



NORTH CAROLINA

Department of Transportation



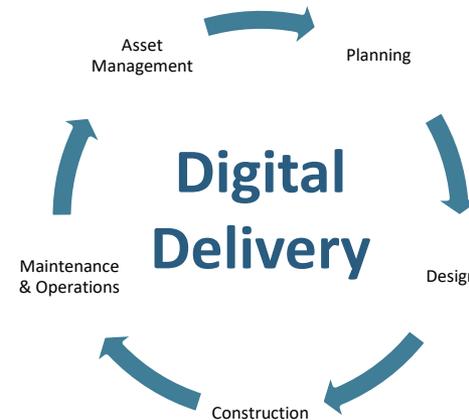
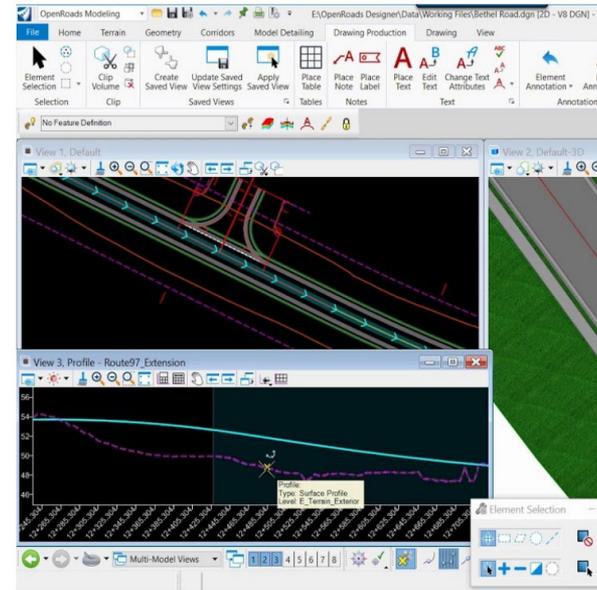
OpenX Platform / Digital Delivery

Implementing the OpenX Platform and the future of Digital Delivery

May 17, 2023

Overview

- Learn what OpenX Implementation is, why it's important, and NCDOT's efforts to fully transition.
- Overview of how Digital Delivery will benefit all aspects of a project's life cycle.



Time for a Poll Question

Time for a poll question

Definitions

The OpenX platform (e.g., OpenRoads Designer, OpenBridge Designer, Open Ground, etc.) represents a major change in the evolution of design software. Potential benefits of switching to OpenX include:

- Data and design integration
- Improved software capabilities
- Enhanced platform for multidisciplinary coordination

Definitions

Digital Delivery:

- The transition away from traditional paper/pdf plan sets to digital 3D models (digital twins).
- Includes focus on both design and asset information.

