Get in the Loop with AutoCAD Map 3D, CaseIntel NetGIS, ReCap, and A360

Trevor Hayward

CTO, CaseIntel Corporation

Dale Lundgren

Development Director, CaseIntel Corporation

Class summary

This talk will demonstrate a streamlined geographic information system (GIS) / mapping workflow developed by CaseIntel Corporation and Autodesk, Inc., for electric utilities to support a highly automated design, build, operate, and maintain workflow. This process uses AutoCAD 360 web app, ReCap software, and LiDAR (light detection and ranging) scanning in the field; AutoCAD Map 3D software and CaseIntel NetGIS for electric utility mapping; InfraWorks 360 software and Infrastructure Map Server software for visualization; and AutoCAD Utility Design software for designing new services.

Agenda

- Discussion – 20 min
  - Quick background on Mapping in Utilities
  - Utility Engineering Lifecycle Challenges
  - Solution Approach
- Demo – 20 min
- Q&A – 10 min

Mapping for Electric Utilities

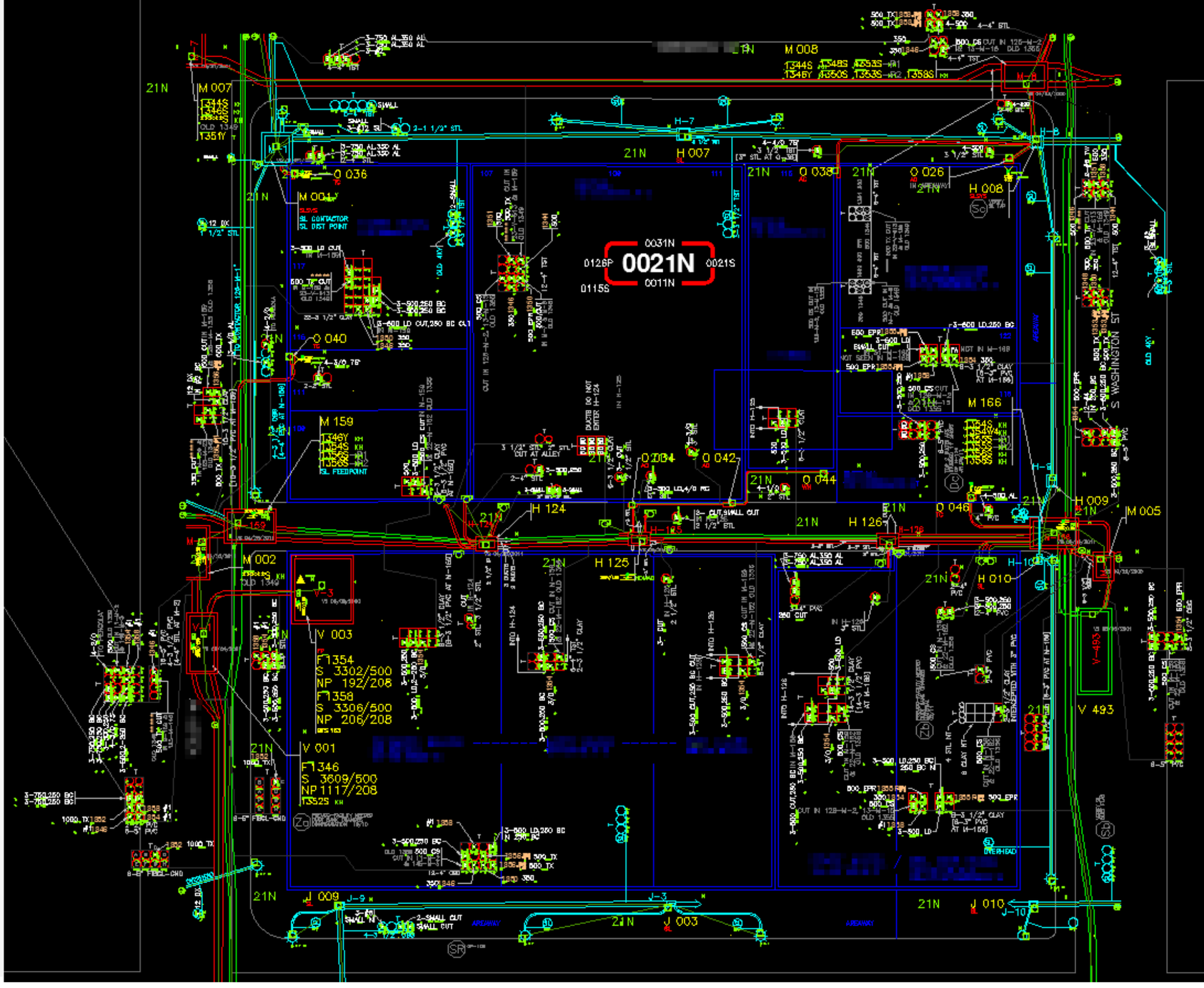
Background

- The following examples are from Seattle City Light in their downtown meshed network.
- CaseIntel deployed NetGIS at SCL, replacing a system of manual drawings with rudimentary data in a database.
- NetGIS is now the GIS for the meshed network, and is the source for asset location, physical and electrical connectivity for the network.

