TxDOT's Digital Delivery Program

Day 2 – December 3rd
Track Rm 1, Session 2
2:30PM – 3:15PM

Presenter: Adrian Martinez

- I have been with TxDOT for 20 years.
- Currently the Assistant Section Director of Digital Delivery within the Design Division.
  - Overseeing the development and implementation of making our design models as legal bid documents, the change management of workflows and processes, and assuring that our design data flows throughout the data lifecycle from Planning to Operations and Maintenance through our asset management systems.
- Started full time career in the San Angelo District and was there for 7 seven years doing PS&E.
- Then took a position in Central Design in the Austin District.
  - Continued working on PS&E, working on several major projects including the DDI at Mopac and Slaughter Lane and the conversion of 8 miles of US 290 from an undivided roadway to 4 lane divided near the town of McDade
  - Was also the Program Manager for the grade separations along the State Loop 360 corridor and SH 71 corridor.
- Before taken on the current role as Assistant Director, I held the position as District Utility Engineer in Austin. Helping to over see the realignment of staff dedicated to more active roles with design staff and projects, establishing more robust district wide Utility Engineering contracts, and working along side Stefan Srnensky, Marco Cameron, Jeff Alvarado, and many others on the utility coordination on the IH 35 Capital Express projects.

TxDOT's Digital Delivery Updates and Highlights

Texas Department of Transportation

Today's Presentation

1. Program Development
2. Pilot Project Programs
3. Construction & Inspection
4. Asset Management
5. Impacts to SUE

Digital Delivery Program Development

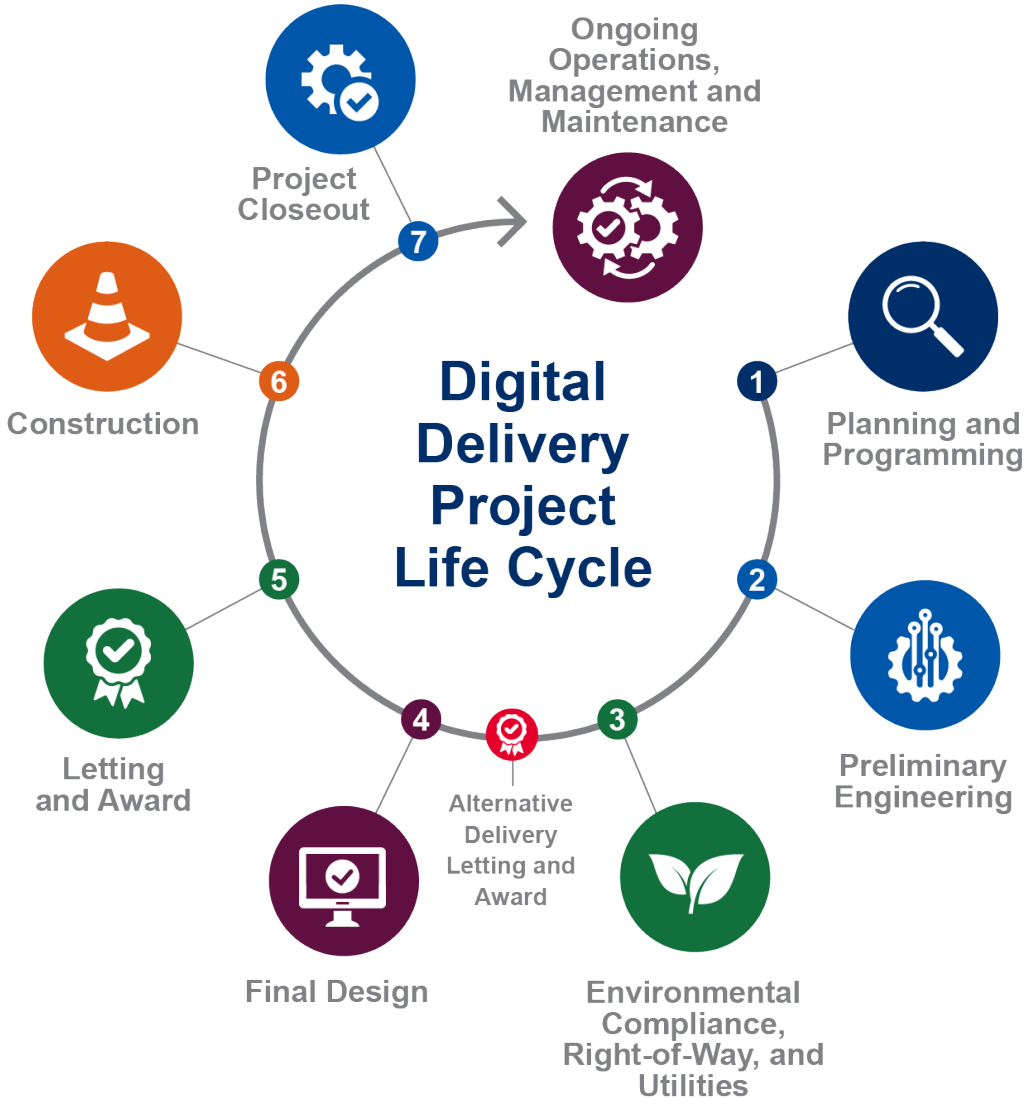
What is Digital Delivery?

Replacing Traditional Plans with Digital Design Models

- Model as the Legal Document (MALD)
- Advanced 3D modeling
- Digital design review tools
- Data-rich design models

The Why

- Already established and proven overseas
- FHWA and AASHTO recognized
- TxDOT wants to be the leader in these initiatives



How will Digital Delivery impact you?

Benefits

- More accurate and optimized design
- Improved project communication
- Model-based quantities
- Extraction of assets
- Less change orders and RFIs
- Ability to tie bid items to features

How will Digital Delivery impact you?

Benefits

- Better location information
- Better utility conflict management
- More accurate utility identification
- Less data and knowledge loss of underground assets
- Better management of joint duct bank assignments
- Clear and concise utility coordination

Digital Delivery Program Core Values

MISSION: Advancing TxDOT's transportation program through digital innovation

SAFETY
Ensuring the transportation system is designed and delivered with the utmost consideration for public safety.

INNOVATION
Embracing and promoting the use of cutting-edge digital technologies and methods.

RESILIENCE
Building a transportation infrastructure that can withstand and recover from disruptions and challenges.

EFFICIENCY
Striving for streamlined processes and optimized resource utilization.

DATA-DRIVEN DECISIONS
Making informed decisions based on accurate and comprehensive data analysis.

Digital Delivery Program Goals

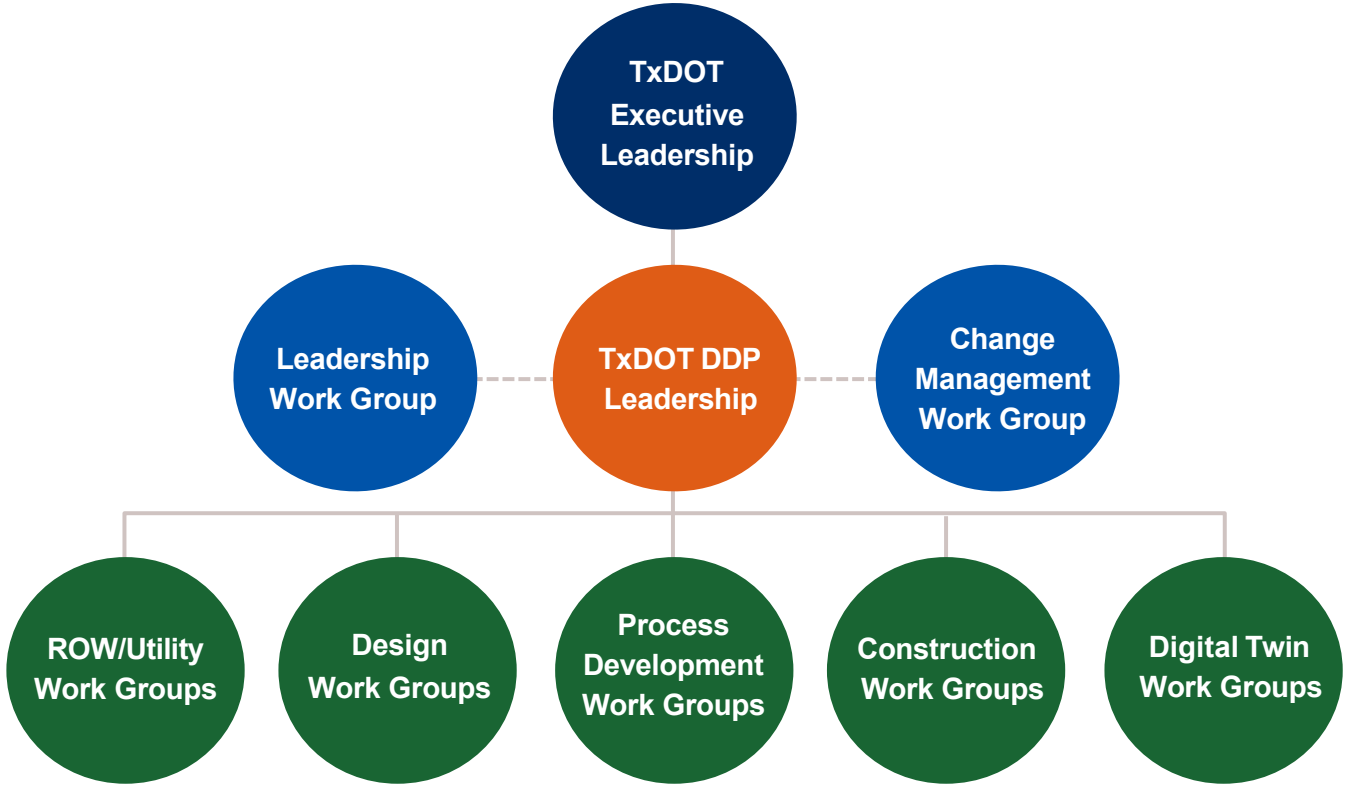
5 STRATEGIC GOALS

1. Integrate Digital Delivery into all applicable aspects of TxDOT's business and operations.
2. Standardize processes and technology across the TxDOT organization.
3. Manage and leverage data throughout all stages of the infrastructure lifecycle.
4. Prepare TxDOT's existing and incoming workforce for a fully digital transportation agency.
5. Advance the state of the practice for Digital Delivery by partnering with peer states and industry.