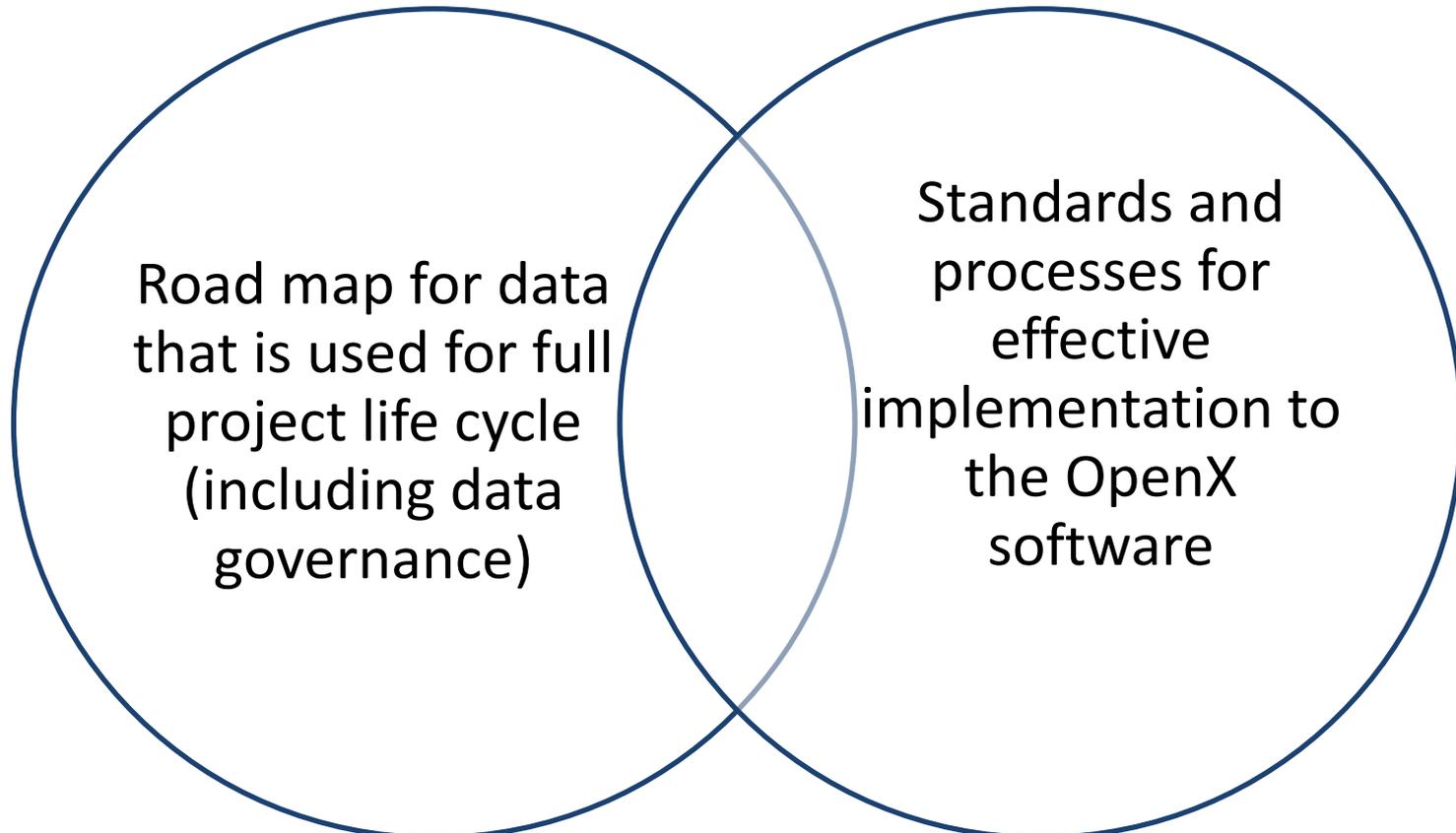


NCDOT Initiative Roles

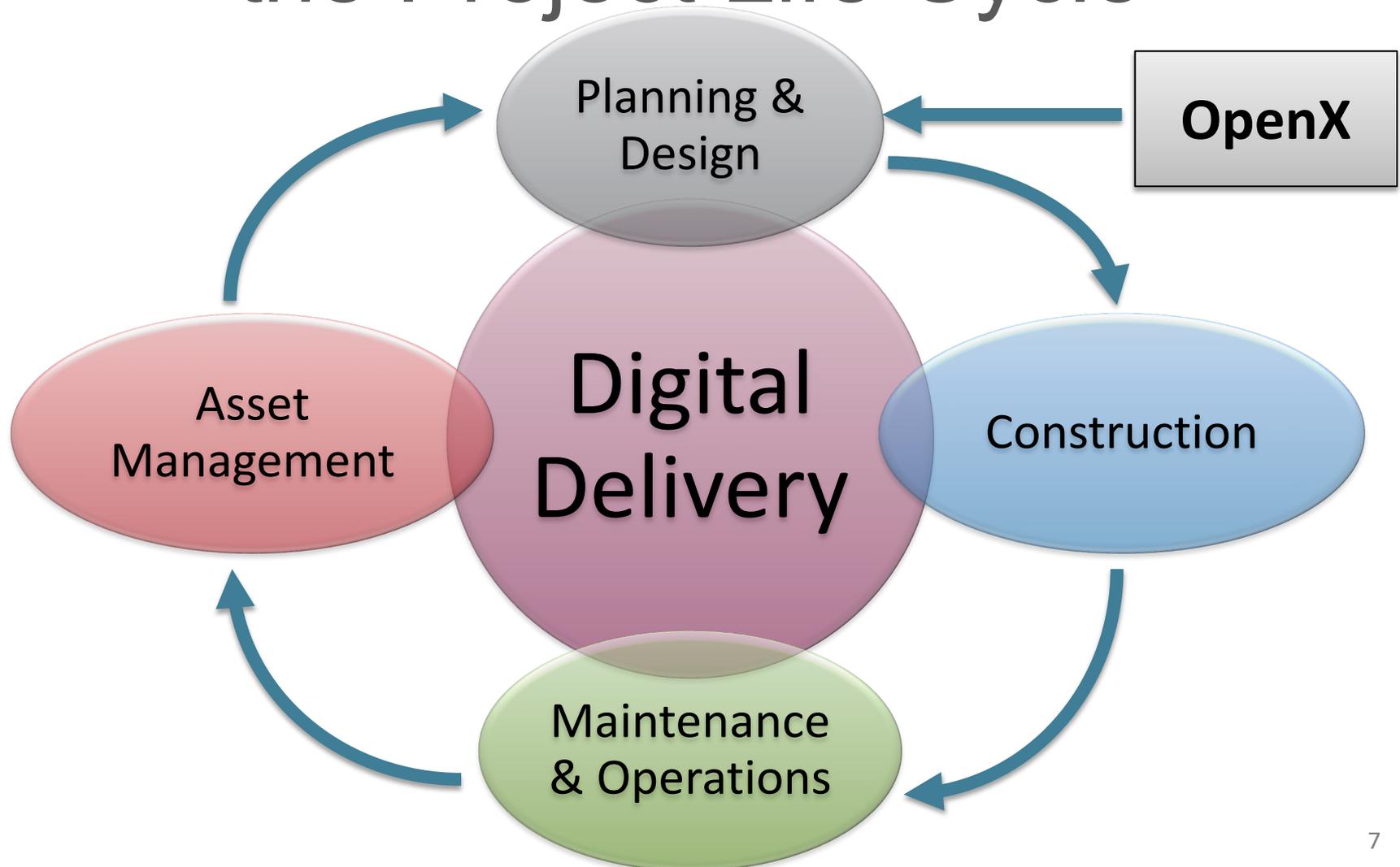
NCDOT has undertaken two (2) different initiatives that are both led by Steering Committees:

Digital Delivery

OpenX Implementation



OpenX and Digital Delivery in the Project Life Cycle



OpenX Project Implementation

Why is converting to OpenX important?

- Who really wants to change from the old way of doing things? It's just a minor change in the approach to software delivery.



Microsoft



Why is converting to OpenX important?

- Bentley has ceased support for the V8i Select Series product line.

Support Status	Continuous Support	Full Support	Expiring Support	Support Discontinued
CONNECT Edition ¹	X			
V8i SELECTseries 10				X
V8i (Earlier SELECTseries)				X
V8, XM, 2004,...				X

¹ CONNECT Edition versions released prior to January 1, 2023, will be supported at least until December 31, 2025 (If an application enters Expiring Support before December 31, 2024, the support period will last until the end of the Expiring Support phase, which may be prior to December 31, 2025).

Why is converting to OpenX important?

- Microsoft will no longer support Windows 10 on October 14, 2025.
 - It is likely the NCDIT will transition NCDOT out of Windows 10 prior to this date.
- Current design software (V8i) will be even further at risk once we transition to Windows 11.

Why is converting to OpenX important?

- Having **NO** implementation plan **WILL** lead to project delivery delays and additional project expenses.



OpenX Migration Initiation

August 14, 2018

- [OpenRoads Designer \(ORD\) Migration](#) memorandum tentatively sets the ORD implementation timeframe for the first quarter of 2019.
- The memo states that there were still some significant items that needed to be addressed prior to full implementation.



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

August 14, 2018

MEMORANDUM

TO: Division Engineers
Business Unit Heads
Multi-Modal Division Directors

FROM: T. M. Little, PE
Chief Engineer

SUBJECT: OpenRoads Designer (ORD) Migration

For the last two years, the Department has been engaged in the migration of its CADD operations to OpenRoads Designer (ORD). ORD is a comprehensive, multi-discipline 3D modeling application that advances the delivery of roadway projects from conceptual design through construction. It blends traditional engineering workflows for plan, profile, and cross sections with 3D parametric modeling to enable the model-centric creation of design deliverables. Since it is 3D model-centric design, many of the Department's current applications and workflows do not translate directly into the new software.

Implementation Timeframe
NCDOT has tentatively set the ORD implementation timeframe to be the first quarter of 2019. This should provide sufficient time to pilot a few projects to address remaining configuration and workflow issues, develop internal training content, and allow for a couple more ORD quarterly updates that will help mature the product.