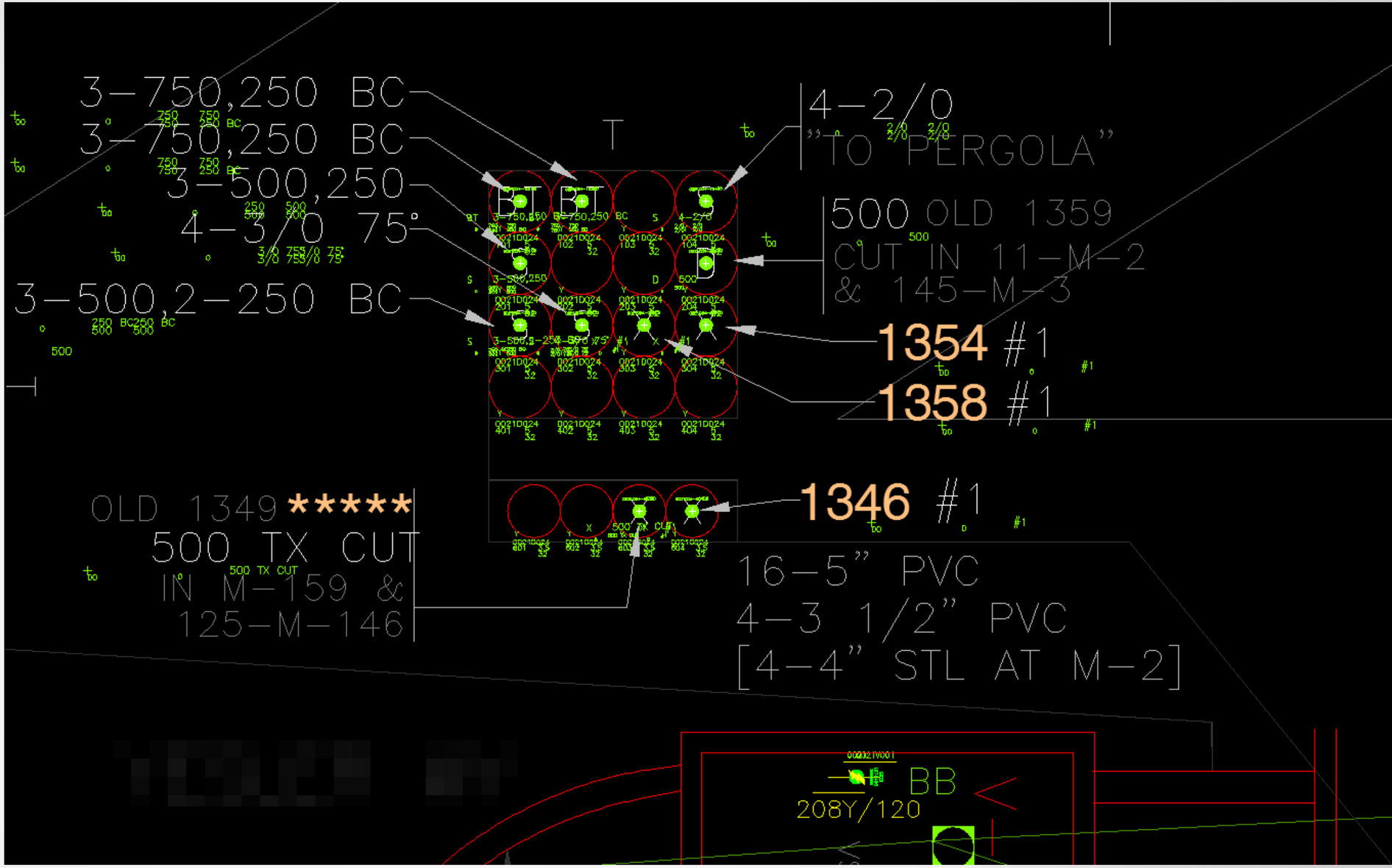
Where does GIS and Mapping fit in an electric utility?

- Maintains information used throughout the utility:
  - Facility, Structure details and location
  - Civil Infrastructure (Duct banks, Ducts)
  - Equipment installation and location
  - Equipment connections
  - Cable characteristics and paths

