



Digital Delivery: Challenges and Solutions – A Technical Look

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|----------|------------------------------------|-------|
| 1 | Introduction | 3 |
| 2 | Understanding Digital Deliverables | 4-5 |
| 3 | Model Use Cases | 6-10 |
| 4 | Digital Deliverables | 11-13 |
| 5 | Questions | 14 |



- Joined TxDOT DDP – Jan. 2023
- Final Design with Digital Delivery
 - Roadway & Drainage Modeling
 - iTwin and GIS review tools
- UDOT Digital Delivery Federal Aid Grant
 - Pilot DD elements
 - Process documentation and training
- Model Development Standards

Roadway Lead

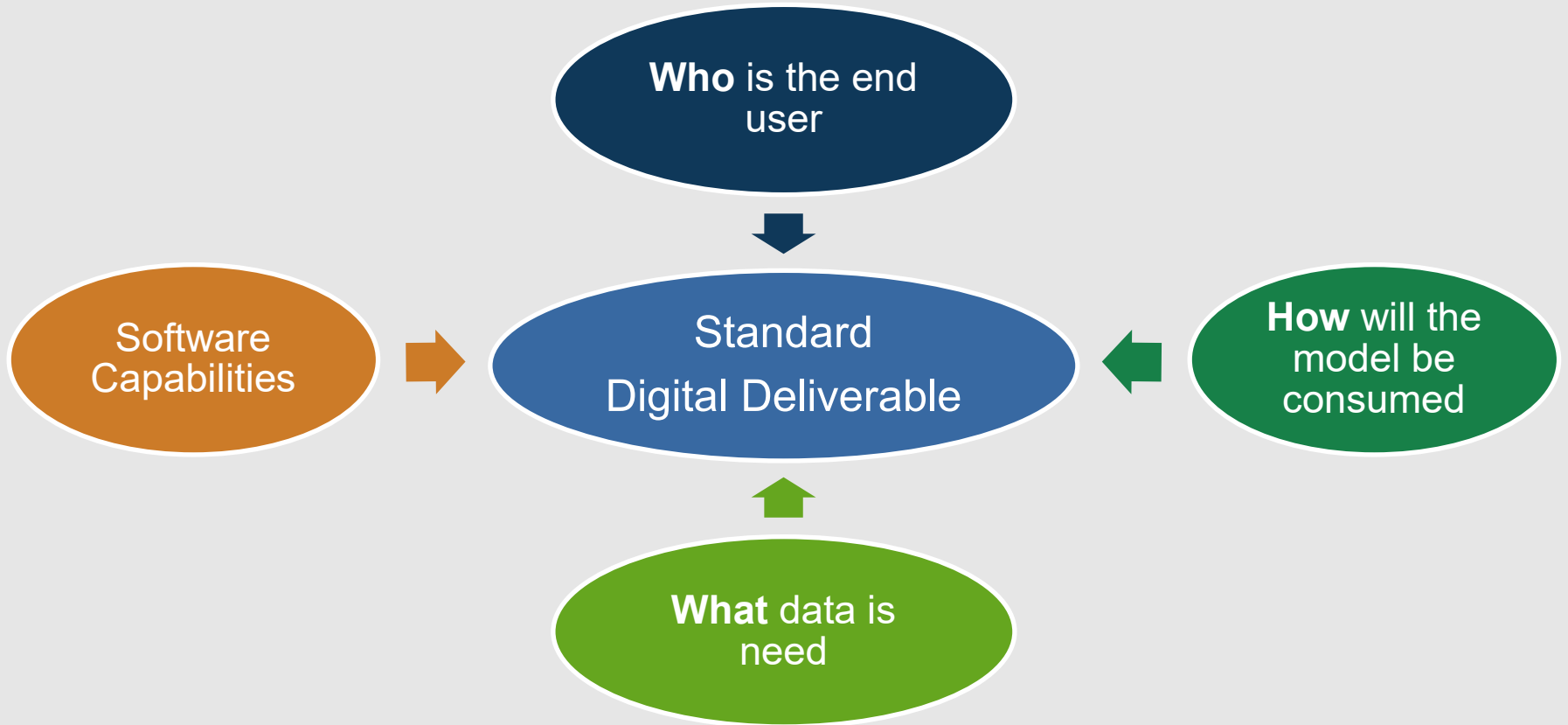


Alexis Walters, PE



Understanding Digital Deliverables

Developing with the end in mind





Model Use Cases

Applying digital delivery to achieve a specific goal

Model Use Cases - Overview



| Model Use Case | Target User | Deliverable | Software* |
|---------------------------|-----------------------------------|-----------------------------------|------------------------|
| Design Review | Owner Design Public | Geolocated design | GIS iTwin & Synchro |
| Model-Based Quantities | Design Contractor | Excel Reports | ORD |
| Construction | Contractor | 3D Breaklines Annotation Files | ORD TBC |
| Inspection | Inspector | Geolocated design Item Types | GIS Synchro |
| Asset Inventory | Maintenance Planning Design | Item Types | GIS |
| Clash Detection | Design | 3D Modeling & Cells | ORD |