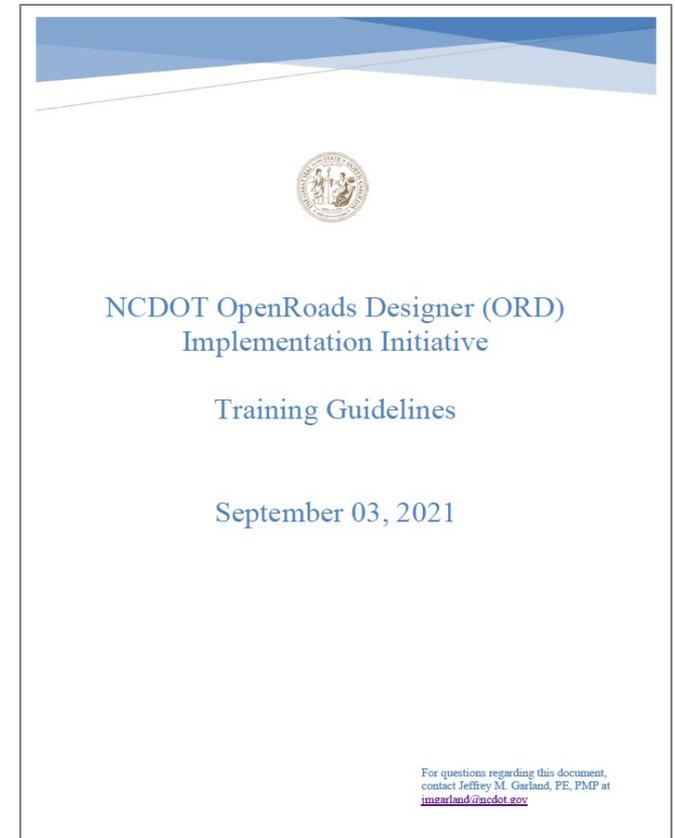
Training
CADD Services will provide general ORD training for all internal users. Some units may provide their own unit-specific training, if necessary. Also, Bentley provides anytime online training that is freely available to all NCDOT users through the Bentley LEARN server.

No general ORD training for external private engineering firms (PEFs) is planned. PEFs are encouraged to explore the capabilities of Bentley LEARN online training as a resource for ORD training. There may be NCDOT specific ORD workflow training provided at NCLUG events or at any time as deemed necessary.

OpenX Migration Efforts

September 3, 2021

- Training Guidelines, CADD Conversion Guidelines, other guidance documents developed to help guide NCDOT and its partners.
- Extensive coordination between NCDOT and Bentley to resolve bugs in the OpenX software.



PEF Readiness Survey



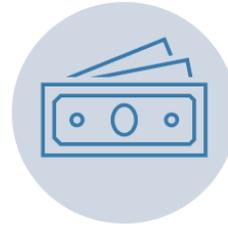
December 2022

- Online survey completed to assess PEF readiness to transition to OpenX
- Feedback from 44 firms, including 11 (25%) Small Professional Service Firms (SPSFs).

PEF Survey Response Themes



Loss of Productivity



Additional cost likely needed



Need for strong / integrated NCDOT support during transition



Training opportunities for staff



Bentley software issues (bugs, functionality on certain items)



Some discipline-specific features are not yet ready.

OpenX Steering Committee



January 2023

OpenX Steering Committee formed in Jan 2023

- Multi-disciplinary with both NCDOT & PEF reps

Goals:

- Guide NCDOT in implementation of OpenX
- Provide support to project delivery teams during implementation

Risk Management Process

Feb - Apr 2023

Focused on ongoing risk assessment to:

- Reduce uncertainty
- Improve communication
- Identify ownership
- Improve continuity



Risk Assessment

- Risks assessed based on probability of occurrence and likely impact of the risk.
- Action Plan (and risk owners) then developed

Risk Identification				Risk Assessment			Response Strategy		
Risk Description IF	Risk Description THEN	Threat / Opp.	Status	Probability	Impact	Score	Strategy	Action Plan	Deliverables Produced / U
If timelines and requirements are not clearly defined, communicated, and enforced with both internal and external stakeholders or if project teams are not clear how to escalate OpenX issues,	then delays to making the department's transition to Open X will occur, project timelines may be impacted, partners may be frustrated, or rework may be needed.	T	Active	High	High	●	Avoid	1. Update Open X transition plan and timelines 2. Assign owner for Open X transition schedule so risks to overall implementation are tracked and reported on to the steering committee 3. Share schedule and requirements with all stakeholders 4. Identify business owners to serve as main point of contact for Open X issues.	A) Memo and/or nice one-p handout from Steering Com with proposed cutoff date ar reasons. B) Updated "SS2 to ORD C Conversion Guide" C) Decision Matrix for Proje Managers D) Updated scope template workday estimates to updat project schedules & costs. E) One-stop location for re issues/ requesting help for a OpenX on the CADD serv website that allows for track have flexibility in ALL sched due to ORD issues
If department-wide and discipline-specific guidelines and standards (such as design manuals, PDN documentation, standard	then teams may use out-of-date standards for their projects leading to quality issues or rework, teams may have issues	T	Active	High	High	●	Avoid	1. Identify guidelines and standards that require update.	A) Updated guidelines and

Managing Risk

- OpenX Committee reached out to project development teams to determine the current status of project transition from V8i to OpenX.
- Responses: 18 total units
 - 14 Divisions
 - 4 units (PMU, SMU, Rail, NCTA)
 - 100% response rate
- Focused on design software (OpenX vs. V8i) used for:
 - The primary plan set (typically associated with Roadway & Hydro)
 - Supplemental design software (SMU, Geotech, rail, traffic, etc.)

Managing Risk

- Approximately 1,000 projects (853 applicable* projects) to be let after mid-2024 (and on PE MF List)
 - 14 Divisions
 - 4 units (PMU, SMU, Rail, NCTA)
 - *Excludes projects that are not using design software or are not relevant to this exercise for other reasons (e.g., project to be deleted or project not started yet).



Managing Risk

- Approximately 34% of all projects already have work being developed in ORD.
- This information provided is specific to primary plan sets to be let in mid-2024 or beyond
 - Not representative of OBD/OBM, Open Ground, etc.
- This is encouraging (better than anticipated), but still leaves much work to be completed.



Managing Risk

- Information collected included:
 - Total projects vs. projects in V8i
 - Projects by month being Let
 - Costs associated with each project
- Used to evaluate Department-wide risks.
- Information collected is being used by the Committee to determine an OpenX implementation date.



Short-Term Expectations

- OpenX Steering Committee is working to finalize a date in mid-2024 where all projects must be converted to OpenX (or started work in OpenX).
- Anything that deviates from this will be reviewed on a case-by-case basis.
- This cutoff date is specific to the use of OpenX for **2D deliverables ONLY.**
- Expectations will be consistent with current Department guidelines

Pilot Projects



May 2023

- Committee is currently leading a multi-discipline effort to convert a handful of projects to OpenX.
- A diverse group of projects have been selected that vary based on the project's:
 - Size,
 - Complexity,
 - Stage of development,
 - Schedule
- **Desired Outcome:** to support project managers and project delivery teams.