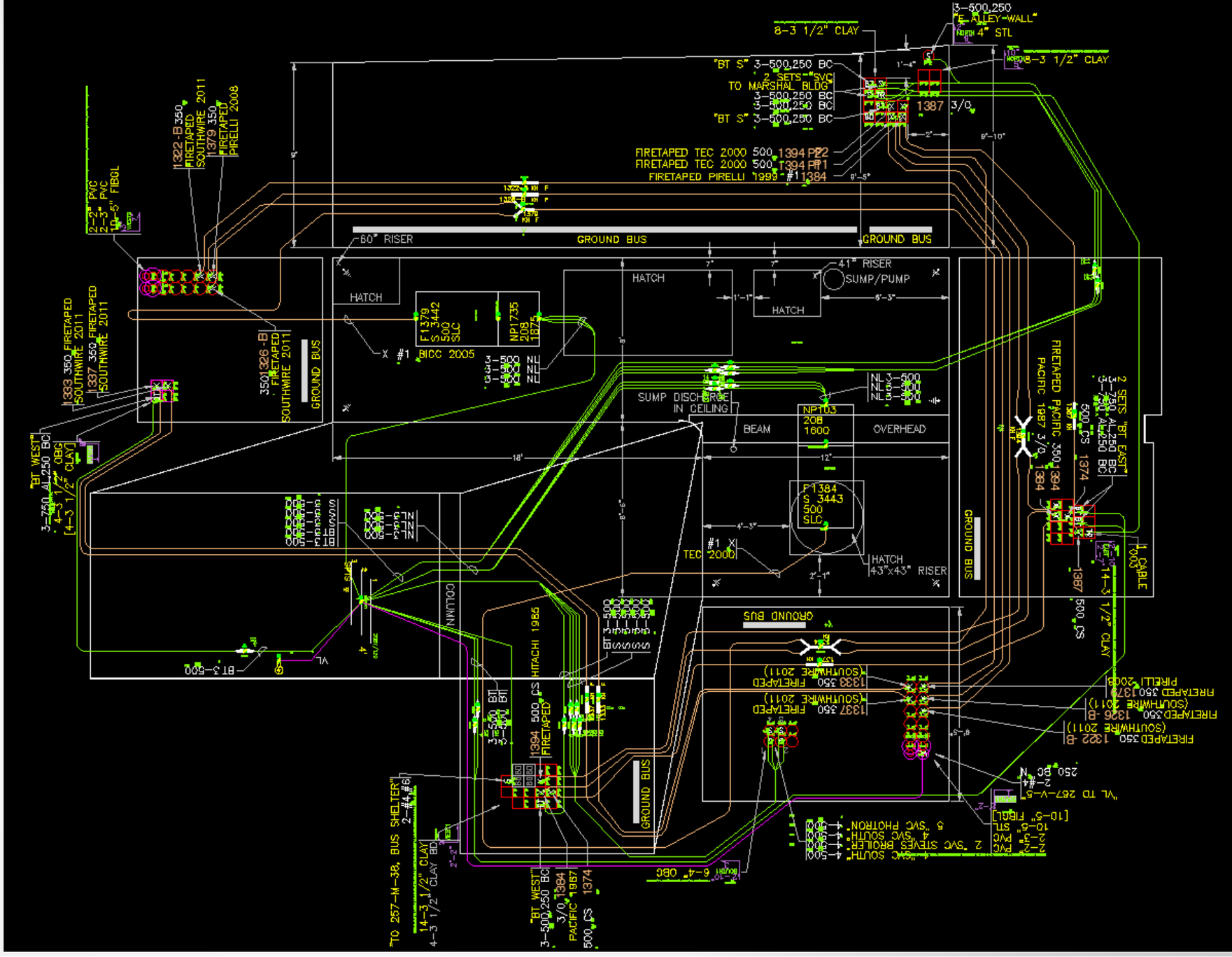
City Block Map

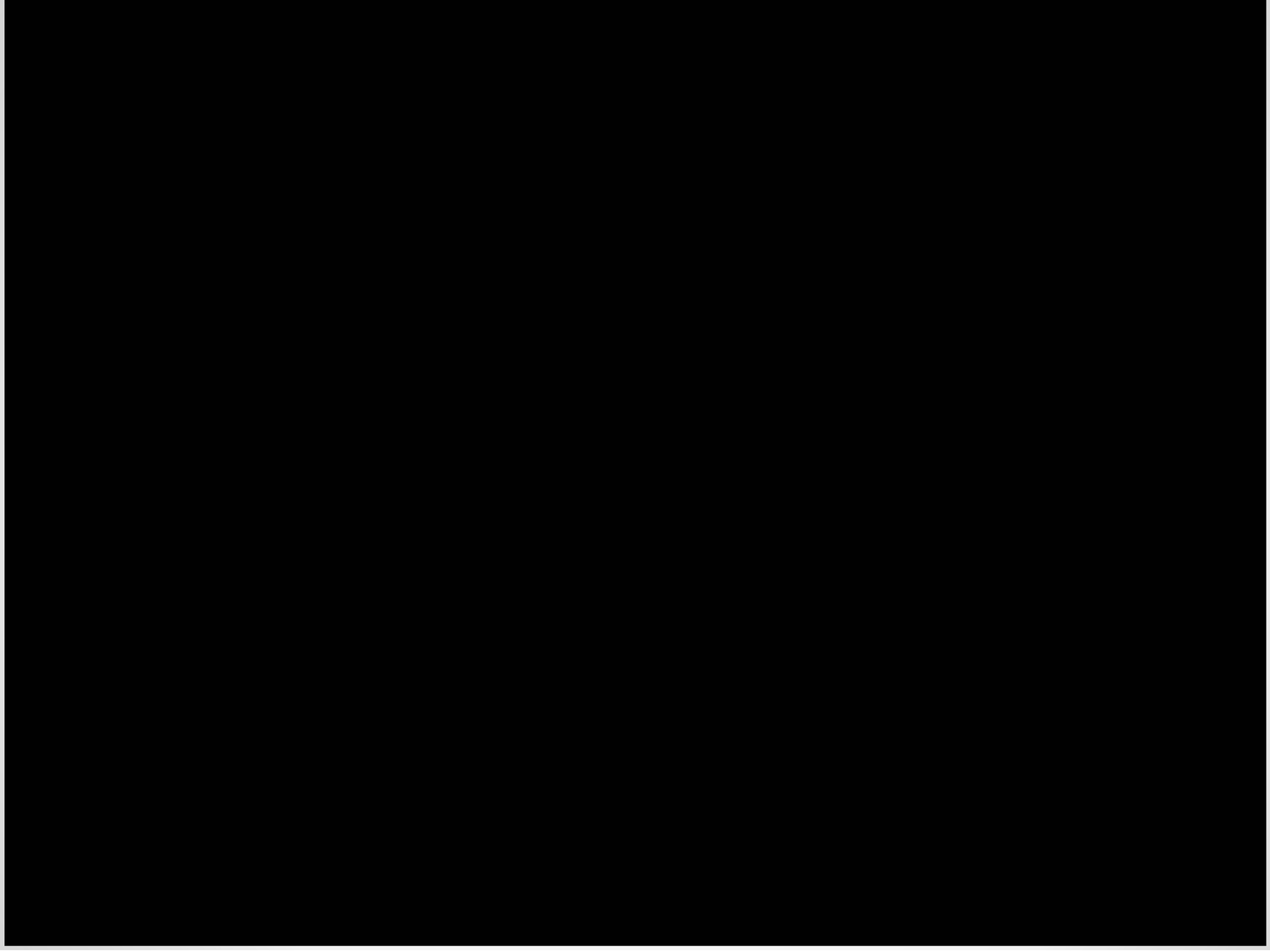


Block Map Detail

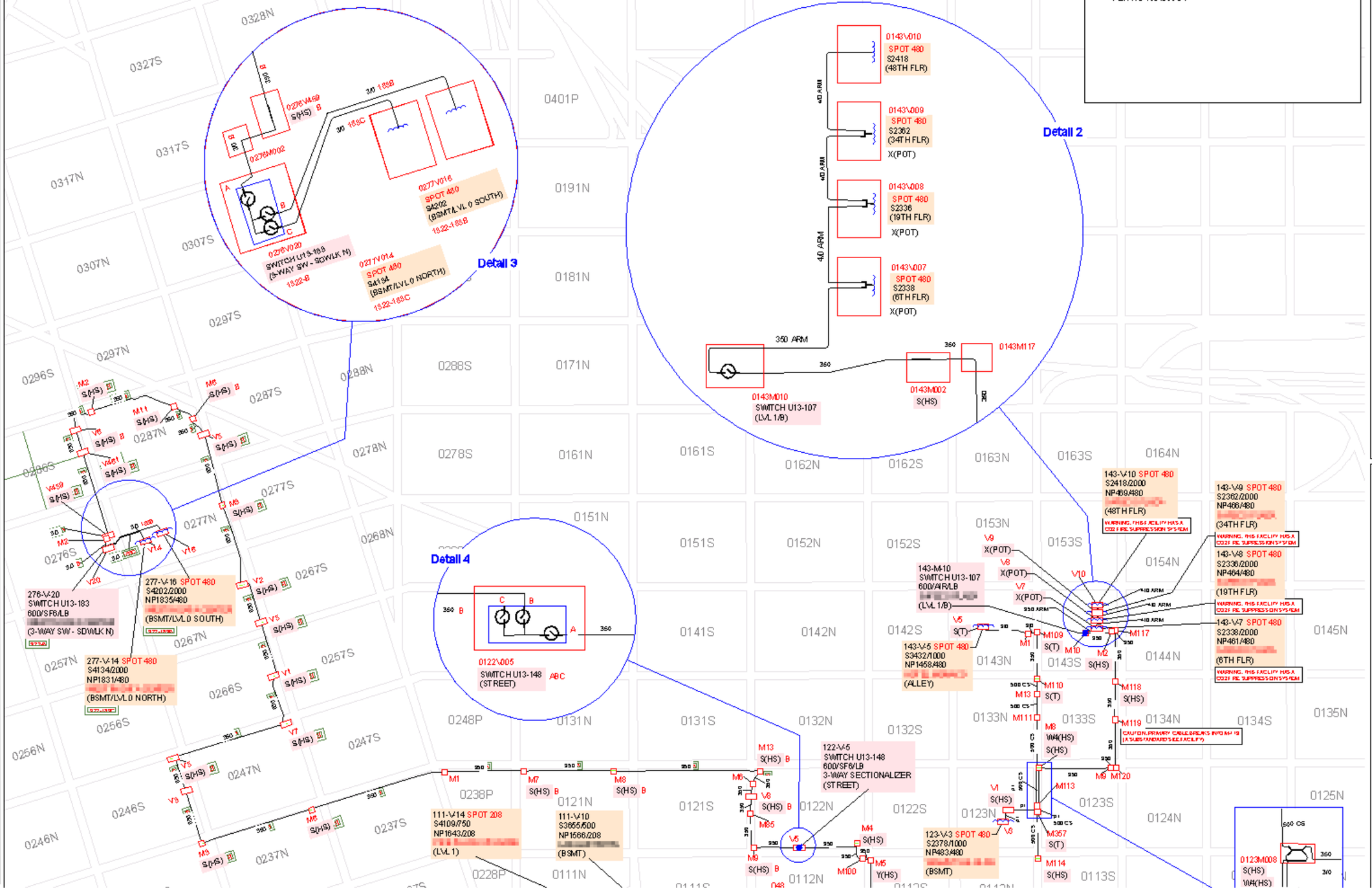


Facility Detail Drawing

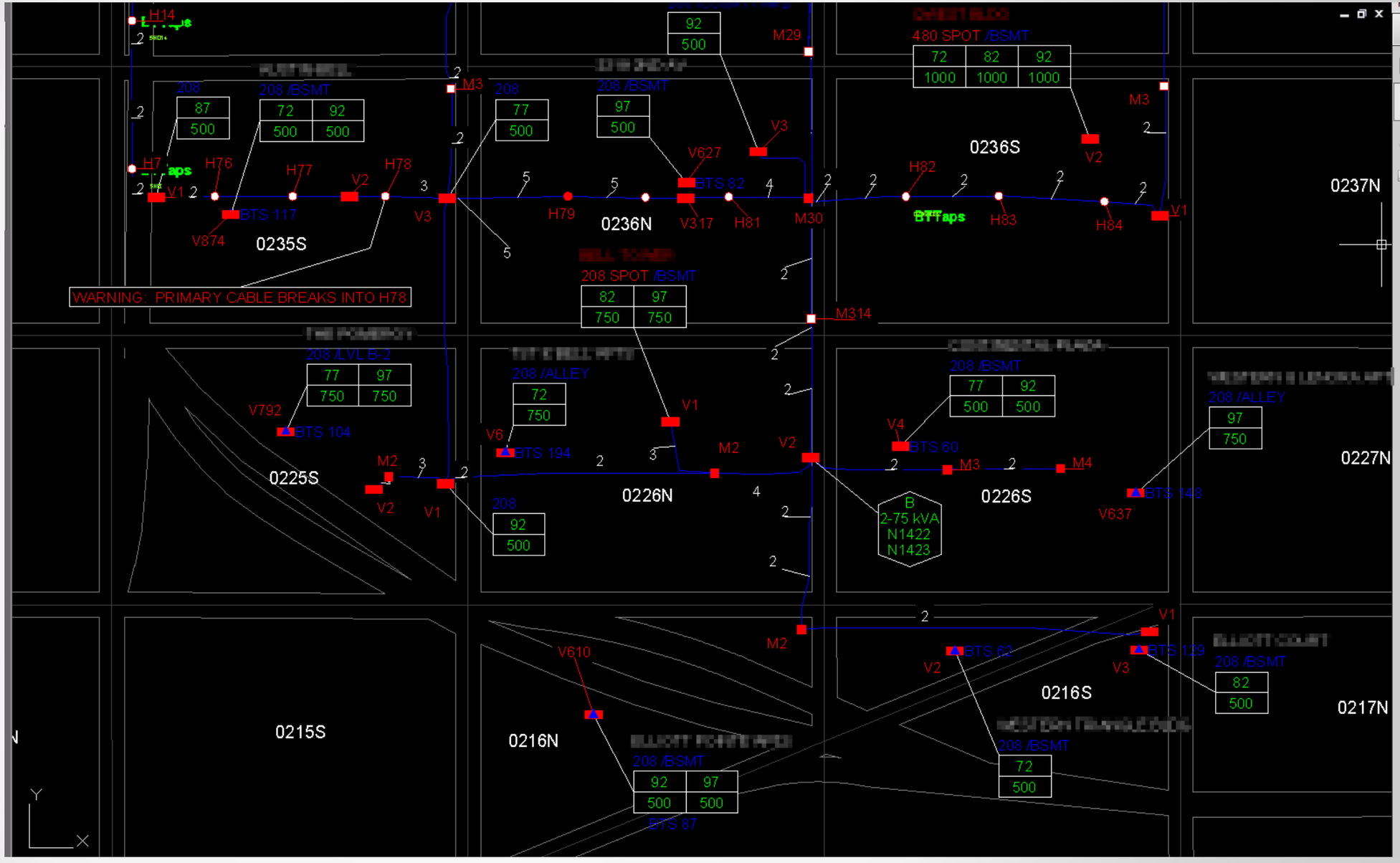




Feeder Map


Detail 2
Detail 3
Detail 4
0143\V010
SPOT 480
S2418
(48TH FLR)
0143\V009
SPOT 480
S2362
(34TH FLR)
0143\V008
SPOT 480
S2336
(19TH FLR)
0143\V007
SPOT 480
S2338
(6TH FLR)
X(POT)
40 ARM
350 ARM
0143M010
SWITCH U13-107
(LVL 1/B)
0143M002
S(HS)
0143M117
0277V016
SPOT 480
S4202
(BSMT/LVL 0 SOUTH)
0277V014
SPOT 480
S4194
(BSMT/LVL 0 NORTH)
0276V020
SWITCH U13-183
(3-WAY SW - SDWLK N)
0276V459