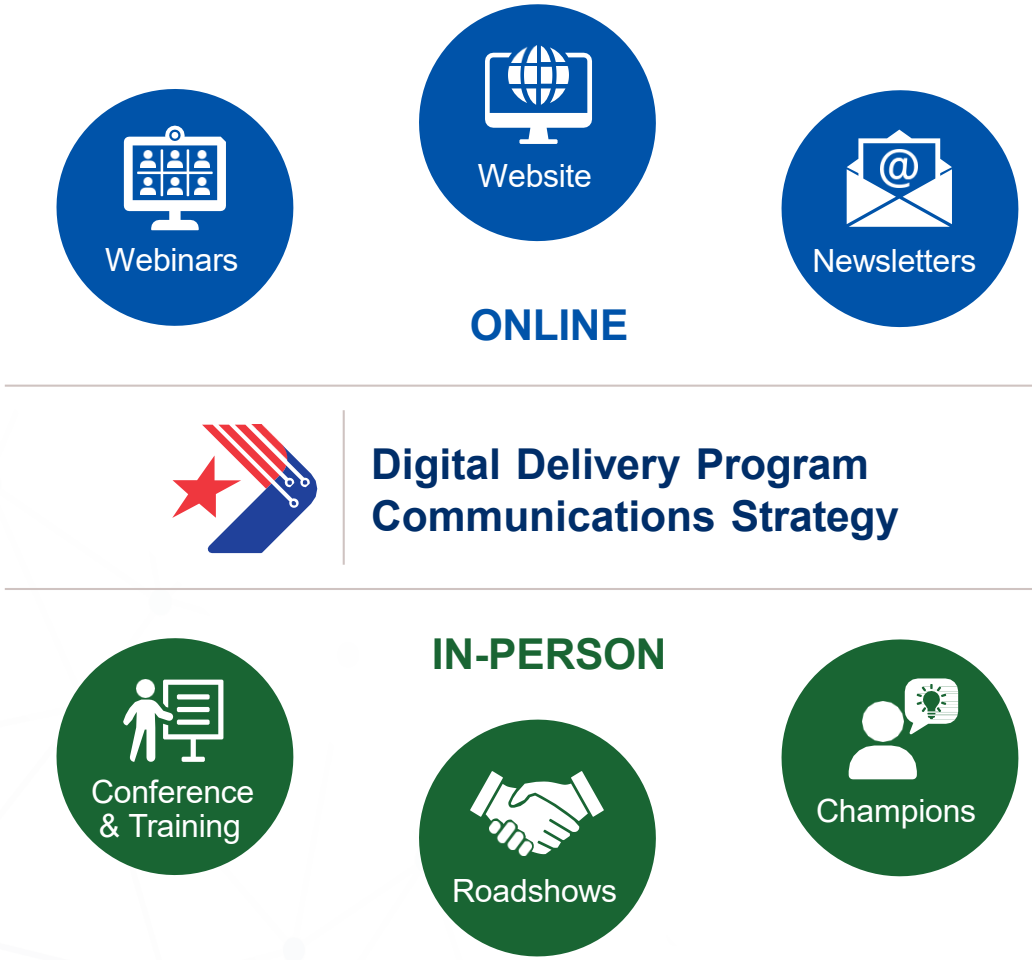
Work Groups

Who is involved?

- Diverse background
  - Divisions
  - 8 Districts
    - urban, metro, & rural
- Associated General Contractors of America (AGC) and
- American Council of Engineering Companies (ACEC) working groups



Stakeholder Communications Strategy Elements



Digital Delivery Program Initiatives

Planning Documents

- Strategic Plan
- Implementation Plan
- Training Plan
- Communication Plan
- Digital Twin Plan
- Impact Assessments

Process

- Digital Delivery Process
- Design Review (QC) Process
- QC Checklists
- Inspection Process
- Software Intake & Evaluation

Standard

- Model Development Standards (MDS)

Digital Delivery Toolbox

- 3D Model Breaklines
- Digital Design File Guidance
- iModel Guidance
- File Naming Convention
- Template Point Naming Convention
- Phased Modeling
- Item Types
- QC Plan and Checklist
- Quantity Reporting
- Signing and Sealing

Digital Delivery Training Efforts

Training Courses
DES 750 - OpenRoads Designer for Plan Development
DES 751 - OpenRoads Designer for Survey
DES 752 - Drainage and Utility Design using ORD DU
DES 753 – Advanced ORD Training (Ramp & Intersection Modeling)
DES 754 – OpenRoads Designer Template Creation
DES 760 - ProjectWise for Power Administrators
DES 761 - ProjectWise Training for Users
BRG300 - TxDOT OpenBridge Modeler Training

Potential Future Training Courses

- *Phased Modeling in ORD*
- *Design Review for Digital Delivery*
- *Construction Inspection for Digital Delivery*
- *Introduction to Digital Delivery*

Roadmap

DIGITAL Delivery Program

START: Geopak Utilization

2018: OpenRoads Utilization

2019: Posting XS

2022: Openroads Rollout

Formation of DDP Working Groups

Ongoing Change Management

2023:
- Software Investigation
- Model Review SOP
- Asset Management
  Digital Twin Exploration
- Strategic Plan

Ongoing Change Management

2024:
- Models for Letting
- Model Development Standards
- Digital Construction Exploration
- Workforce Transition Strategy

SPRING 2025:
- 1st Fully Digital Pilot Project

Summer 2025:
- Models supplement for information only for all projects

Additional Pilot Project

Statewide Policy for Digital Delivery of Applicable Projects

DDP Pilot Project Program

Pilot Project Digital Delivery Goals

DESIGN

3D modeling constructability and clash detection

Data attribution to CAD elements for model-based quantity reporting

Digital review tools for model review and comment resolution

DELIVERABLES

Models as legal documents

3D Model Breaklines for Automated Machine Guidance (AMG) and estimating

CONSTRUCTION

Digital review in the field

Digital as-builts e-Ticketing for materials documentation

Digital construction management tool

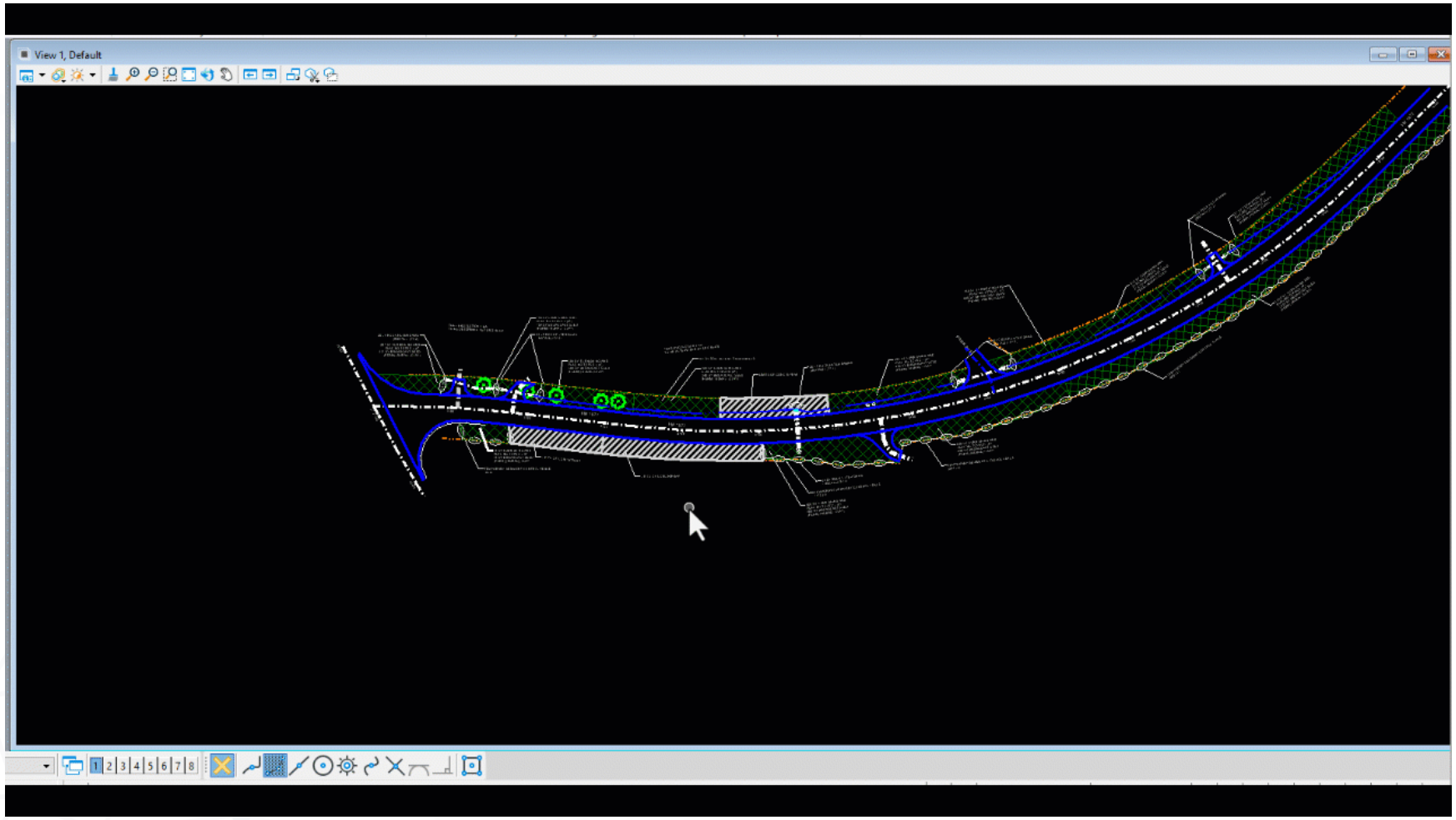
ASSET MANAGEMENT

Data attribute to CAD elements for asset tracking

Digital as-builts

3D Model Breaklines for Automated Machine Guidance (AMG)

Model Item Types for Estimating and Reporting



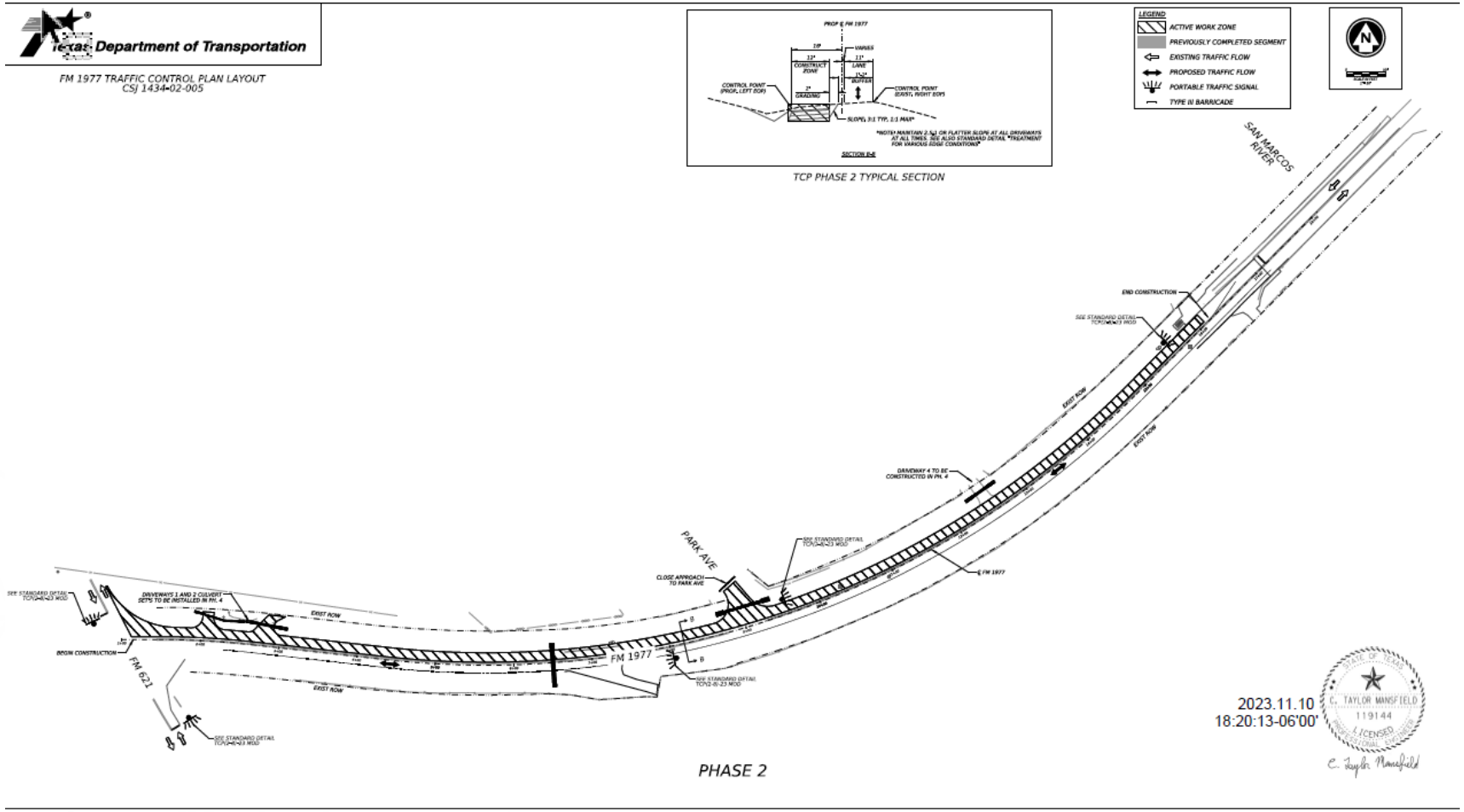
What is a Digital Delivery Deliverable?