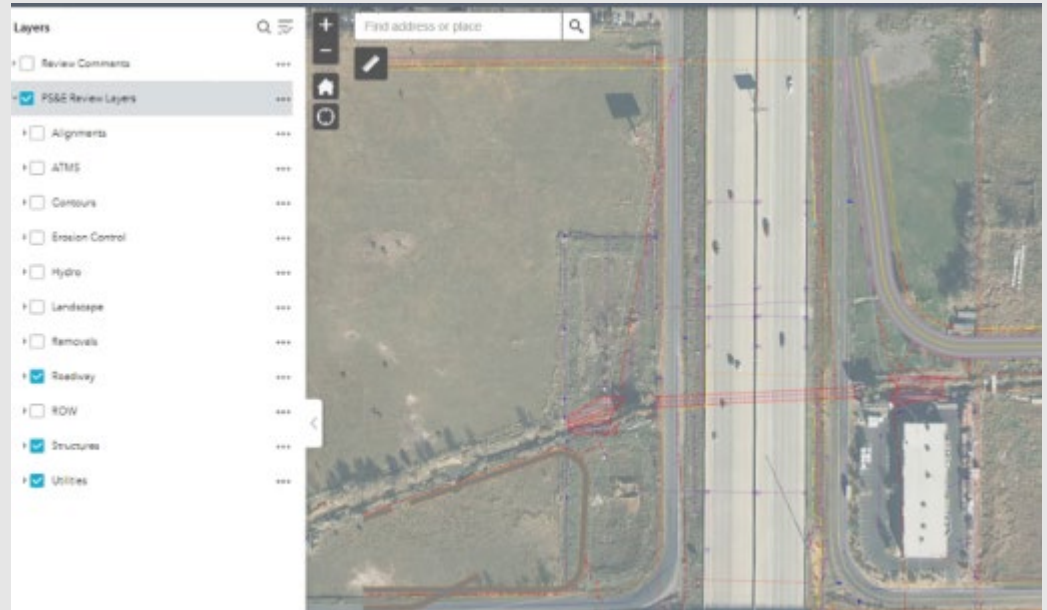


BENEFITS

Compatible with many users

Does not require individual licensing

Minor training

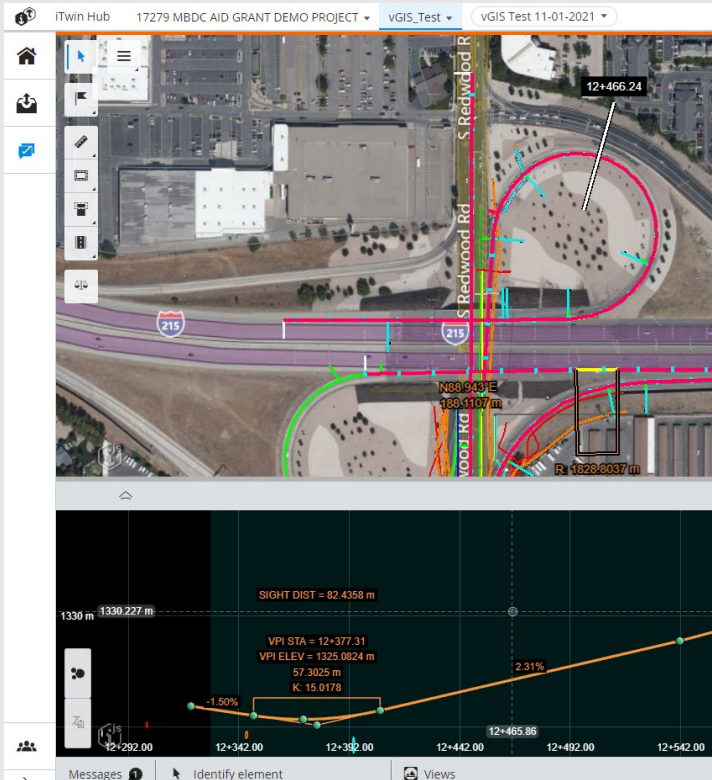


CHALLENGES → SOLUTIONS

2D review only → Typical sections for side slopes

Needed a platform for PDFs → Linked design elements to PDFs

Model Use Case - Digital Review with Bentley's iTwin



BENEFITS

3D design review capabilities

Platform connected to PW & PDF viewer

CHALLENGES → SOLUTIONS

Element data conversion → Annotation Files

Software functionality → Bentley support



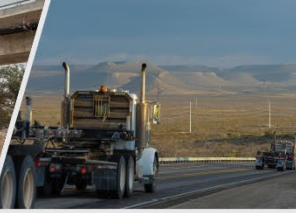
BENEFITS

Streamline estimating based on intelligent designs

CHALLENGES → SOLUTIONS

Reports must be custom built → Workspace Development
Limitations on pay item units → Bentley Support & Communication

| | A | B | C | D | E | F | G | H |