S(HS)
0276M002
0122\V005
SWITCH U13-148
(STREET)
ABC
276-V-20
SWITCH U13-183
600/SF6/LB
(3-WAY SW - SDWLK N)
277-V-16 SPOT 480
S4202/2000
NP1835/480
(BSMT/LVL 0 SOUTH)
277-V-14 SPOT 480
S4134/2000
NP1831/480
(BSMT/LVL 0 NORTH)
143-V10 SPOT 480
S2418/2000
NP469/480
(48TH FLR)
143-V9 SPOT 480
S2362/2000
NP466/480
(34TH FLR)
143-V8 SPOT 480
S2336/2000
NP464/480
(19TH FLR)
143-V7 SPOT 480
S2338/2000
NP461/480
(6TH FLR)
143-M10
SWITCH U13-107
600/AIR/LB
(LVL 1/B)
143-V5 SPOT 480
S3432/1000
NP1458/480
(ALLEY)
122-V-5
SWITCH U13-148
600/SF6/LB
3-WAY SECTIONALIZER
(STREET)
111-V14 SPOT 208
S4109/750
NP1643/208
(LVL 1)
111-V10
S3655/500
NP1566/208
(BSMT)
123-V-3 SPOT 480
S2378/1000
NP483/480
(BSMT)
0123M008
S(HS)
WM(HS)

Secondary Map



GIS / Mapping Challenges

Typical Situation

- Multiple tools used, e.g. traditional GIS and AutoCAD
- Thousands of drawings, may or may not be in sync with each other.
- GIS limitations hinder complete, accurate, detailed modeling
- Drawings imply connectivity model, but is it correct?
- GIS, CAD, Asset Management and Engineering Systems don’t share information
- Information lost as it flows between CAD based and GIS based systems
- Archaic, paper based markup workflows limit information, contribute to errors