Scope of Work

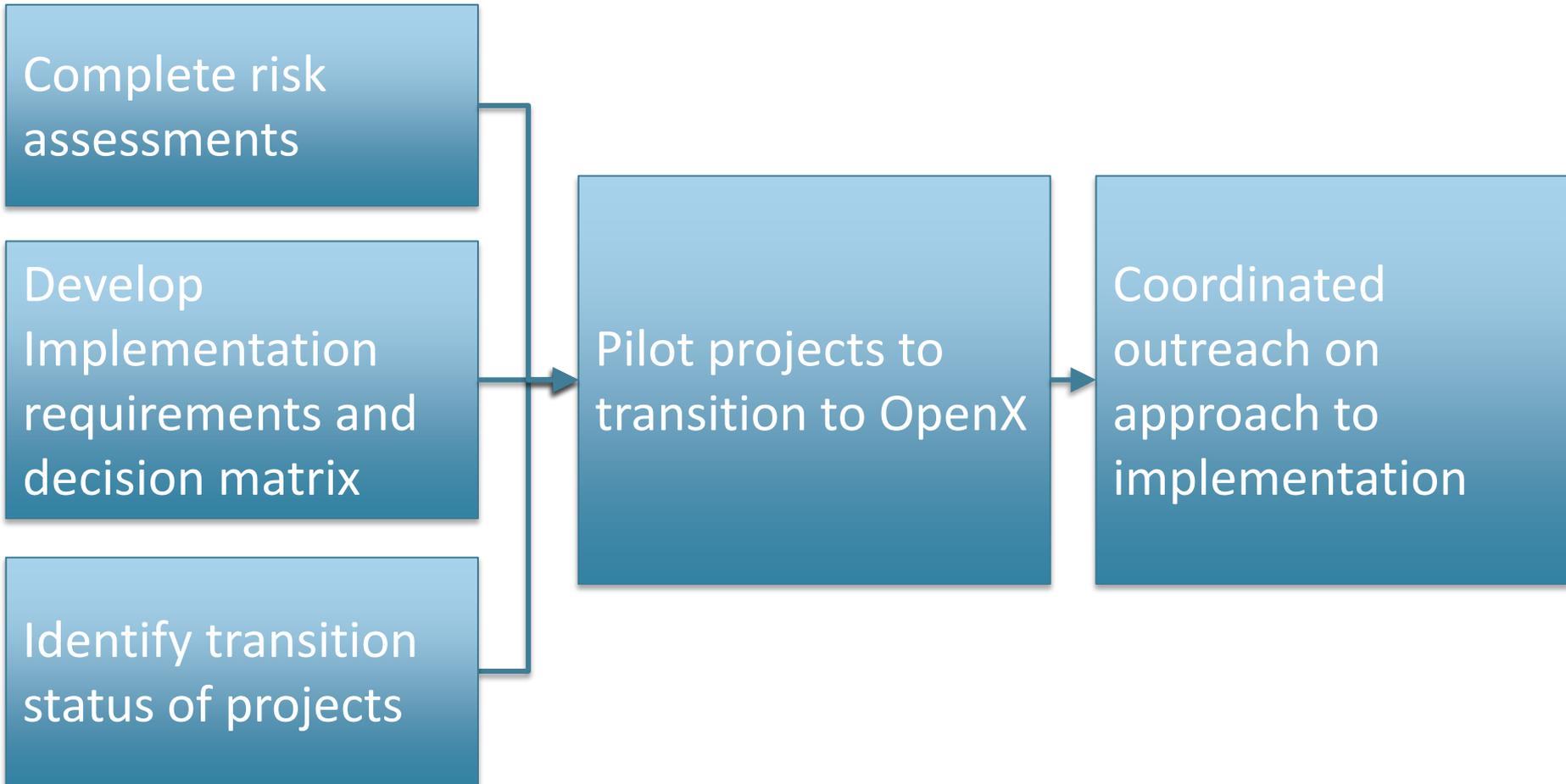
- The scope of work is to convert Microstation V8i **files** to OpenX.
- Goals:
 - Identify inter-discipline workflows,
 - Determine level of effort required to convert,
 - Identify potential roadblocks in the conversion efforts
- Develop standard scopes of work for project conversion.

Reminder:

Effort is for 2D Deliverables **ONLY**



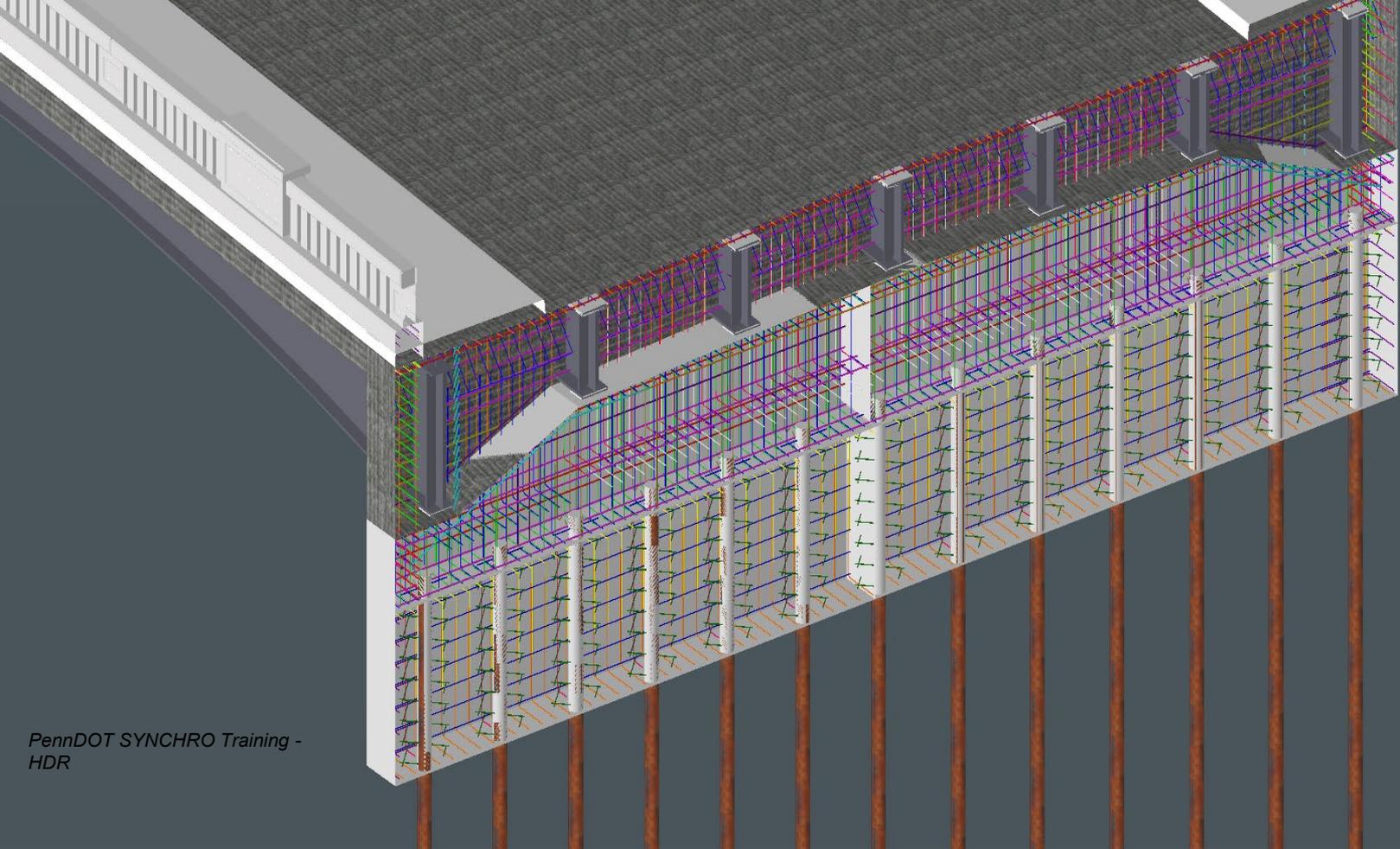
Ongoing OpenX Committee Efforts



Time for a Poll Question

Time for a Poll Question

Digital Delivery



*PennDOT SYNCHRO Training -
HDR*

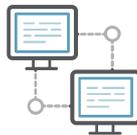
Overview of Digital Project Delivery at the National Level

What is Digital Delivery?

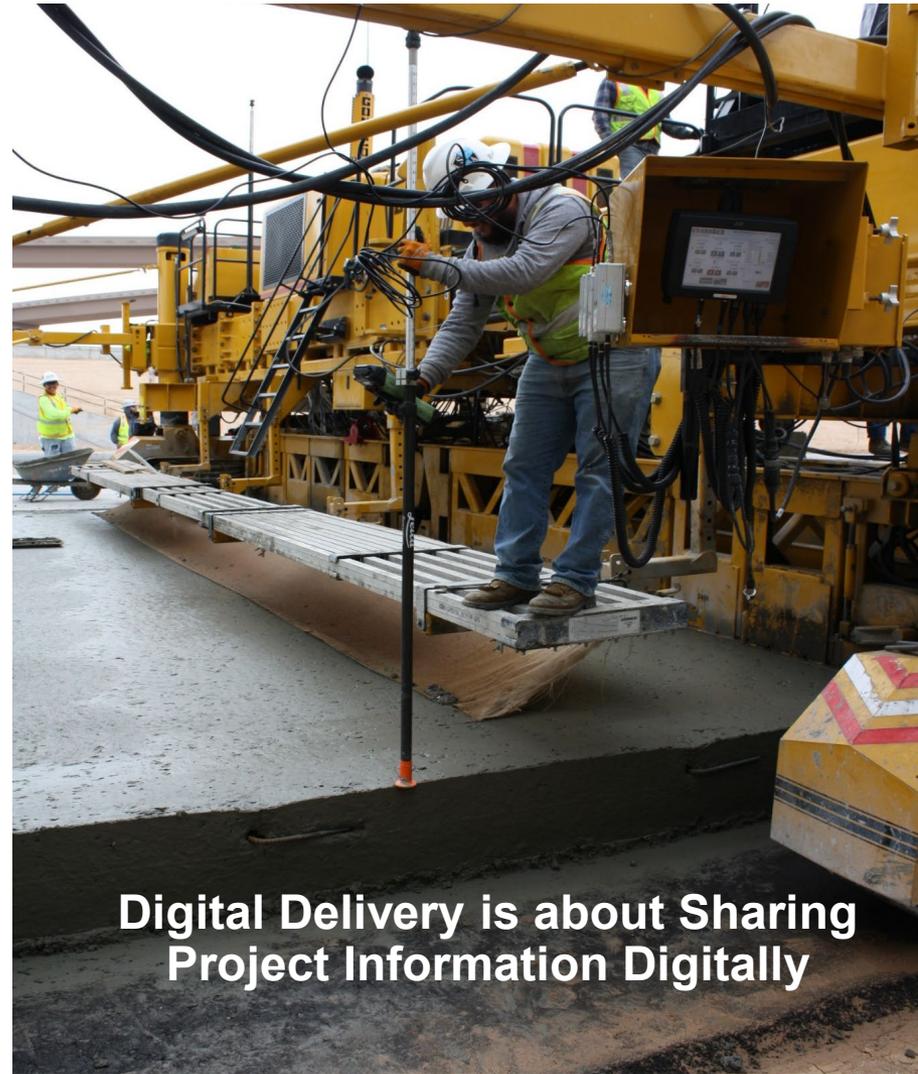
DIGITAL DELIVERY of project data utilizes **3D models and other files** to enhance design activities, facilitate construction, and incorporate digital information to support the asset management lifecycle.



ELECTRONIC WORKFLOWS are paperless, but document based – deliverables for people.



DIGITAL WORKFLOWS are data-based exchanges resulting in deliverables for computer systems.



Digital Delivery is about Sharing Project Information Digitally

What is Digital Delivery?

PA and AZ define Digital Delivery as

modernized approach to project delivery processes and contract media that incorporates digital data. Simply stated, construction projects have the ability to be bid using 3D technology and no longer only be delivered in a traditional 2D construction plan format.

Utah DOT defines Digital Delivery as

data is compiled digitally from each stage in the lifecycle of the project, reducing the need for paper, capturing as-built information, and aiding decision making by downstream users.



