3D Utility Mapping

John Scaife & Jeff Lyons
Cole Engineering Group Ltd.

TRENCHLESS TECHNOLOGY ROADSHOW
May 28-29, 2014 – Scotiabank Convention Centre, Niagara Falls, ON
Introduction to Cole Engineering

- Cole Engineering Group Ltd. (CEG) is a client-focused, value driven consulting engineering company serving clients in the public and private sectors,
- Multi-Disciplined firm with over 280 people in 3 locations (Markham, Mississauga, Caribbean)
- Service sectors in Municipal Engineering, Environmental Engineering and Science, Transportation and Land Development
What is Subsurface Utility Engineering?

- An engineering process which assigns attributes to secured underground utility information
- Reduces project risks via better information
- Procured professional service
Standardized Processes for SUE

- ASCE 38-02 Process Documentation
- CSA Standards S250-11 Documentation

**Deliverables Review**
Provide various “Levels” of Detail depending on project requirements:

- **Level D** – Historic Records, GIS and CAD Records
- **Level C** – Visible or Surveyed Features for project area
- **Level B** – Underground Remote Sensing using various Geophysics
- **Level A** – Field Verification using Test Pits
SUE Level ‘D’ - Utility Records – Various Quality and Format
SUE – Level ‘C’

- historic civil engineering practice
- ‘engineering’ survey of project area
- capture all visible utility appurtenances
- plot on composite drawing
- professional judgment in correlating these data to Level D information
SUE – Level ‘C’ Photo Evidence
SUE – Level ‘B’

- geophysical survey: electromagnetic line locators;
- ground penetrating radar; EM mapping
- capture of all markings to appropriate tolerances
- reduce to plan documents
- professional judgment in correlating these data with
- Level C and/or D information
- identify potential conflicts and build a conflict matrix
SUE Level ‘A’

- typically ‘daylighted’ for visual confirmation
- capture to appropriate tolerances
- reduce to plan documents
- resolve or confirm conflicts
- deliver stamped drawings and support notes
Summary of SUE Process

- Utility mapping aids with design
- SUE is recognized engineering process
- CSA S250 standardizes depiction
- Tremendous value to project owners and designers
- Better information means better design and safer and more productive construction
“3D” = “Building Information Modelling”

- BIM Process supports Collaboration on any project,
  - Surveyors
  - Architects
  - Engineers
  - Planners
  - Clients/Owners
  - Construction
  - Government
- Single Model Environment linked to Project Survey, Design and Construction
Why use BIM for Subsurface Utility Engineering?

Visualize, Analyze, Collaborate, Communicate...

- Create the Existing Base Model from City GIS, Surveyor and other mapping suppliers
- Collaborate with Trenchless Strategy in complex Utility projects
- Integrate Detailed Design From Engineers using 3D Environment
- Perform Crossing and Clash Detection to enhance SUE Services
- Deliver GIS Ready Asset Data Sources to the Project Team
- Provide Images and Video of the 3D Model for stakeholders
BIM Model of Urban Environment

- Project Wide Model compiled from:
  - Level ‘D’ - GIS Datasets from City and Various Utilities
  - Level ‘C’ – Topo and LiDaR Mobile Ground Survey
  - Level ‘B’ – Locate Pickup and Survey
  - Level ‘A’ – Test Pit Verification
Collaboration with Surveyors

- Integrate Data provided by Surveyors seamlessly using various data formats and workflows
- Integrate Mobile LiDaR Datasets for feature verification – millions of points (direct use of point cloud)
- Create intelligent SUE Datasets for Engineers...REAL Value!
Image of Mobile LiDaR, GIS and Survey Datasets
For Visual Inspection: SUE “In Context” with Project

- Review Concept, Detailed Design, or Asbuilt Construction with SUE Datasets in Realtime
- Do we need to Move Utilities?
- Do we need to perform enhanced Level ‘A’ field work?
For Design Analysis: Crossing & Clash Detection

- Crossing: Level ‘B’ Data between existing and proposed design infrastructure
- Clash: Level ‘A’ Enhanced Utility Data with Z Elevation can determine actual Clash (Hard or Soft)
GIS Ready Datasets: Example Pipe “Size” Thematic Mapping
Public Communications

- Deliver Images and Video for Public Consultations to support the Project beyond SUE Services
Online Access to SUE Model Data

- Share Models Online with Entire Project Team
- Supports Mobile or Browser based Viewing
- Supports “Augmented Reality” field inspection and review using iPAD
Sample Video from BIM Model

*Underground Yonge Street*

*Elgin Mills and Yonge Intersection*

*BIM Environment Navigation and Tooltips*

*Test Pit Alley*
Final Summary

✓ Cole has leading edge expertise and many resources
✓ SUE adds value to Infrastructure Projects
✓ BIM Visualization assist SUE Interpretations and Lower Risks
✓ Better Information means Better Design
Questions?

See us at Booth# 46
Thank You

Come see us at Booth #46 for more information about SUE and BIM Services

www.ColeEngineering.ca
Markham   Toronto   Caribbean