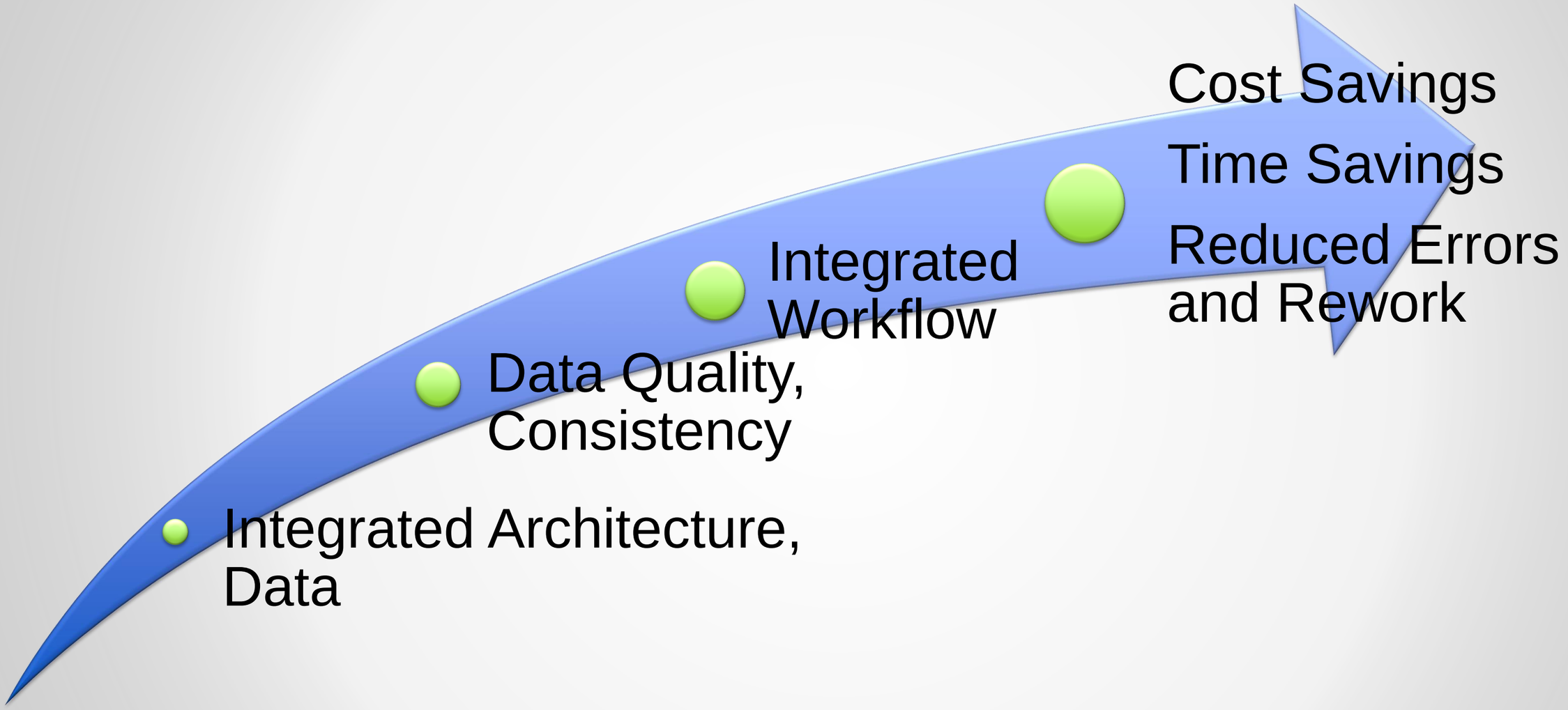
Seattle City Light Change Drivers

- Accelerate map production through single point of entry and automation
- Establish robust primary and secondary connectivity models that enable:
  - Tracing and analysis tools for mappers to improve model quality
  - Automated production of feeder and secondary maps
  - Exports of facility, equipment, cables and connectivity data to:
    - Analysis and loadflow applications, e.g. Cyme, Synergi, ETAP
    - Design tools for engineers, e.g. Autodesk AUD
    - Outage Management Systems

Benefits of Integrated Workflow and Architecture

- Mapping
  - Accelerated map production through automation and single point of entry
  - Greatly reduced error rate
  - Better customer service
- Asset Management
  - Improved cost effectiveness of asset maintenance
  - Reduced need for field verification, saving engineer and crew time
  - Improved safety due to current and accurate maps
- Engineering
  - Enhanced capacity planning
  - Improved accuracy on new designs

GIS/Mapping Value Chain



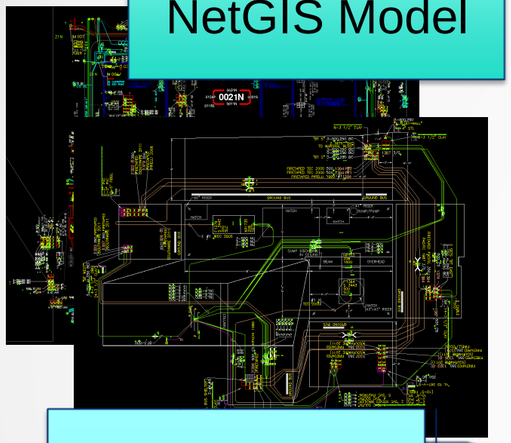
Lifecycle Workflow

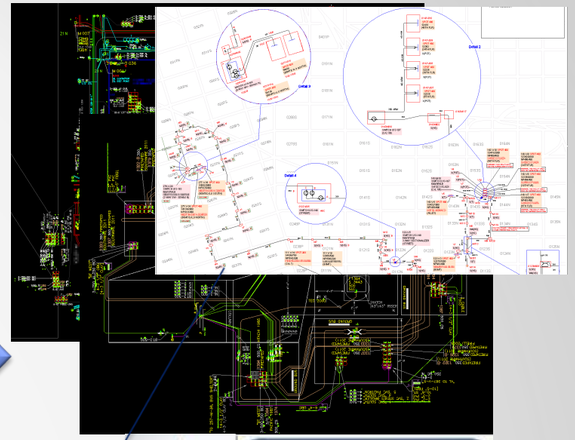
NetGIS Model Based Workf

Synchronize affected drawings

Update As Built Drawings and NetGIS Model

Import markup, point clouds, pictures, etc





Sync Updates

Create, update derived drawings

Design

Field Update

Export CIM model

Drawing

Export to AUD for design

Red Lines

LIDAR

Capture Field Changes

Model

Publish

Publish

Visualization

Ad Hoc Analysis

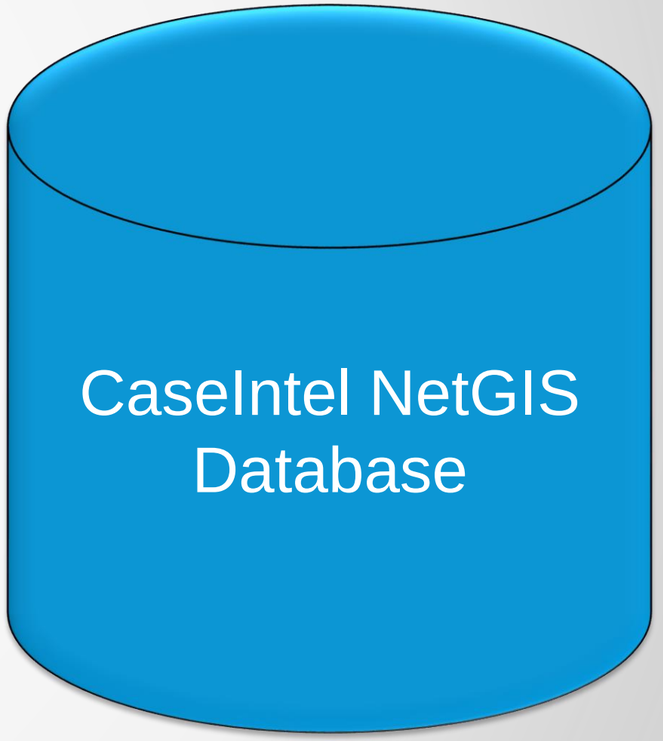
Solution Approach

Architectural Approach

- AutoCAD add in -- all drawings synchronized in real time to common underlying database as drawing is edited.
- Business rules enforced using rules and data in database (Oracle).
- Preserve ‘look and feel’ of AutoCAD.
- Use open spatial format for easy data access
- Use server based network tracing and analysis.
- Allow users to control automated changes to drawing, e.g. model synchronization.

