Window Help
- Page: 1 of 1
- Zoom: Entire Page
- Content: A detailed technical drawing of a water profile. It shows a cross-section of a street with various pipes and structures. Labels include 'PROPOSED FINISHED GRADE', 'PROPOSED WATER MAIN', 'ROOF CLASS I', 'ROOF CLASS II', 'ROOF CLASS III', 'EXISTING GRADE YANKEE HILL RD ABOVE WATER MAIN', 'EXISTING GRADE YANKEE HILL RD ABOVE WATER MAIN', 'PROPOSED CHANGING GRADE - FUTURE YANKEE HILL RD', and 'WATER MAIN'. The drawing includes a grid and various annotations.



# Summary of Most Important Lessons Learned

- Technically capable & accommodating Consultants
- Manage the Expectations for GIS – It's Labor Intensive and runs slower than CAD
- GIS is starting to generate Real Benefits to Management 2 to 3 Years after our initial conversion investment
- Need to "Think Out Of the Box" for creative solutions to everyday problems
- Utilize Mentoring – Improves Acceptance / Performance
- Whenever ANY component is Upgraded – Test Everything
- Patience and Humor are good things to possess when running GIS ☺

# Questions?

## Contact Information:

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