Digital Delivery is about Sharing Project Information Digitally

Concepts of Digital Delivery



Model-Centric
Design and
Collaboration

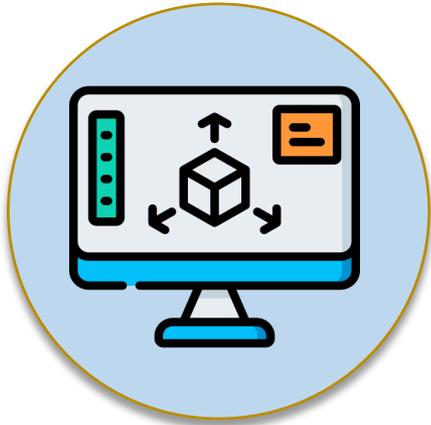


Contractual Model-
Based Deliverables

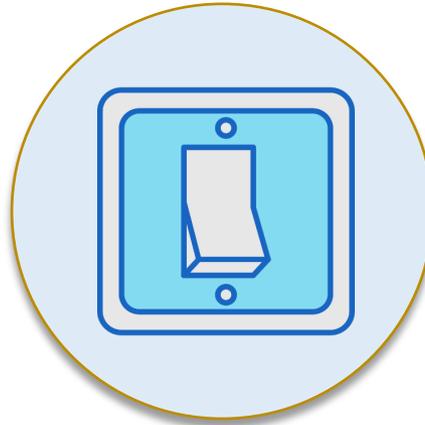


Digital Handoffs for
Asset Lifecycle

What Digital Delivery is NOT



3D/4D/5D Only



Flip of the Switch



An Application

Benefits of Digital Delivery



Improved design
quality



DOT and Contractors using the same
information



Data visualization allows project teams to optimize
construction means, methods, and schedules

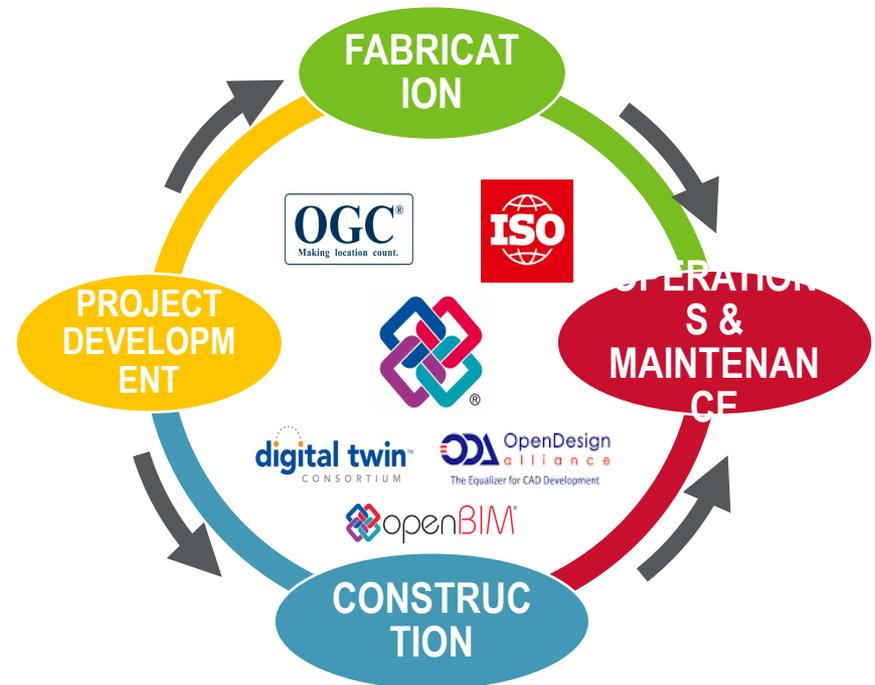


Streamlined data collection
that
reduces duplication of work



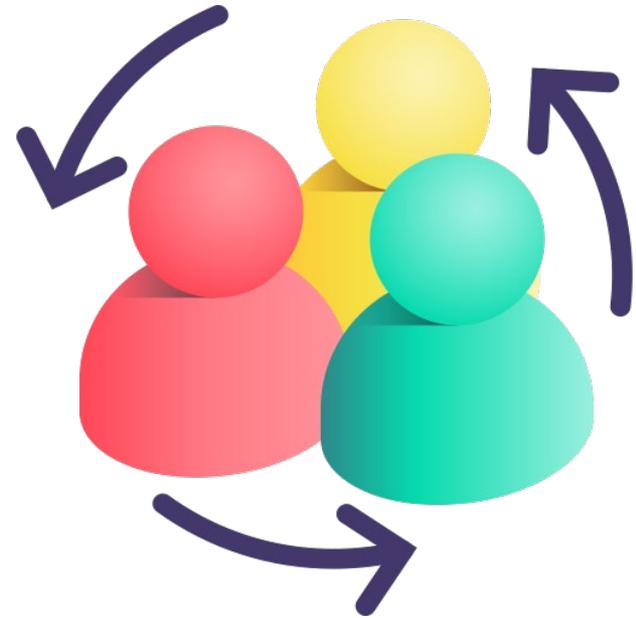
Ability to access the right
information at the right
time