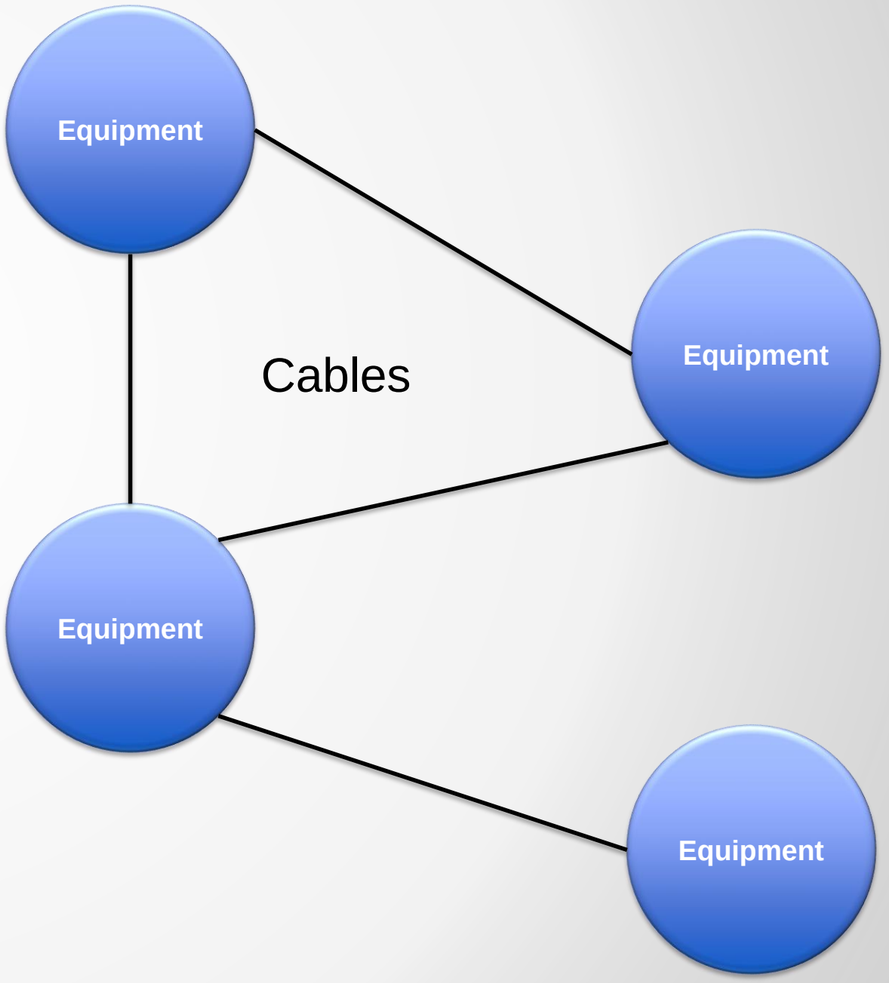
What's in the Database?

- Drawings
  - Complete, unaltered AutoCAD Drawings
- Electrical Model
  - Equipment
  - Electrical Connectivity
  - Cable Detail
- Civil Infrastructure
  - Facilities
  - Ducts
  - Duct Banks
  - Connectivity
- Business Rules