Roll Plots

- P&P (plan & profile)
- Phased TCP
- Removal
- Environmental

Digital Files

- Index of Files
- All relevant dgn's
- XML
- KMZ



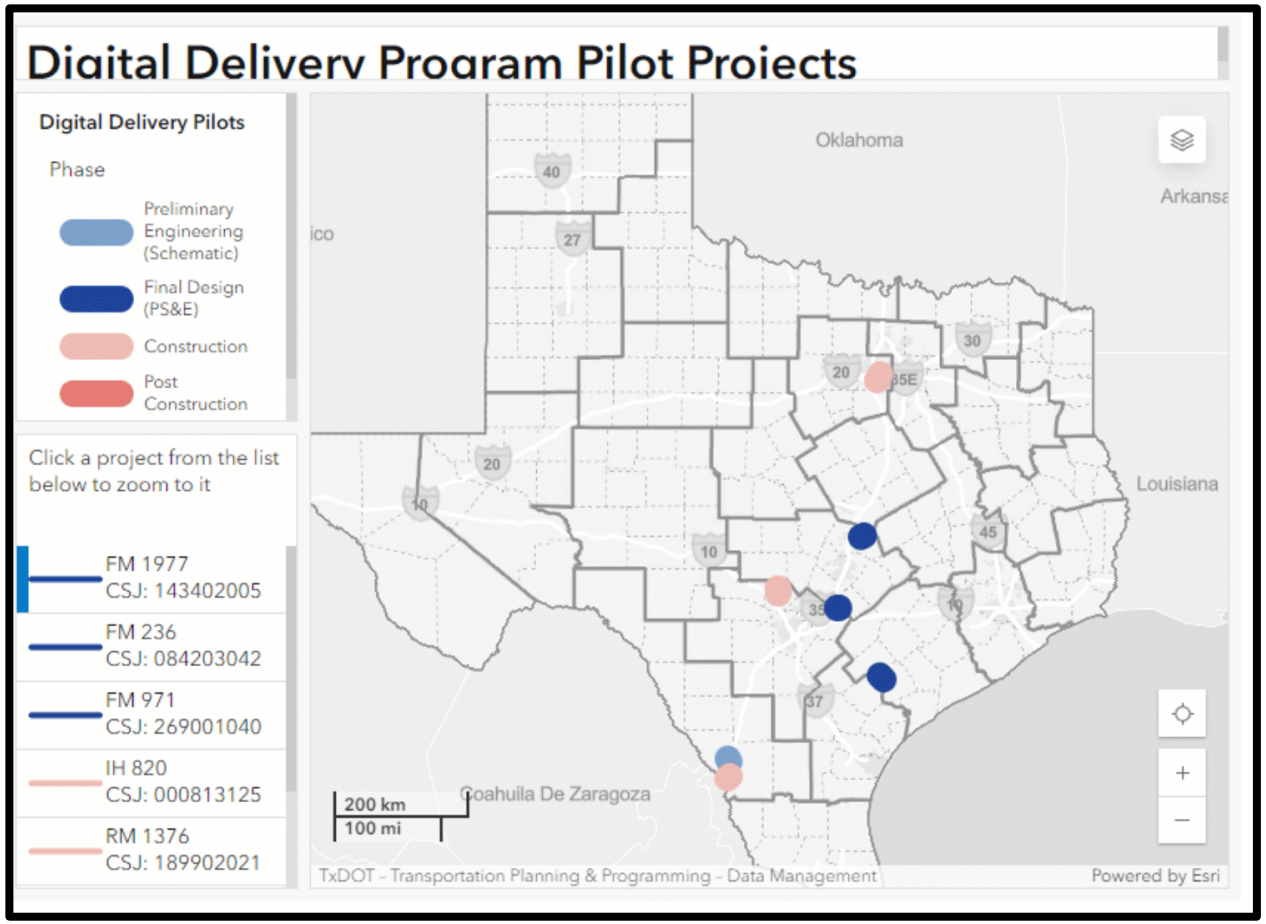
Example of phased TCP roll plot.

Pilot Project Tracker

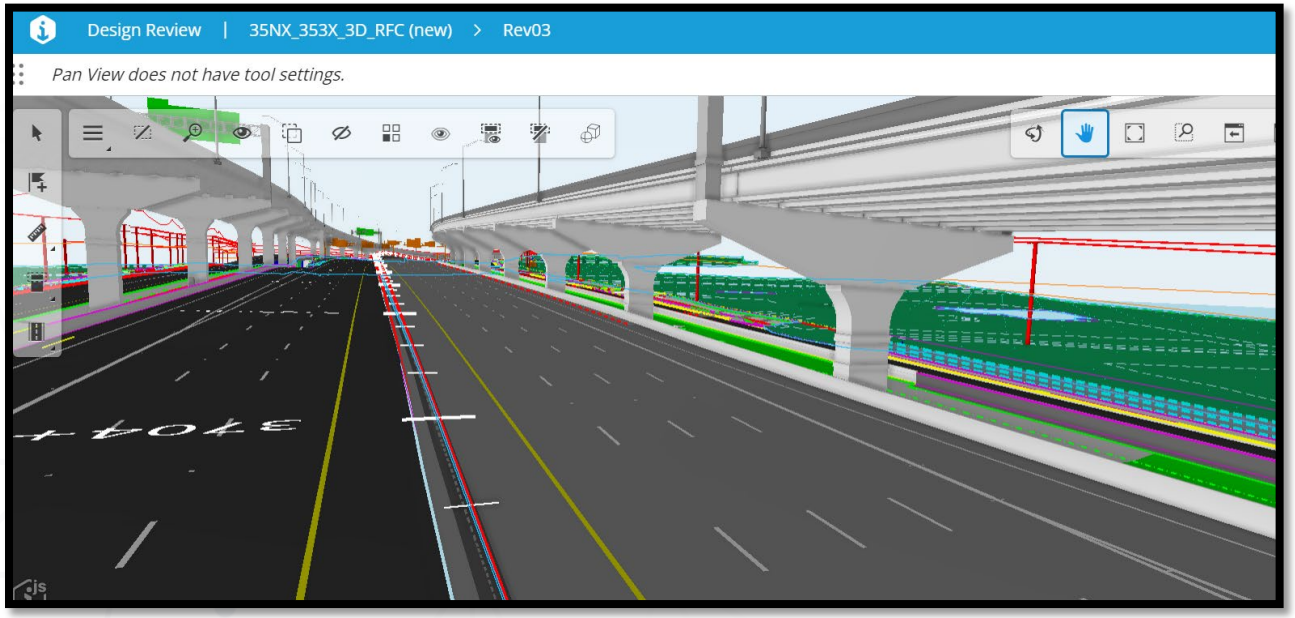
HIGHWAY NAME	DISTRICT	SCOPE	LETTING DATE
FM 1977	**San Antonio**	PS&E. 0.311 mi. reconstruction and widening from FM 621 to the Guadalupe/ Caldwell county line.	**Jan. 2025**
FM 1929	**San Angelo**	PS&E. ~8.5 mi. of rehabilitation of existing road from US 83 to Lake County Rd.	**November 2026**
FM 236	**Yoakum**	PS&E. ~5 mi. conversion from 2 to 3 lane facility. Includes proposed roadway realignment, widening, medians, and drainage improvements.	**May 2027**
US 83	**Laredo**	Schematic and PS&E. 3.741 mi. roadway widening and reconstruction from 1 mi. north of SH 255 to Los Botines Ln.	**September 2027**
FM 971	**Austin**	PS&E. 3.14 mi roadway widening from CR 334 to SH 95. Includes proposed pedestrian and drainage improvements.	**October 2027**

Pilot Project Map

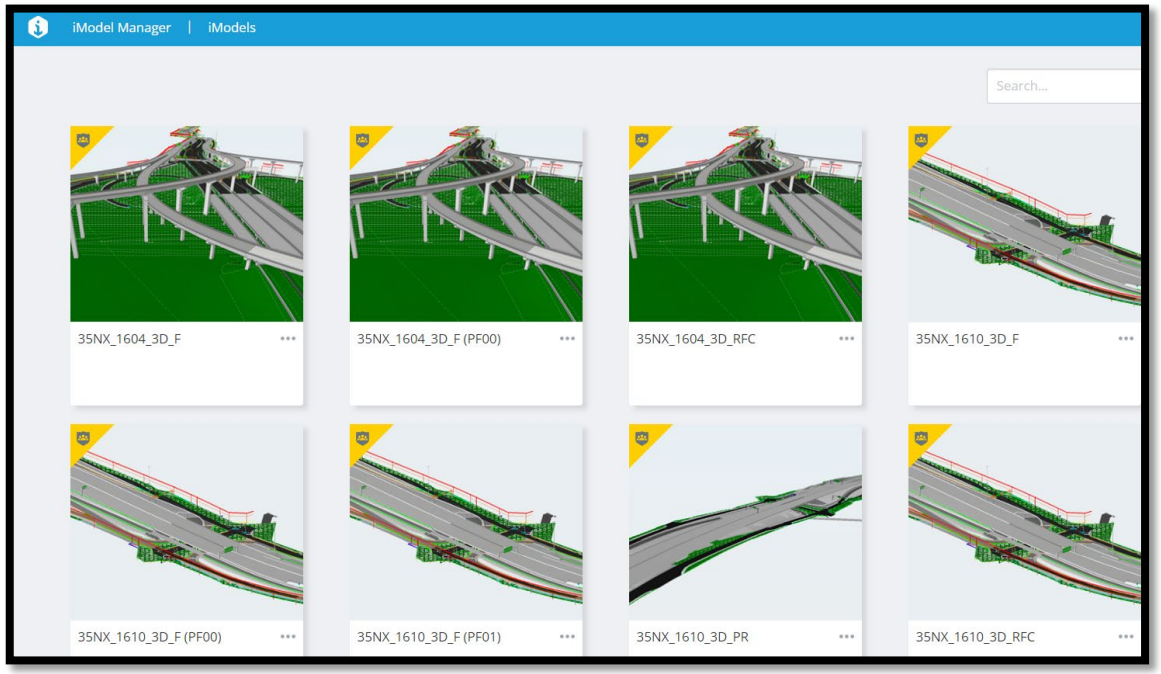
Scan QR Code to view the GIS Pilot Project Map