|---|-------------|------------------|-----------------|------------------|-----------------|------------------------|-----------------|----------------|
| | Alignment | Begin/To Station | Begin/To Offset | End/From Station | End/From Offset | Pay_Item_Name | Pay_Item_Number | Pay_Item_Units |
| 1 | | | | | | | | |
| 6 | I-15 Ramp A | 100+76.55 | -76.94 | 100+75.83 | -46 | Check Dam - Fiber Roll | 15717025 | ft |
| 7 | I-15 Ramp A | 101+01.36 | -68.31 | 101+00.95 | -50.61 | Check Dam - Fiber Roll | 15717025 | ft |
| 8 | I-15 Ramp A | 101+26.38 | -68.99 | 101+25.98 | -51.66 | Check Dam - Fiber Roll | 15717025 | ft |
| 9 | I-15 Ramp A | 101+51.49 | -73.62 | 101+51.01 | -52.71 | Check Dam - Fiber Roll | 15717025 | ft |



Digital Deliverables



BENEFITS

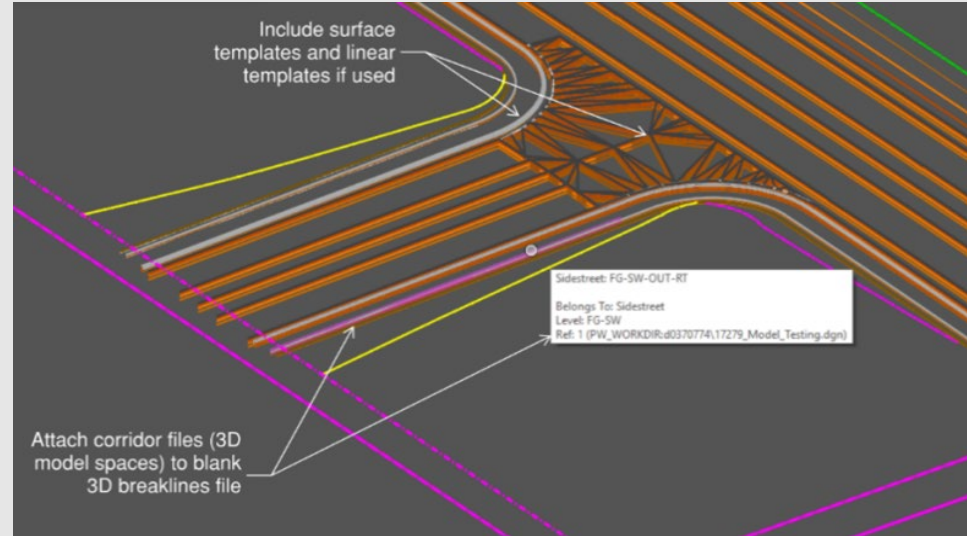
Streamline construction for large earthwork projects.

Increased accuracy for fine grading.