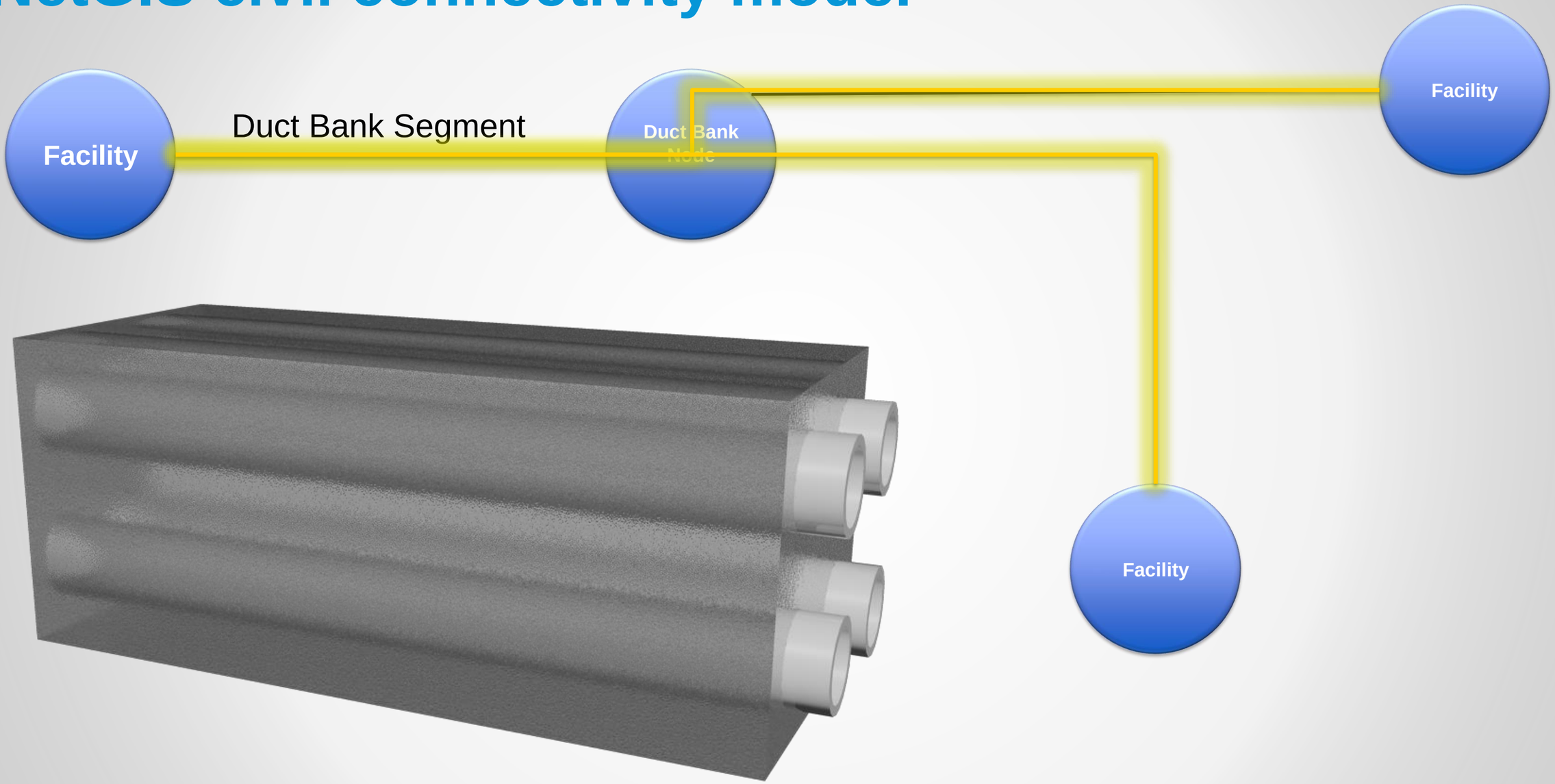


NetGIS electrical connectivity model

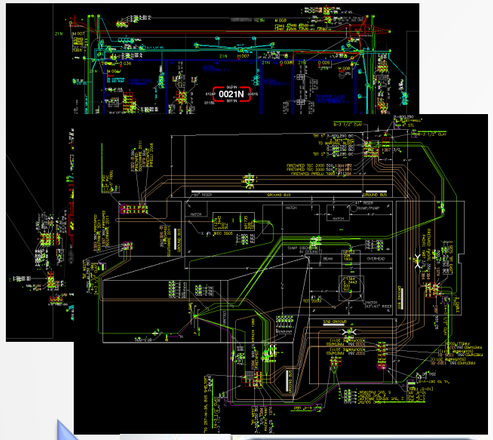
- Uses server based in-memory tracing engine. Not dependent on workstation performance.
- Scalable to millions of nodes
- Understands circuit characteristics (phasing, voltage, etc.)
- Understands detailed physical and electrical characteristics of the cables.
- Allows a hierarchy of Conductors to Physical Cable, to Cable Sets

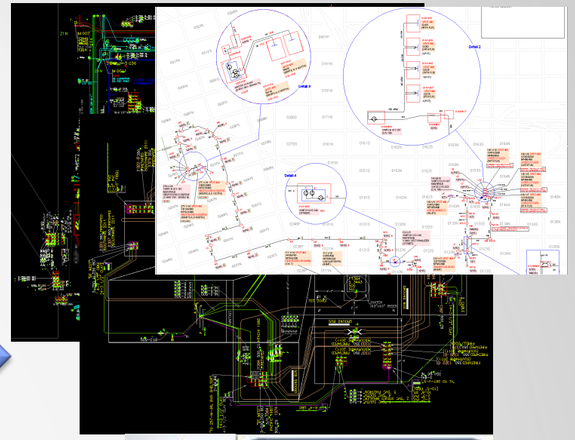


NetGIS civil connectivity model



Interface Technology





DWG, RCS

NetGIS API

NetGIS API

CaseIntel NetGIS Database

FDO

UD

SERV

360

M3D

DWGS

SCANS

RECAP

esri

Oracle Spatial

ORACLE DATABASE 12c

CIM RDF/XML

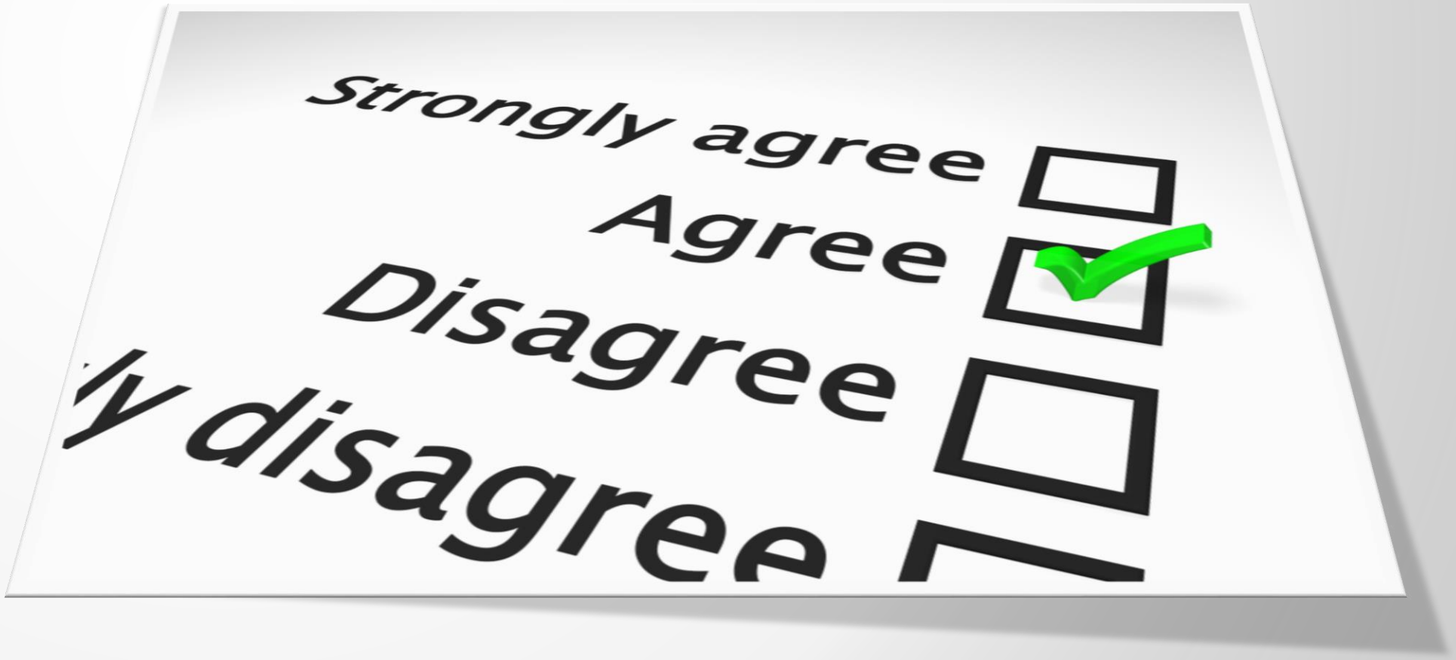
CIM users group

Lifecycle Demo

Questions and Discussion

Be heard! Provide AU session feedback.

- Via the Survey Stations, email or mobile device.
- AU 2016 passes awarded daily!
- Give your feedback after each session.
- Give instructors feedback in real-time.



Contact Information

- Trevor Hayward
  - Trevor.Hayward@caseintel.com
  - 206-774-6712 Ext. 2252
- DaleLundgren
  - Dale.Lundgren@caseintel.com
  - 206-774-6712 Ext. 2281