I-35 NEX Central Project – San Antonio District

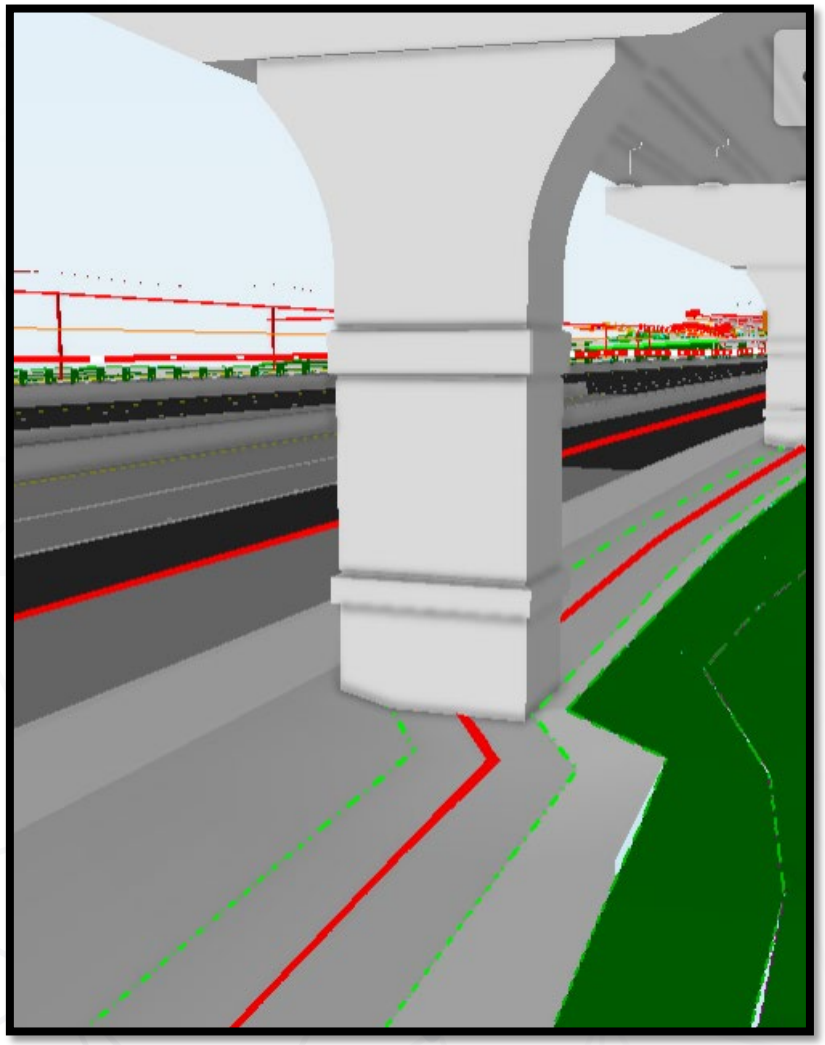


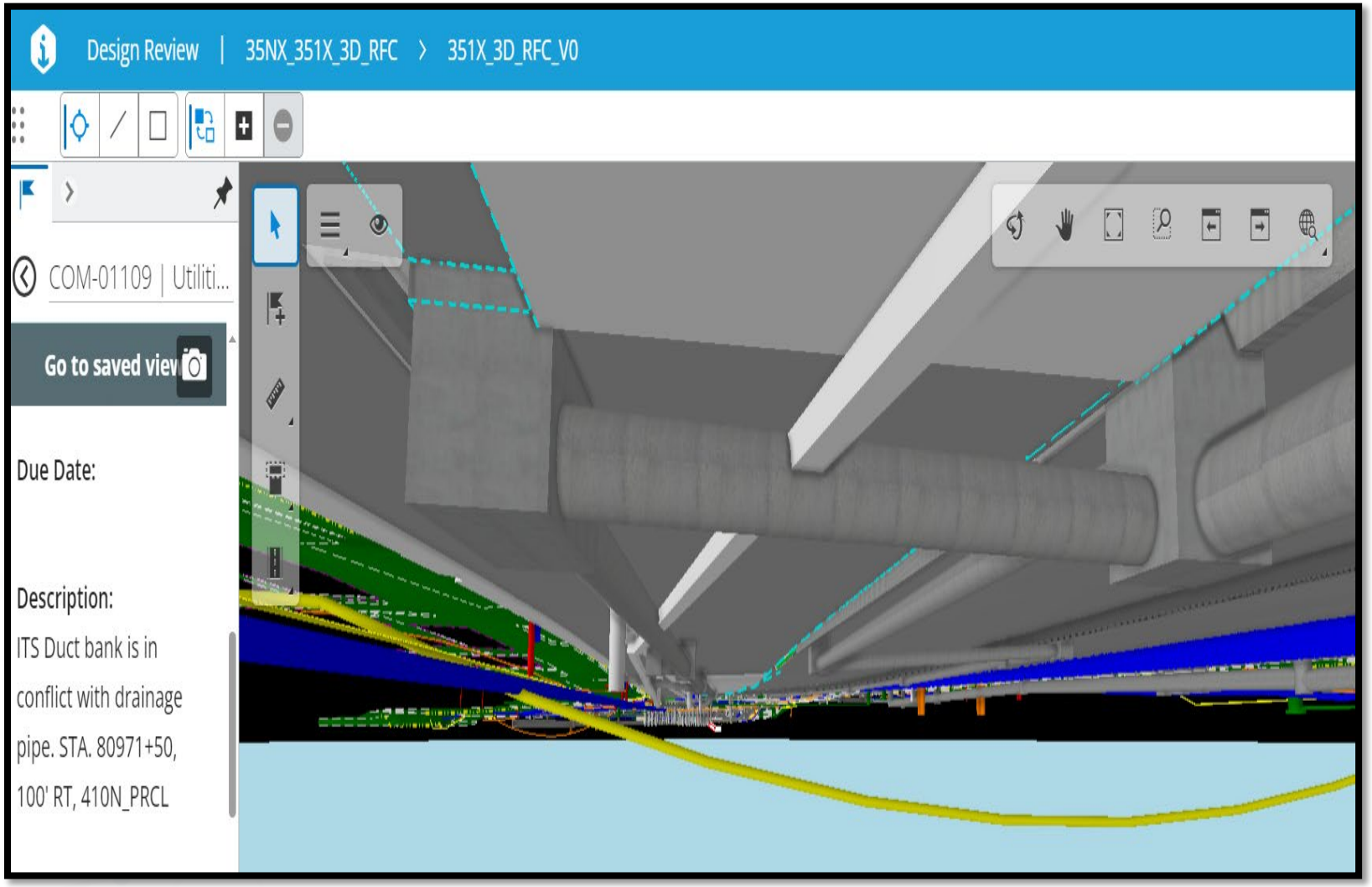
- $1.5 Billion Design Build Project – Elevated Lanes
- 109 3D iModel Design Submittals - 3D iModel provided in iTwin before plan sheets



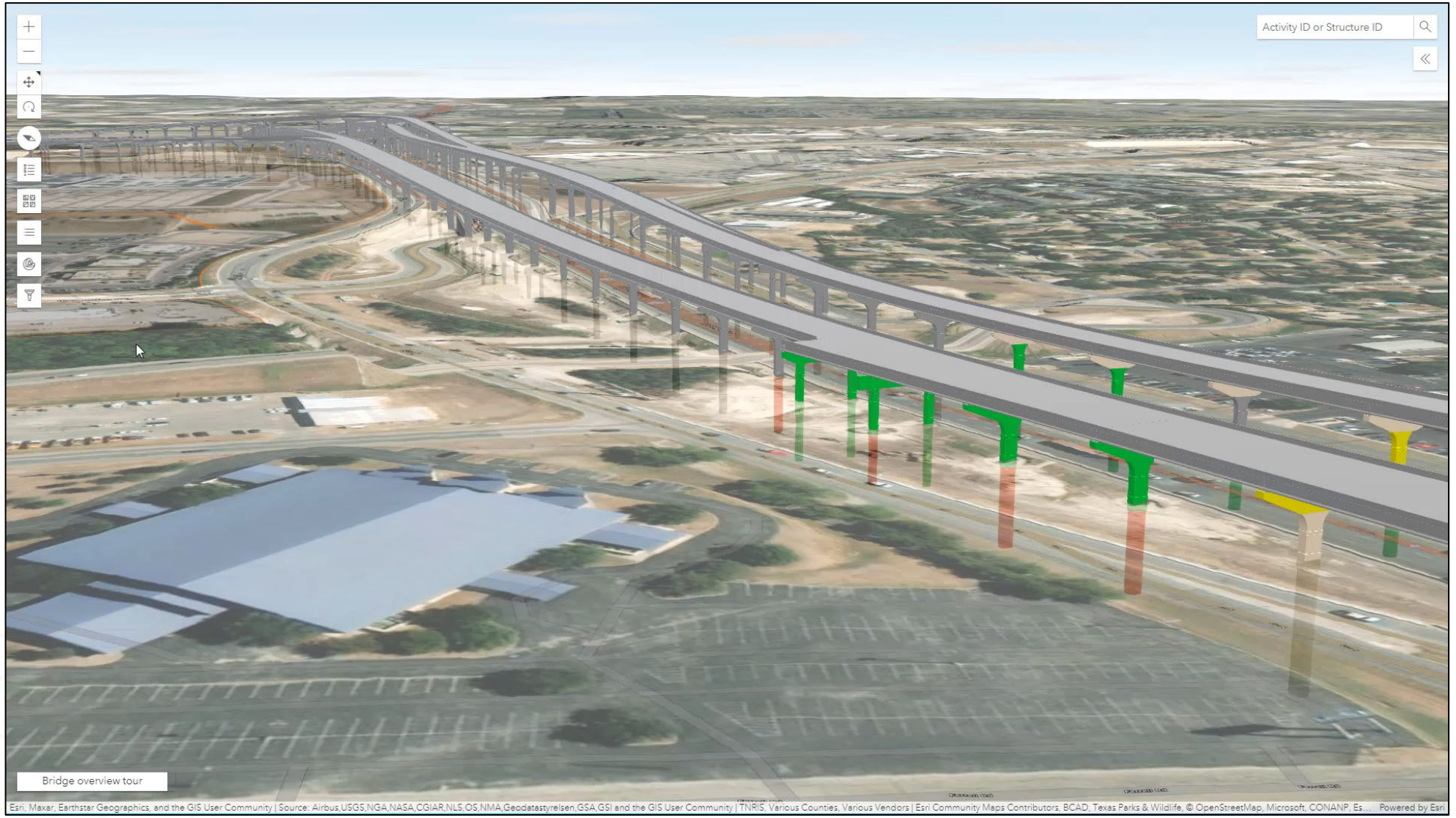
- iModels accessible to DB Contractor and TxDOT
- Comments made in iTwins
- DB Contractor working on a final project as-built model that incorporates design changes