Challenges of Digital Delivery



Lack of open data standards

Challenges of Digital Delivery

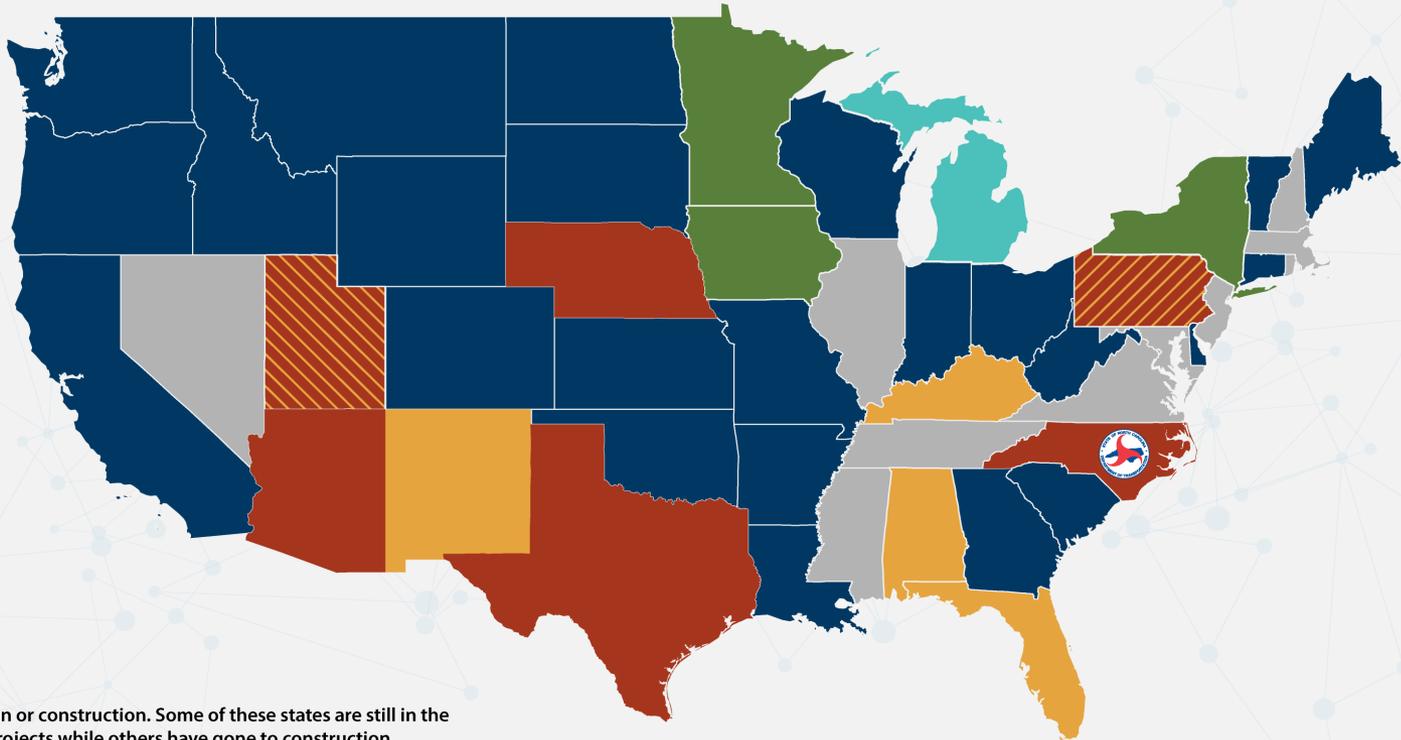


Change can be difficult



Digital Delivery State of the Practice

Digital Delivery State of the Practice



Note: piloting includes design or construction. Some of these states are still in the design phase of their pilot projects while others have gone to construction

LEGEND

States deliver AMG models for information only		Piloting contractual AMG and bridge models		Piloting contractual multi-disciplinary models (planless)	
Piloting contractual AMG models only		Piloting contractual bridge models only		Strategic planning for MALD	
				Unknown status	

Digital Delivery Directive 2025 ROADMAP



Our Vision

By 2025, construction projects will be bid using 3D technology and no longer be in a traditional construction plan format

Our Mission

To support the digital transformation of project development within PennDOT developing modeling requirements, processes, and workforce development to enable improved asset information transfer by using 3D data-rich information models

Goals

Implement 3D Technology

Advance the Use of Accessible Digital Processes and Tools

Capture Data-Rich Asset Models

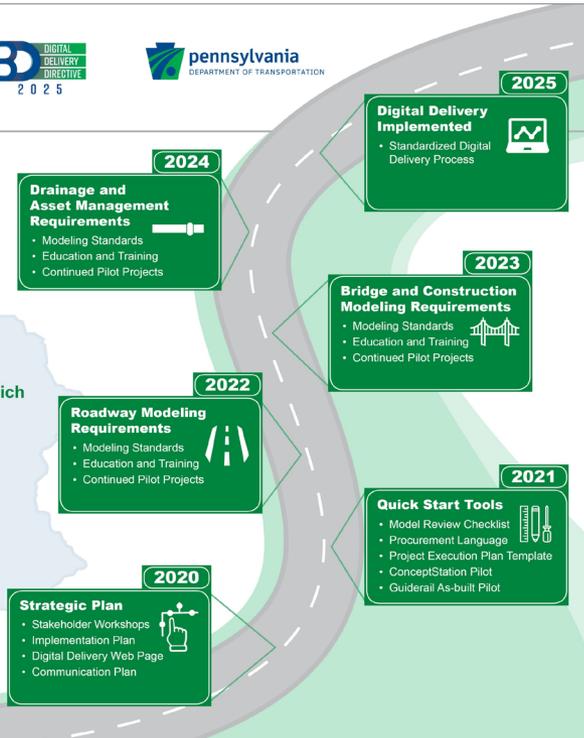
Keys to Success

- Manage Pace of Change
- Help People Perceive Progress
- Create Safe Space for Experimentation
- Empower Pilot Project Teams
- Use Construction Partnering

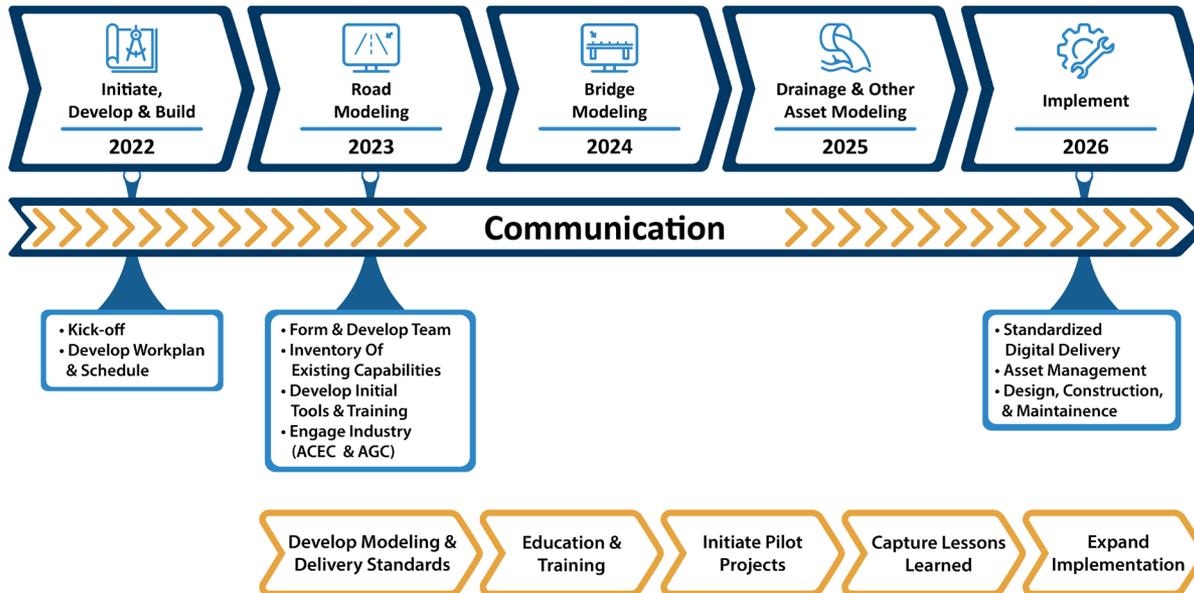
Strategic Approach

- Assess Stakeholder Needs, Desires and Priorities
- Align Technical Solutions with Stakeholder Input
- Advance Technical Solutions Incrementally

