Infrastructure Modeling and Data Management - The Road to Digital Delivery

Jacque Brown, P.E.
Strategic Implementation Manager – Microdesk

Butch Loncar
Engineering Automation Coordinator – Pennsylvania Turnpike Commission

Stephanie Rindosh, P.E.
Infrastructure Solutions Specialist – Microdesk
About the speaker

Jacque Brown, P.E.

- B.S.E. Civil Engineering degree from Arizona State University
- 16+ years in the Infrastructure industry, Microdesk for 7+ years
- Manages projects for clientele in the Transportation and Highway, Land Development, Power and Energy, and Port Authority industries
- Assists clients, such as PTC, in managing and organizing data, developing and establishing standardized content and procedures, BIM model development and coordination
About the speaker

Butch Loncar, PTC

- Robert "Butch" Loncar is the Engineering Automation Coordinator for the Pennsylvania Turnpike Commission
- 34+ year employee of the Commission with 28 years within the Engineering Department
- For the last 20 years he has been the Engineering Automation Coordinator whose responsibilities are overseeing the development of the Engineering Technology Standards and the operation and maintenance of the CAD and other engineering software and hardware within the Engineering Department
About the speaker

Stephanie Rindosh, P.E.

- M.S. Civil Engineering degree from Villanova University and B.S. Civil Engineering degree from The College of New Jersey
- 5+ years of industry experience in major highway design and construction
- Provides highly skilled consulting, training and mentoring for engineering firms to ensure the most up-to-date AEC technologies are integrated into their design workflows
Introduction
Infrastructure Modeling and Data Management - The Road to Digital Delivery

- The Pennsylvania Turnpike Commission is responsible for over 550 miles of highway
- The PTC faces multiple challenges with data management and variations in project deliverables
- Their final goal is to implement digital models as a requirement for project bidding
The PTC and Microdesk Partnership

- Integrate organization standards
- Initiate the process of building intelligent 3D models
- Solutions included:
  - Master files of all 550+ miles of highway
  - A cloud-based document management solution
  - Standards for project deliverables
  - Development of BIM models
- Solutions provided a reduction in rework, easier access to data, and an integrated system between departments
Pennsylvania Turnpike Commission Overview
OUR VISION
Driving the standard for safety, customer service and mobility.

OUR MISSION
To operate a safe, reliable, customer-valued toll road system that supports national mobility and commerce.
The Pennsylvania Turnpike Commission

What is PTC?

• Brief History
  o October 1, 1940 - "America's 1st Superhighway"
    ▪ 2.4 million vehicles in first year opening
    ▪ Average of 6,575 per day
  o October 1, 2020 – 80th Anniversary of Opening
    ▪ 210.3 million vehicles per year (as of 2019)
    ▪ Average of 576,284 vehicles per day

• Major Projects at PTC
  o Total Reconstruction Projects of Original System
  o Southern Beltway U.S. Route 22 to I-79
  o Mon-Fayette PA Route 51 to I-376
  o I-95 Interchange
PTC Facts and Numbers

553 MILES

553 Miles / 7 Routes
2,442 Total Lane Miles

75 FARE COLLECTION FACILITIES

75 Fare Collection Facilities Using E-ZPass and Toll By Plate

28 MAINTENANCE FACILITIES

23 Maintenance Buildings and 5 Tunnels

576,284 AVERAGE VEHICLES PER DAY

As of 2018, the Average Vehicles Per Fiscal Year is Greater than 210 Million
PTC Highway Program

FY 2020 Highway Program First Year Spending = $480,939,219
By Category

- Roadway/Safety: 35.4%
- Bridge, Tunnels & Misc Structure: 14.2%
- Total Reconstruction: 30.9%
- Interchanges (w/o Cashless): 7.8%
- Highway Miscellaneous: 8.0%
- Cashless Tolling Conversion: 3.8%
Harrisburg East Toll Plaza and Interchange
Challenges at PTC