I-35 NEX Project – San Antonio District





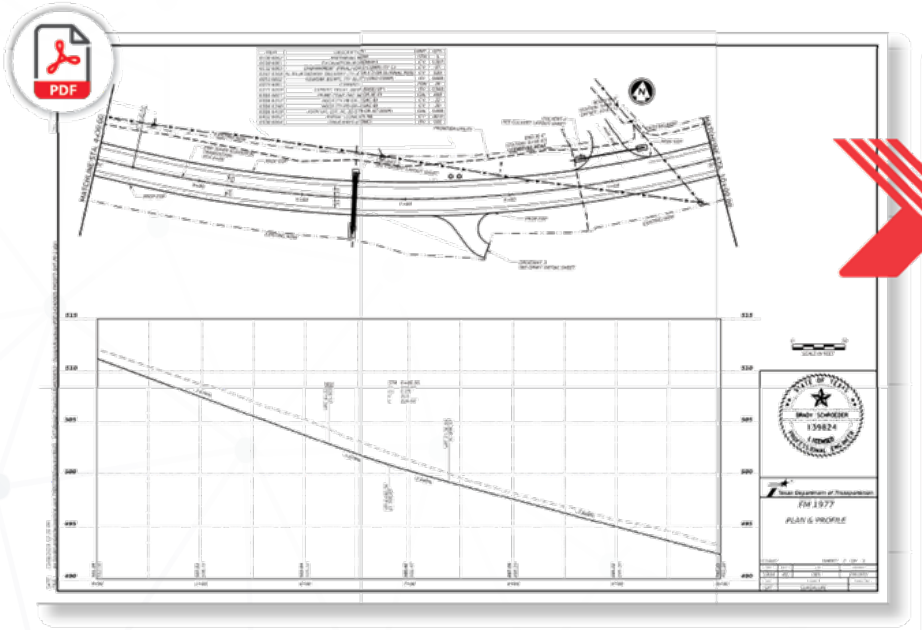
I-35 NEX Project – San Antonio District

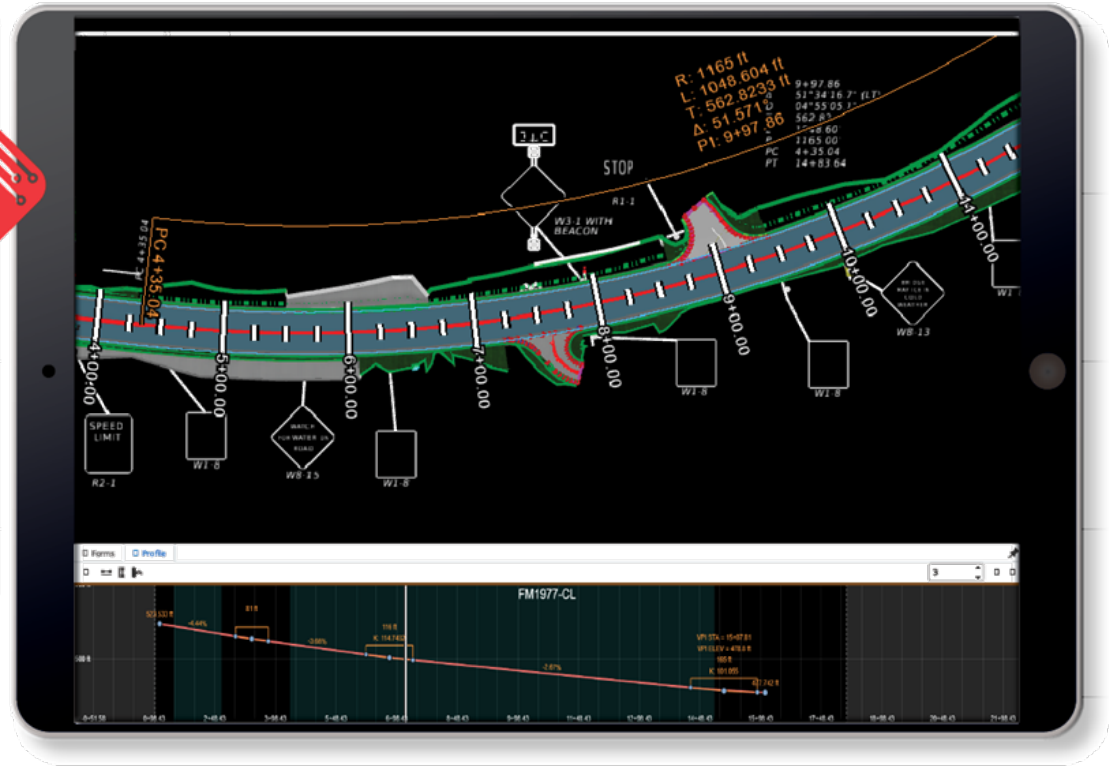


Construction & Inspection

Plan and Profile:

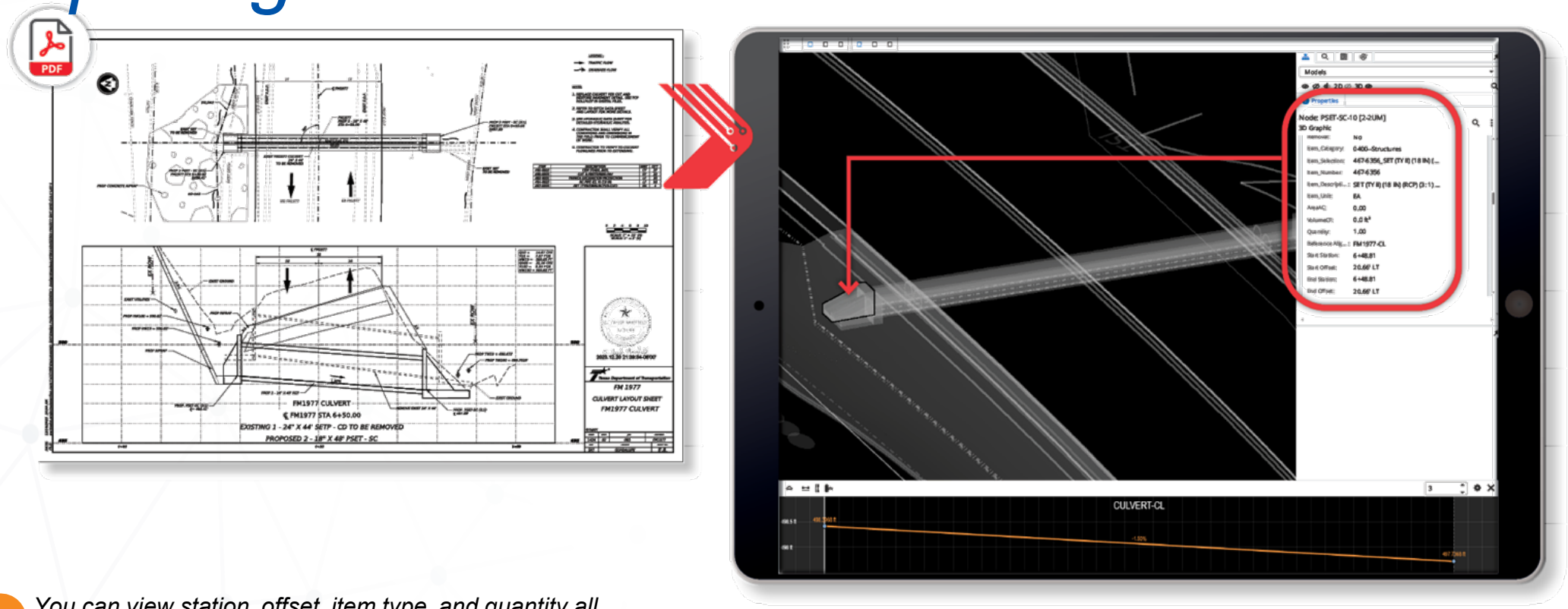
Comparing Plan Sheet to iModel P&P





- *Model-based deliverables allow viewing the entire alignment in one setting, no longer having to flip between pages or matching up lines.*

Plan and Profile:
Comparing Plan Sheet to iModel P&P



- *You can view station, offset, item type, and quantity all from the same window while viewing the model.*
- *Viewing items in a 3D space around other 3D elements will allow the designer and construction staff to determine constructibility. It can be difficult to visualize how your SET/headwall will sit relative to your ditches with a plan and profile sheet. The model allows you to turn on/off your road surface and other elements that would block your view to focus in on specific area.*

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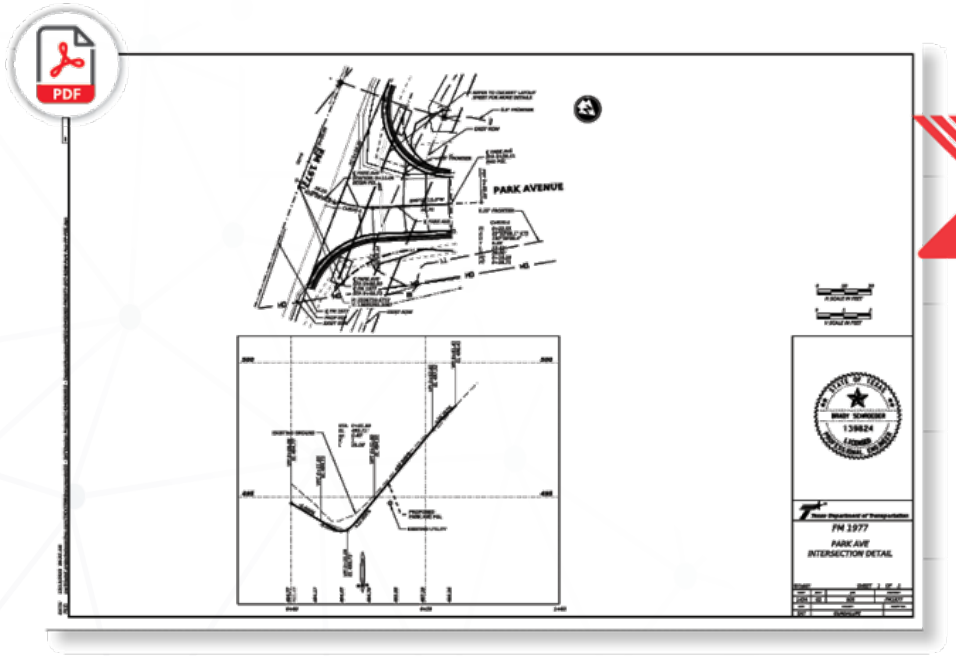
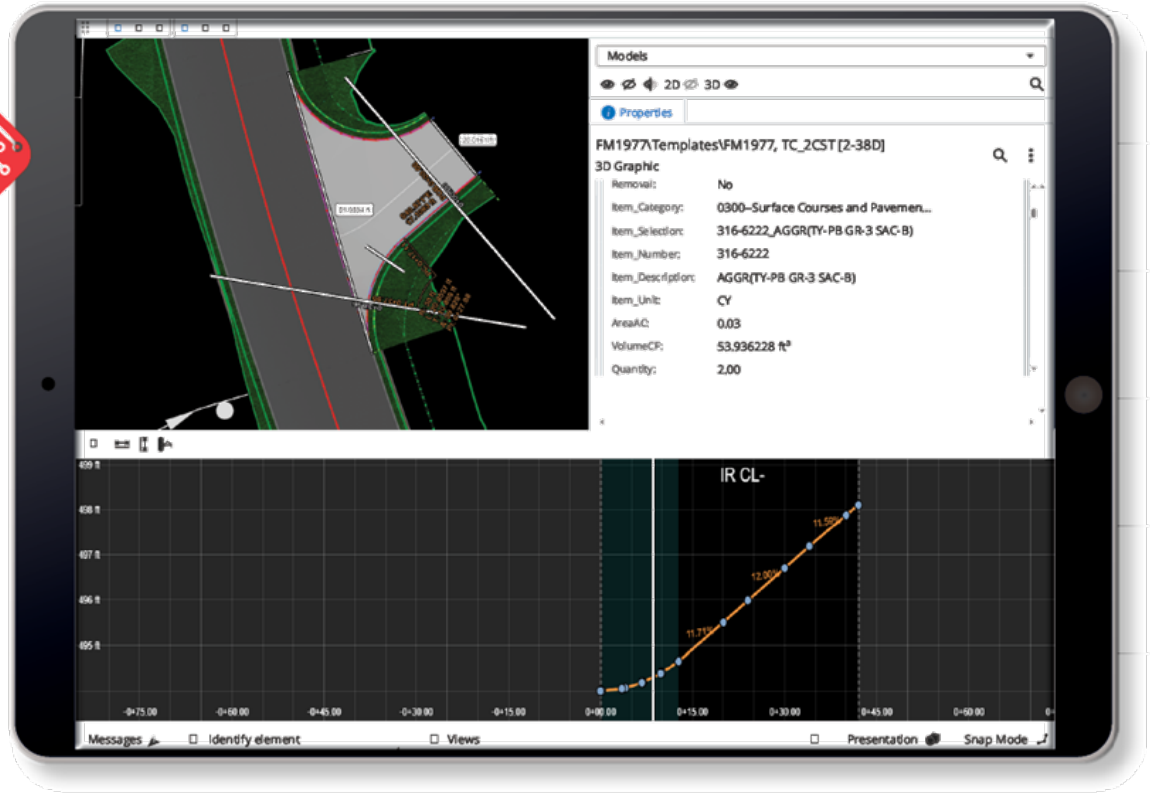
Plan and Profile:
Comparing Plan Sheet to iModel P&P