CHALLENGES → SOLUTIONS

Consistent deliverables → Naming Convention standards

Software conversion → No gaps over overlapping elements



Digital Deliverable #2: Data-rich Item Types



BENEFITS

Communicate Design Intent

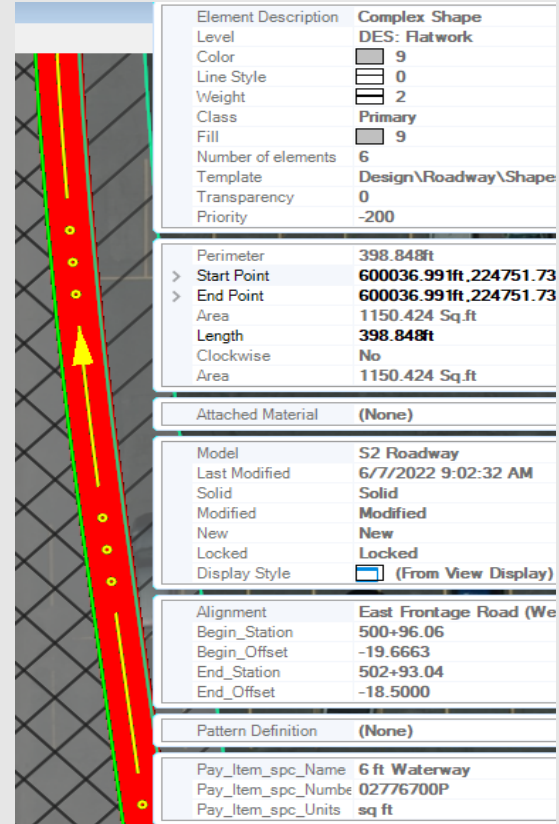
Asset Management

Automated annotation

CHALLENGES → SOLUTIONS

Data conversion → Annotation files

What data is needed? → Data dictionary



| | |
|---------------------|-------------------------------|
| Element Description | Complex Shape |
| Level | DES: Flatwork |
| Color | 9 |
| Line Style | 0 |
| Weight | 2 |
| Class | Primary |
| Fill | 9 |
| Number of elements | 6 |
| Template | Design\Roadway\Shape |
| Transparency | 0 |
| Priority | -200 |
| <hr/> | |
| Perimeter | 398.848ft |
| > Start Point | 600036.991ft,224751.73 |
| > End Point | 600036.991ft,224751.73 |
| Area | 1150.424 Sq.ft |
| Length | 398.848ft |
| Clockwise | No |
| Area | 1150.424 Sq.ft |
| <hr/> | |
| Attached Material | (None) |
| <hr/> | |
| Model | S2 Roadway |
| Last Modified | 6/7/2022 9:02:32 AM |
| Solid | Solid |
| Modified | Modified |
| New | New |
| Locked | Locked |
| Display Style | (From View Display) |
| <hr/> | |
| Alignment | East Frontage Road (We |
| Begin_Station | 500+96.06 |
| Begin_Offset | -19.6663 |
| End_Station | 502+93.04 |
| End_Offset | -18.5000 |
| <hr/> | |
| Pattern Definition | (None) |
| <hr/> | |
| Pay_Item_spc_Name | 6 ft Waterway |
| Pay_Item_spc_Numbe | 02776700P |
| Pay_Item_spc_Units | sq ft |



BENEFITS

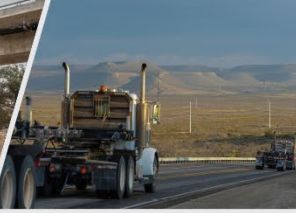
Clearly communicates with contractor

CHALLENGES → SOLUTIONS

Number of Files → Excel filter options

Understanding the data → File Description/FIO or MALD

| Document Description | 20124_F-115-6(239)259_ADV_Set | Document Format | Submit to Electronic Plan Room Type (Pick List) |
|--|--|-----------------|---|
| Final Combined Contractor Advertising Pay Item Levels | 20124_Final PayItems_ADV | DGN | MBDC FIO |
| Digital Delivery Documentation: Level of Development (LOD) Spreadsheet | 20124_UDOT_LOD Spreadsheet Master File_ADV | XLS | MBDC FIO |
| Digital Delivery Documentation: Level of Development (LOD) Spreadsheet | 20124_UDOT_LOD Spreadsheet Master File_ADV | PDF | MBDC FIO |
| Signing Design: East Frontage Road | 20124_S2_Pkg A_Signing_ADV | DGN | MBDC Legal |
| Signing Callouts: East Frontage Road | 20124_S2_Pkg A_Signing_Callouts_ADV | DGN | MBDC Legal |



Questions