• Data Management Challenges
  o 80 years of data done to standards that vary across generations and accuracy
  o No single cohesive view of the entire system
  o Reconciling accuracy differences from 1940 to 2020

• Project Deliverable Variations and Challenges
  o Variations in project deliverables and compliance

• Other Challenges
  o Creating intelligent models and integration with GIS
  o Creating a “Digital Twin”
  o Collaborating with CAD/Model data vs. pdf plans
  o As-Builts
The Road to Digital Delivery

- Project Planning
- Design
- Construction
- Project Closeout & As-Built Data
- Operations & Maintenance
- Asset Management
- Capital Planning
- Capital Portfolios
- Capital Projects

Infrastructure Modeling and Data Management
Solutions
Master LRS and ROW Drawings in Civil 3D

Alignments

Right-of-Way

Mile Posts

Travelways
Master LRS and ROW Statistics

1,671 ALIGNMENTS
Total Alignments Including
92 Primary
1,008 Secondary
272 State Roads
299 Access/Maintenance

6,507,493 LINEAR FEET OF RIGHT-OF-WAY
Total Linear Feet of Right-of-Way Linework

14,776 MILEPOST LABELS
Includes 11,327 Primary and 3,449 Secondary Mileposts

1,419 MILES OF TRAVELWAY
Includes 1,128 Miles of Primary and 291 Miles of Secondary Travelway
Pavement Linework

- **LiDAR Scanning**
  - Process and Convert
    - 5.1 TB of Data
  - Import into Civil 3D
  - Draw Linework
    - Edge of Median
    - Edge of Shoulder
    - Edge of Pavement
BIM/3D Models

- BIM/3D Models or Roadways and Drainage Networks in Civil 3D
  - Approximately 30 miles completed
Harrisburg East Interchange
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GIS and Pavement Asset Management Systems
Data with intelligence used to feed GIS and Pavement Asset Management Systems
Engineering Technology Standards Development

- Documentation
- AutoCAD and Civil 3D Templates
- Bentley MicroStation and OpenRoads Templates
- Sheet Templates
- Compliance Checking

Future Standards Development
- Survey and As-Built Standards
- BIM/3D Modeling Standards
Looking Forward
Do More
Do Better
With Less

Inspired by Autodesk CEO Andrew Anagnost
Autodesk University November 2017
Digital Delivery by 2023

• 3D Intelligent Model is the primary source document
  o All information extracted from 3D Models

• 3D Model Benefits
  o Better visualization
  o Reduce project errors
  o Reduce project costs
  o Provide more information with greater accuracy
  o Stronger communication
  o Future planning
  o And many more!
3D Model Development of Entire Turnpike
Compilation and Organization of Data
File Management

“I am not disorganized — I know exactly where everything is!
The newer stuff is on top and the older stuff is on the bottom.”

Copyright 2004 by Randy Glasbergen. www.glasbergen.com
Project Evolution

2015-2017

INITIAL RESEARCH
- Review Current PTC Workflows & Research Technology Solutions
- CAD Standard Document
- C3D Master Centerline Alignment Files

2017-2019

C3D INTEROPERABILITY
- C3D Master Right-of-Way Files
- CAD Linear Reference System
- GIS Integration
- GIS Workflow Interoperability between multiple stakeholders

2019-2021

BIM MODEL DEVELOPMENT
- LiDAR Scans & C3D Master Pavement Data
- Development of Corridor and Drainage Models
- BIM Technology Standards & Compliance Checking
- Research & Workflow of Data File Management System

2021-2023

DIGITAL DELIVERY
- Continue development of Corridor and Drainage Models
- Integration of Data File Management System
- Develop efficient digital review procedures
- Project Pilot and Review
- Implementation of Digital Delivery
Future of the PTC and Microdesk Partnership

Valley Forge Interchange 1954

Valley Forge Interchange 2015
Pennsylvania Turnpike Commission
LEADING FUTURE HIGHWAY DESIGN
PTC Bridge Demolition