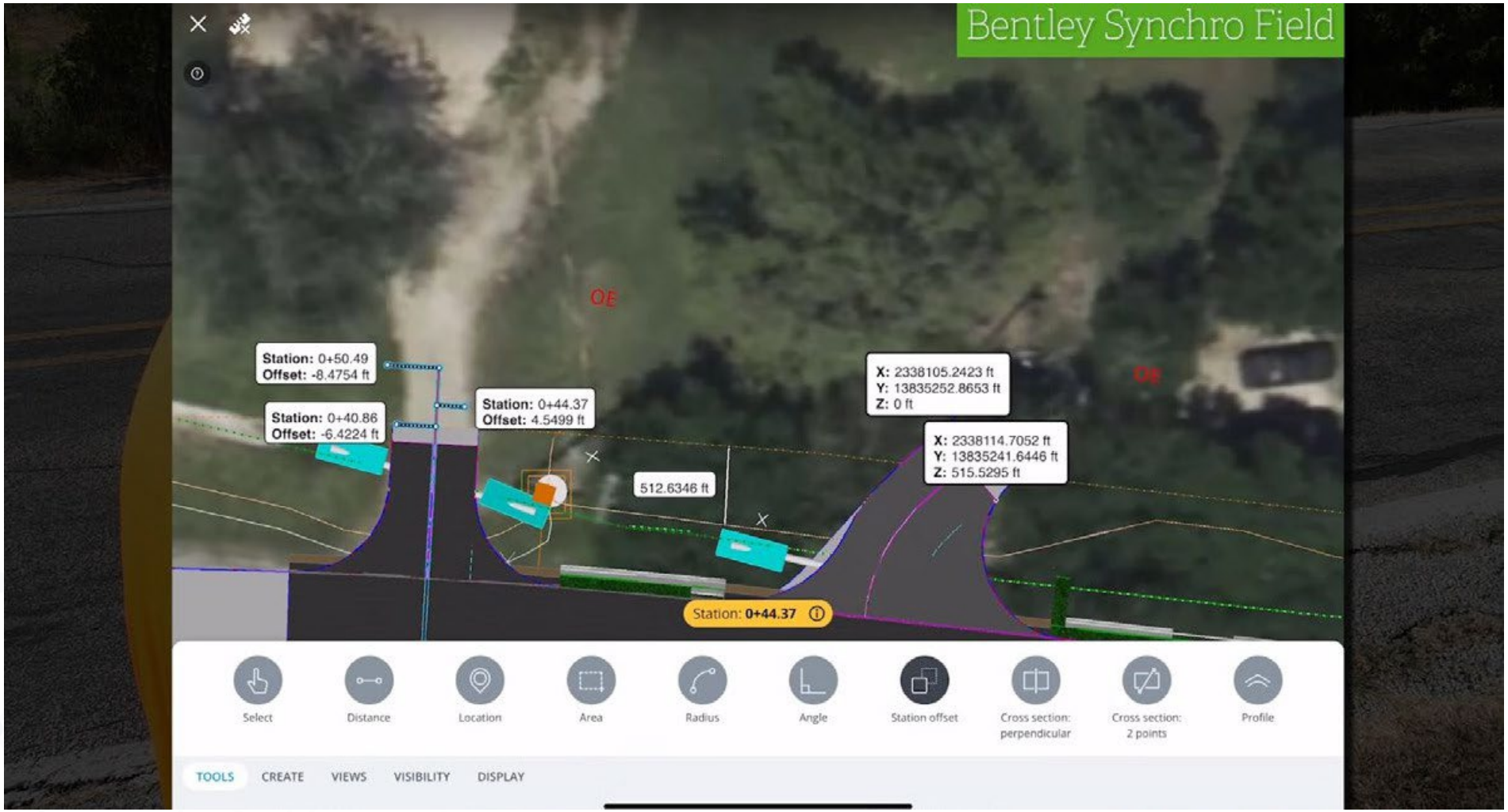




Viewing information in the model allows you to see the bid item and all of the information about its location by clicking on the respective model element. You don't have to flip back and forth between the summary tables and plan/profile sheets.

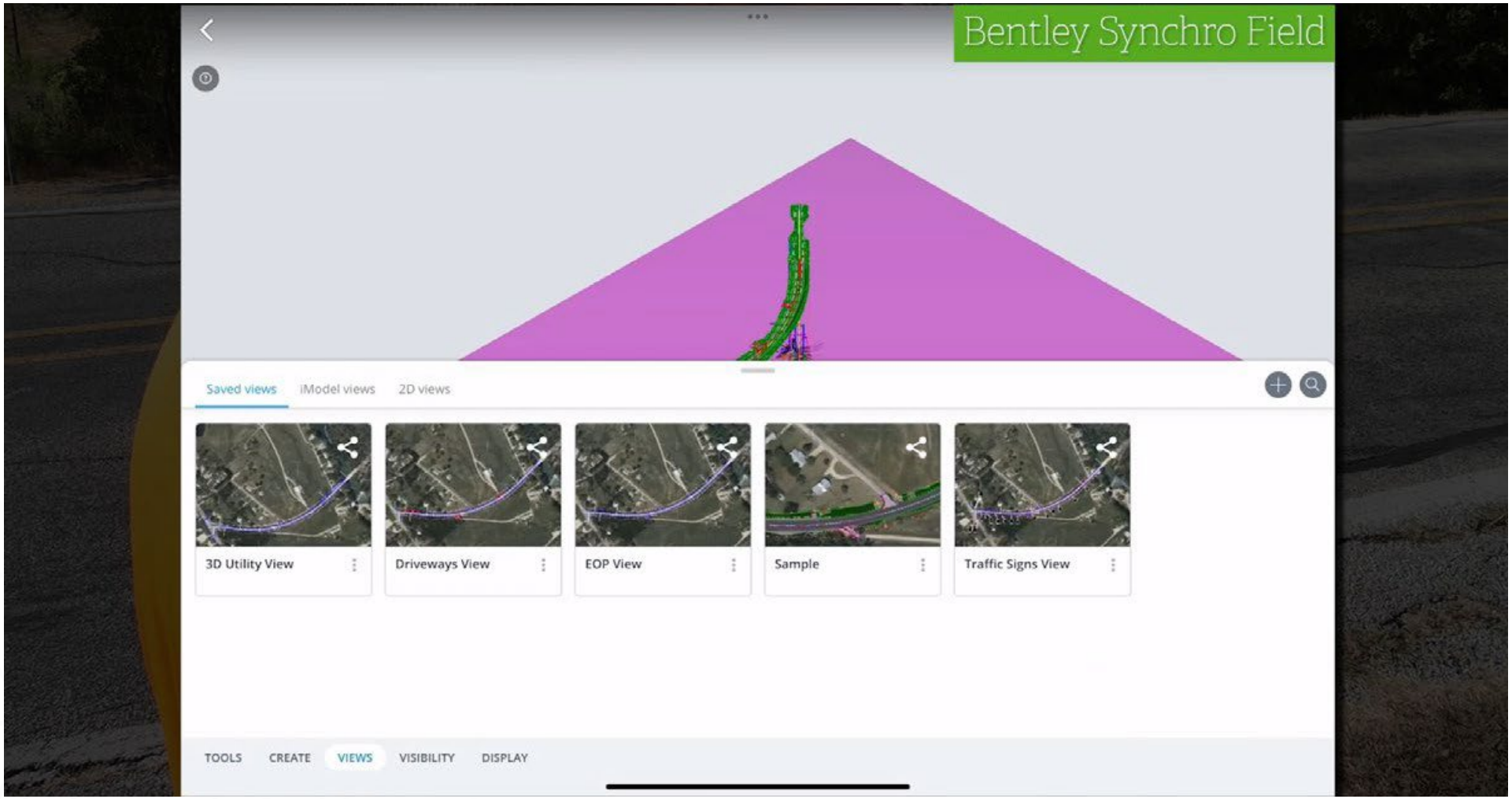
Data Capture

- Capture and access data from the field including measurements, notes, and photos
- Create and assign tasks to team members



Model Viewing

- View the model on a tablet while in the field. Saved views replicate what is typically shown on a traditional plan set

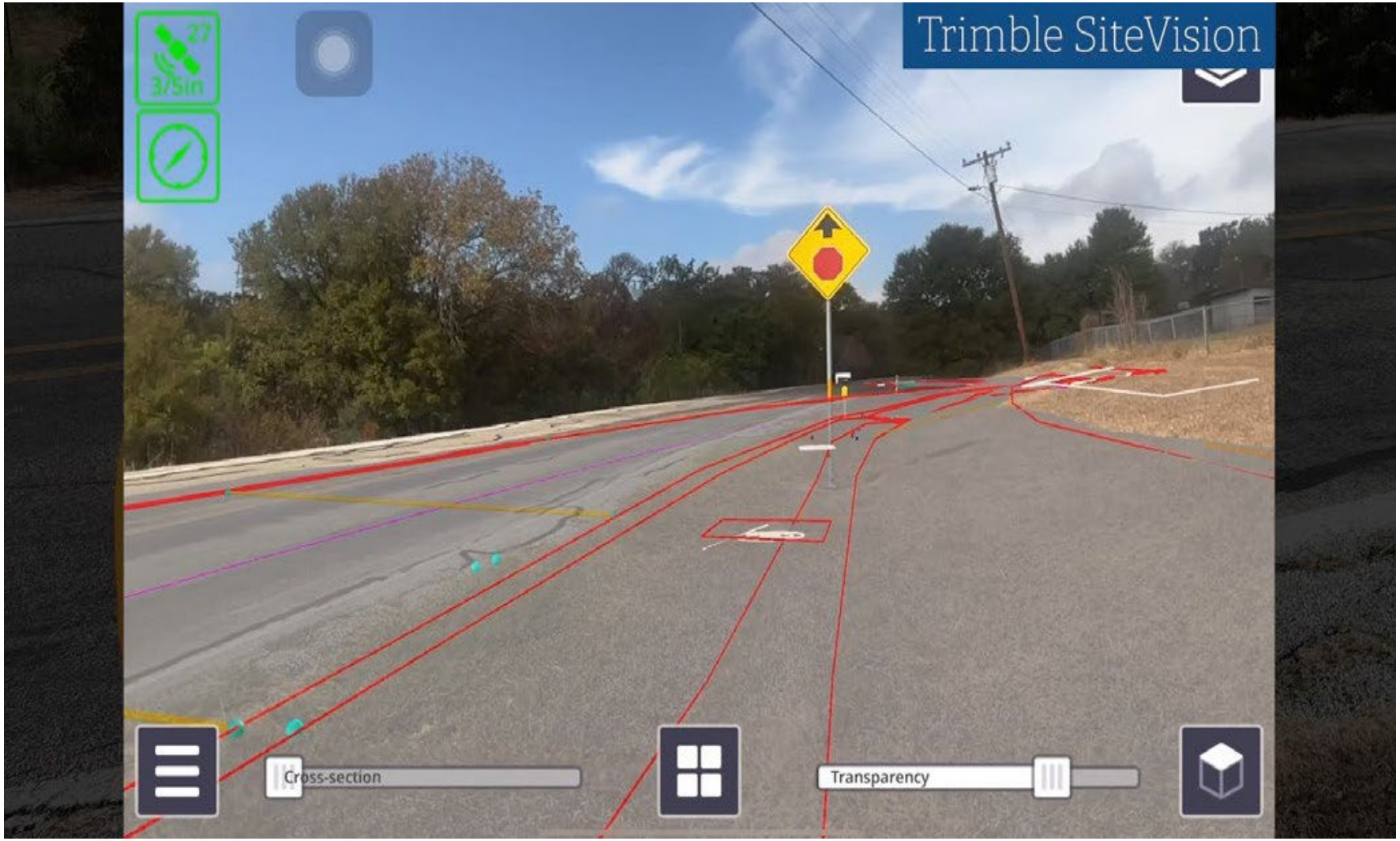


Field Measurements and LiDAR Collection

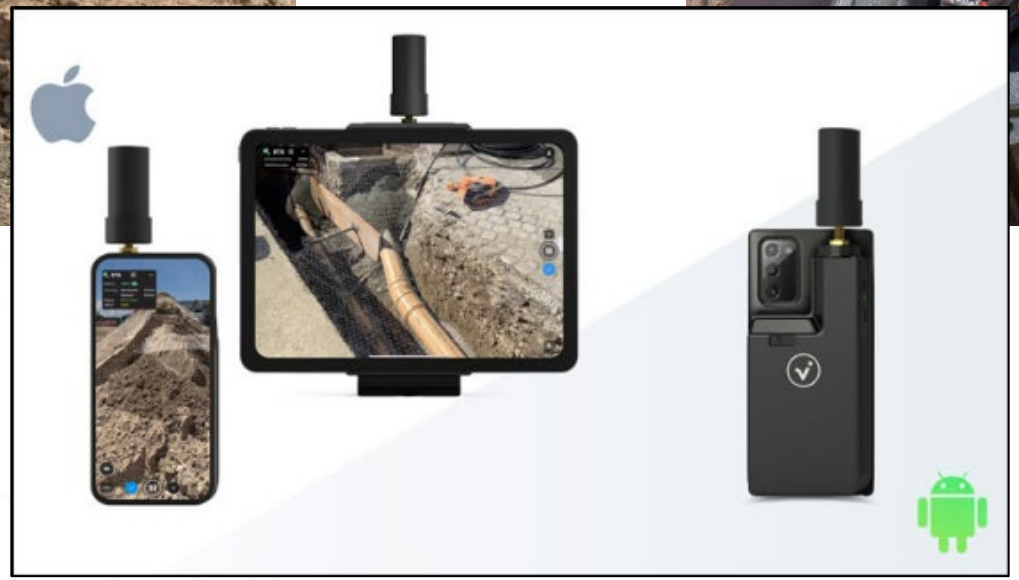
- Measure positions using GNSS, Electronic Distance Measurement, and Augmented Reality to better understand your data on site
- LiDAR scanning capabilities with IOS devices paired with a GNSS receiver

AR Visualization

- Visualize 3D models and data dynamically overlaid onto the real-world environment on a mobile device
- This would include Subsurface utilities if they were modeled
- GNSS technology allows for precise positioning and alignment
- Suggested hardware is an iPad Pro and Trimble Catalyst GNSS receiver



3D Inspection Utilizing the Design Model and Available Technology

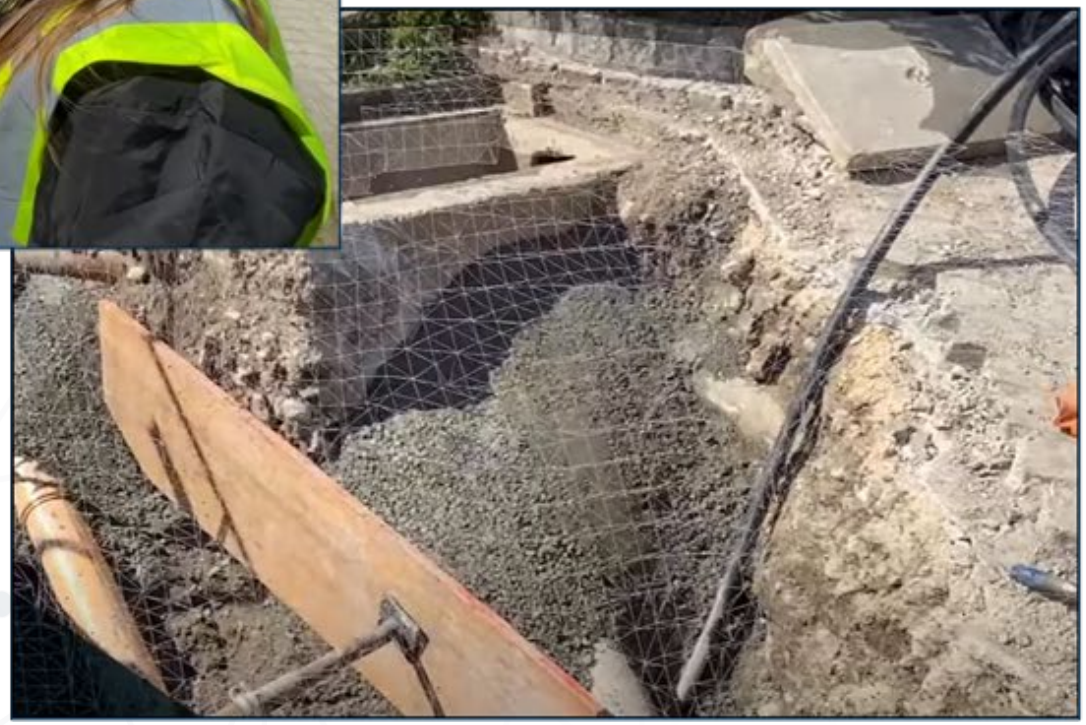


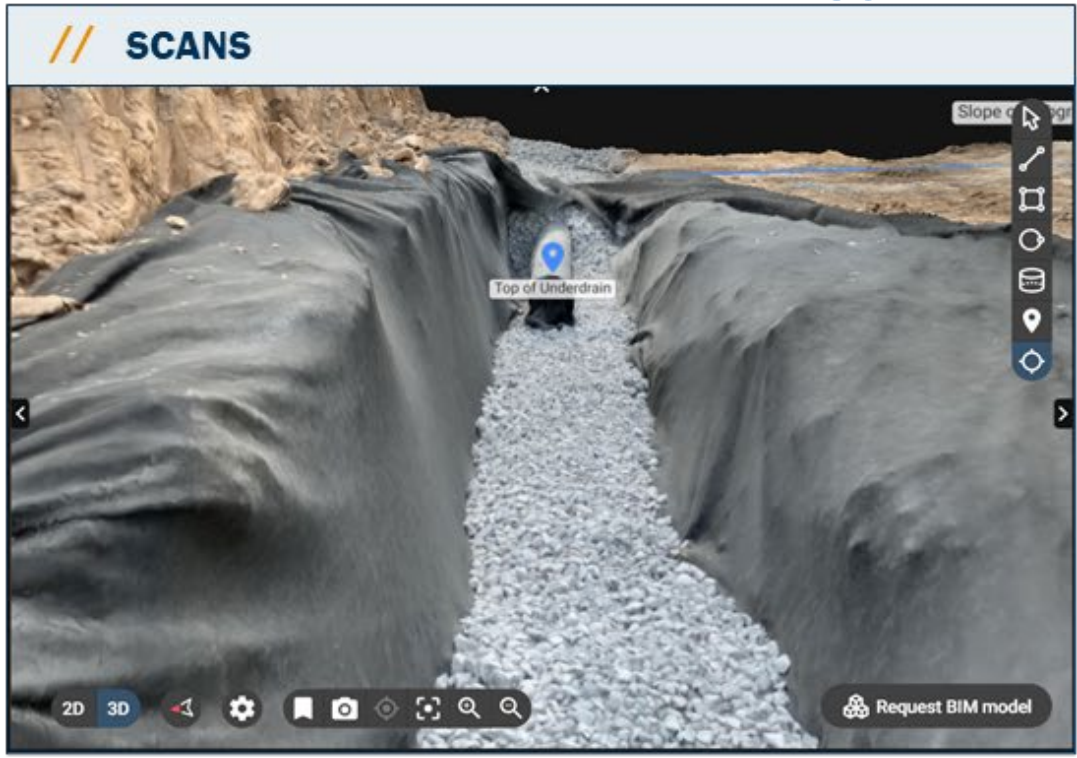
3D Inspection Utilizing the Design Model and Available Technology

Verifying As-built vs. As-Designed

- ✓ Used PS&E, shop drawings, and 3D ORD plans to verify MSE wall
- ✓ Verified accuracy, resolution, ease of use, and compatibility with existing systems
- ✓ Technology is readily available today
- ✓ Next steps: merge LiDAR field scans back into ORD model to document progress and future clash detection

3D Inspection Utilizing the Design Model and Available Technology



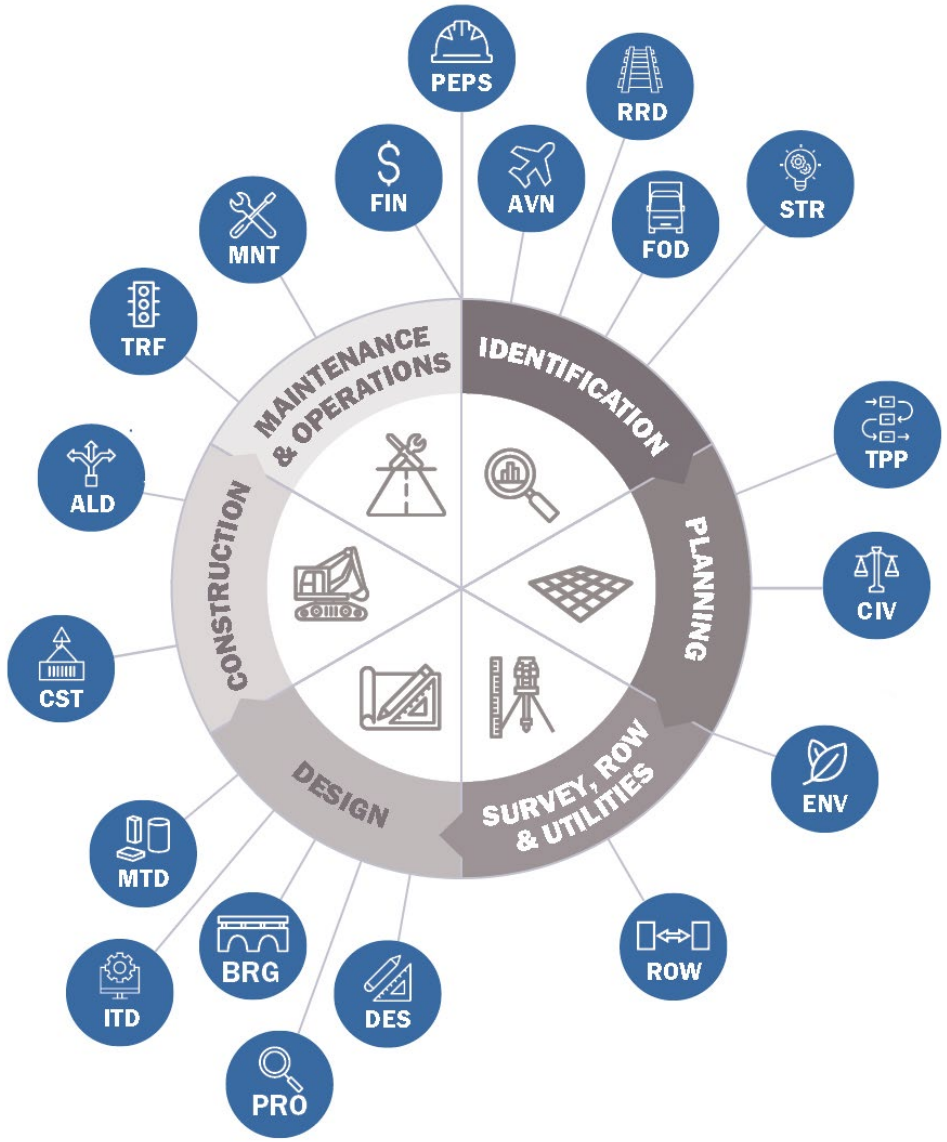


Asset Management

Business Areas Throughout the Project Lifecycle

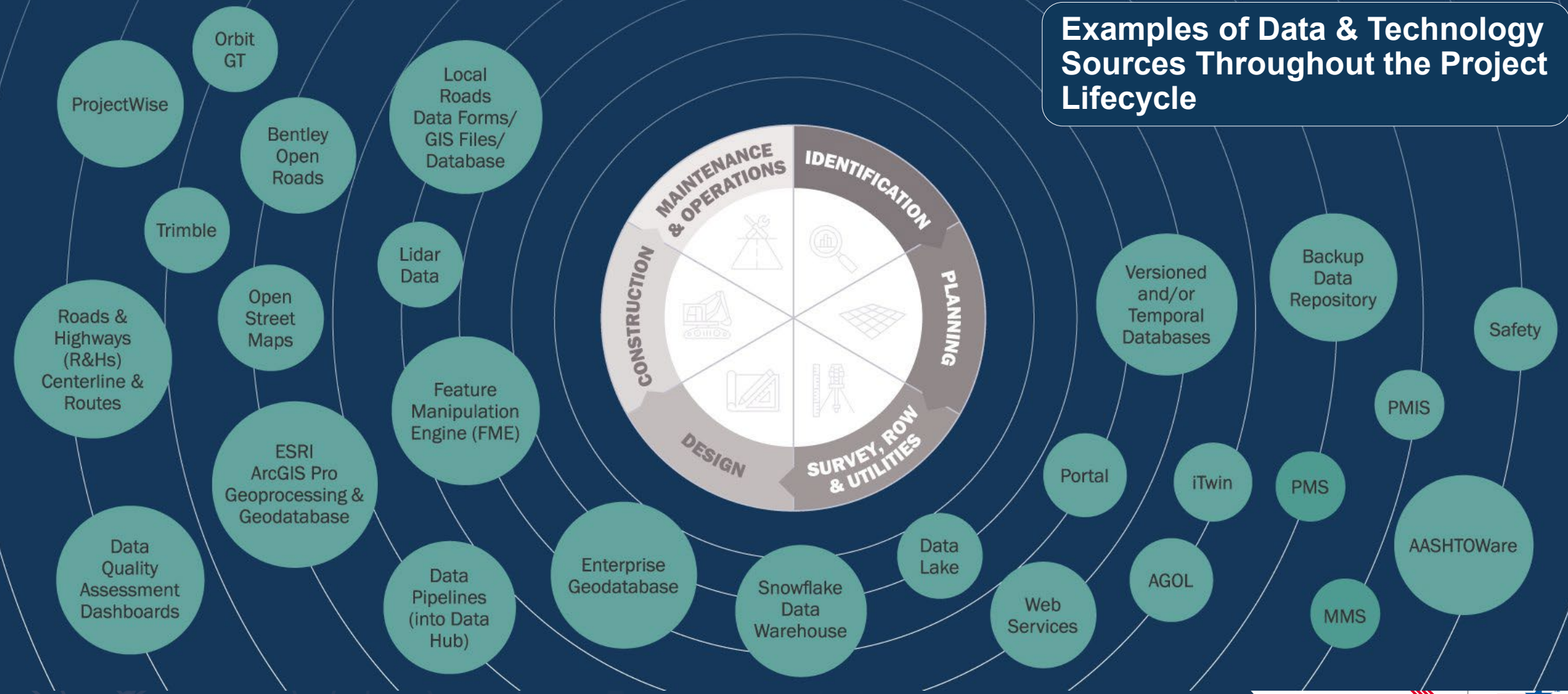
Throughout the typical TxDOT project lifecycle, different business areas come together to ensure a project is successfully delivered.

The future of digital data at TxDOT means that we can leverage engineering processes and data to build better asset information, inventory the characteristics of our roadway network, understand spending, and select projects more efficiently.

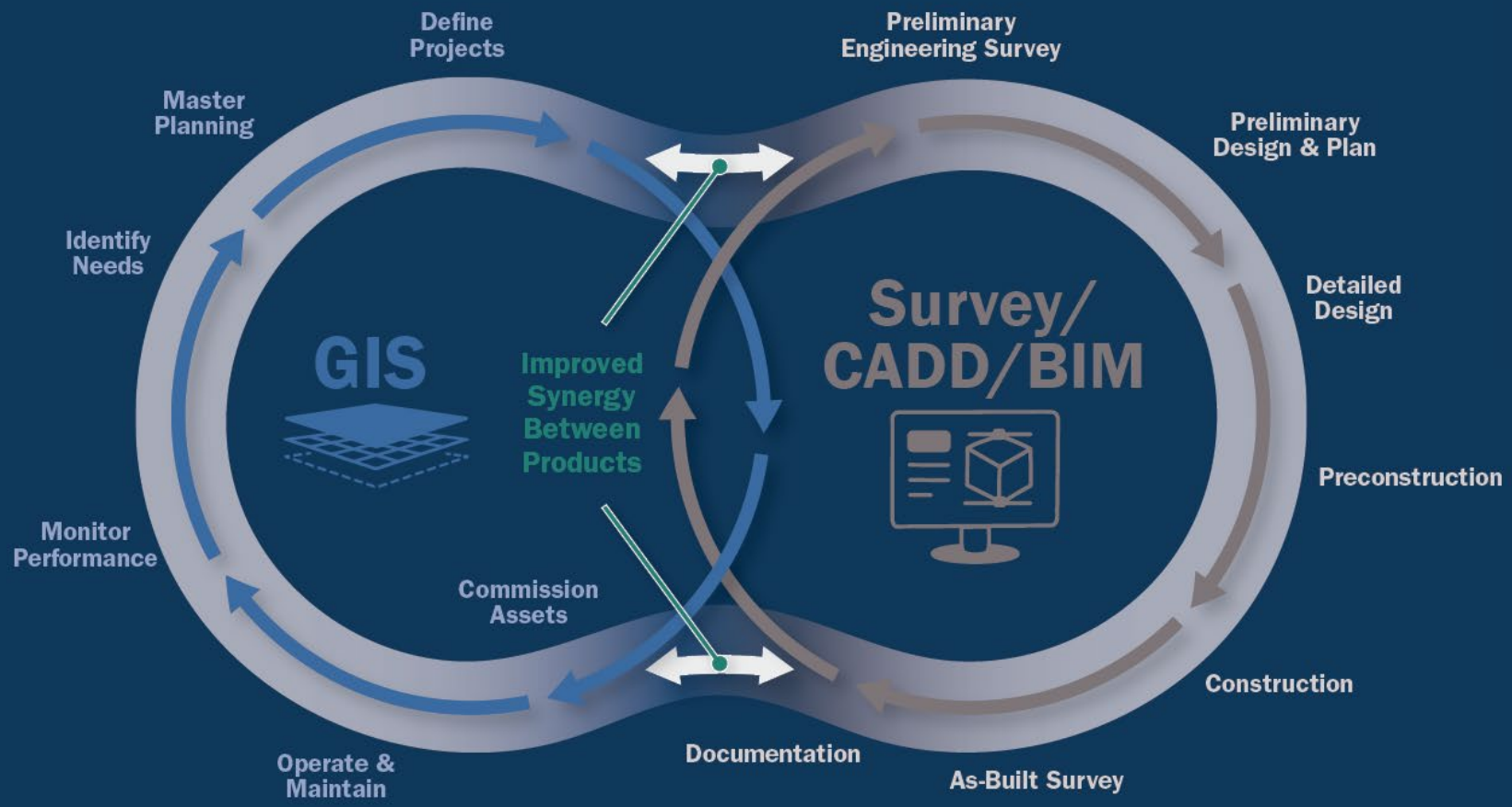


The ideal workflow of data through a project lifecycle comes from multiple business areas, sources, and technologies that come together in a central system that make the data not only accessible through the project but also to multiple users.

Examples of Data & Technology Sources Throughout the Project Lifecycle



Asset Management Lifecycle



Data flow can be seen in this example of the integration of data sources, technologies, and users in the Asset Management Lifecycle.

Data Use Cases

These use cases highlight data that when made readily available, TxDOT can use for downstream purposes throughout the project lifecycle.

Planning

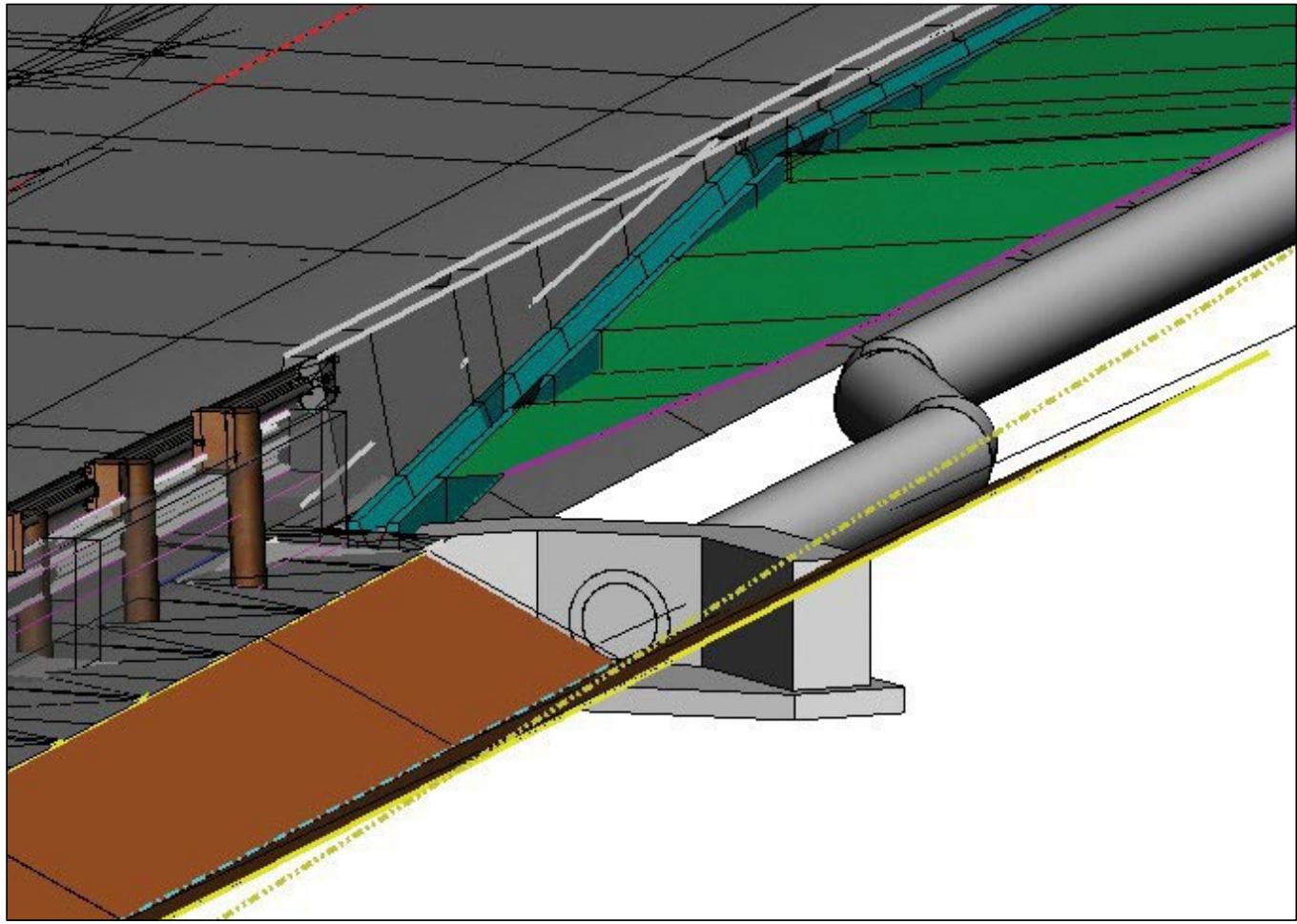
Design

Construction

Survey, ROW, & Utilities

Survey, ROW, Utilities

Data for subsurface utilities can be collected from survey data and modeled in design and GIS software products.



Impacts to SUE

SUE Future Needs

Planning

- Updates to the Texas Administrative Code and Utility Accommodation Rules
- Clear contract language

Design

- CAD Deliverable Processes: Digital Delivery Model Workflows
- Existing Utility Models: Development of Utility Data Item Types: **Owner Name, Facility Size, Facility Type, Facility sub-type, Material, OH/UG, SUE QL (Quality Level), utility notes, operational status, or comments, Conveyance, Conflict ID#, utility feature description, encasement**
- External and Internal Utility Design Deliverables

Construction

- Construction Model as-builts
- Formats that are compatible for RULIS and GIS

Digital Delivery Reminders

- If you have questions, please reach out via email:

digital-delivery@txdot.gov

- Also stop by our updated website at https://www.txdot.gov/business/resources/digital-delivery.html or scan the QR code for more info!

Questions?


Thank You!