Email: RA-PDDIGITALELIVERY@pa.gov



PennDOT 3D2025 Roadmap



Arizona DOT Multi-Year Roadmap

A Phased Approach

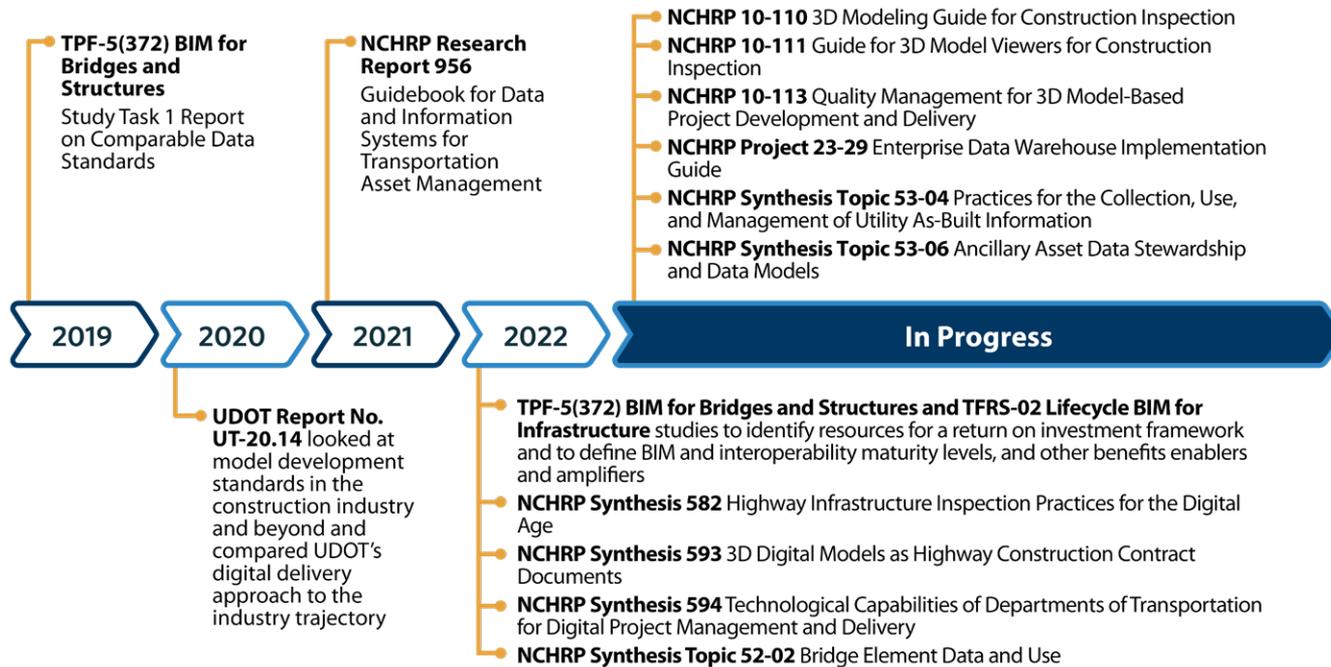
Iowa DOT Strategic Plan

- Look at past initiatives, many that were unconnected
- Document Gaps
- Identify Tactical and Strategic Goals
- Implementation and Evaluation Plan



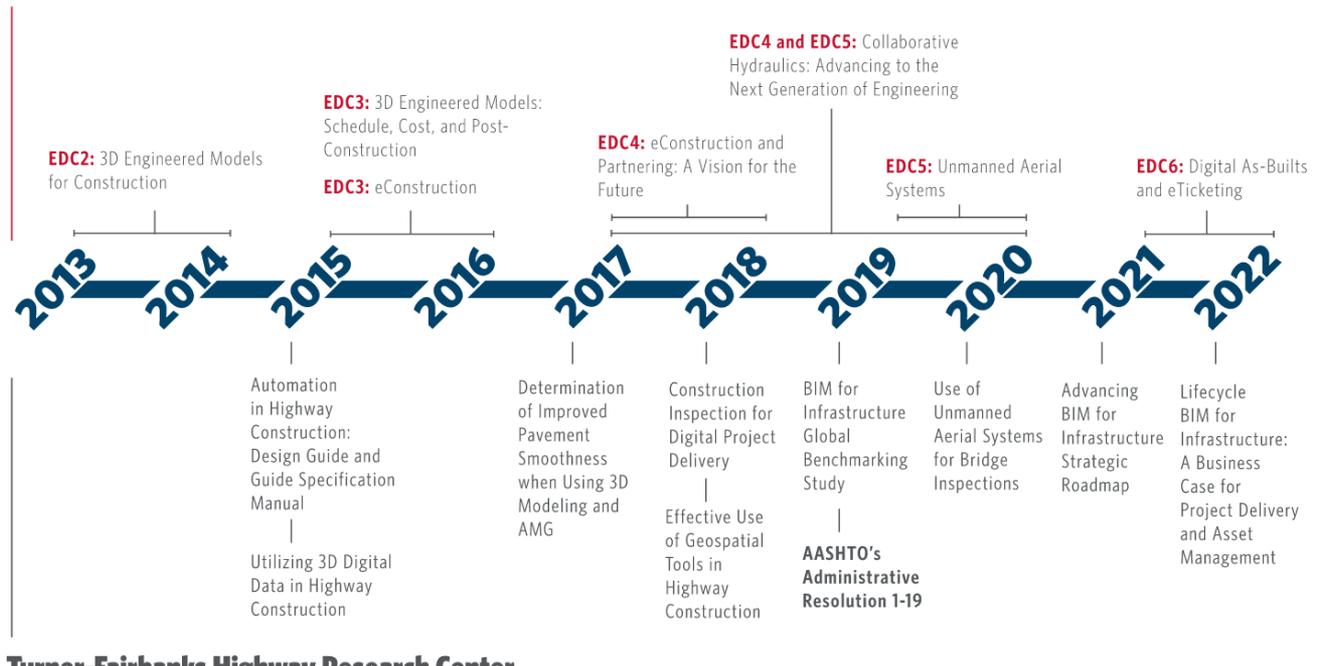


Federal-Level Initiatives



National Research Initiatives

Every Day Counts (EDC)



Turner-Fairbanks Highway Research Center

FHWA Initiatives

	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
GOALS	Transition from 2D to 3D for plan production	Deliver 3D model for information only	Deliver 3D model contractually with conventional plans	Deliver 3D model contractually without plans	Collect digital as-builts
ASSESS	<ul style="list-style-type: none"> Department and stakeholders' readiness Resources and technology Projects that fit use case criteria and timeline 	<ul style="list-style-type: none"> Software suitability (design, bridge, review, construction) Files to be delivered File exchange mechanism 	<ul style="list-style-type: none"> Modeling standards 3D review process Stakeholder readiness for contractual models 	<ul style="list-style-type: none"> Tools available to replace all plan sets 	<ul style="list-style-type: none"> Tools/systems to harvest information Priority asset data collection methods
DEVELOP	<ul style="list-style-type: none"> Identify digital delivery lead and champions Draft multi-year plan and schedule Plan stakeholder engagement Procure software and create user training 	<ul style="list-style-type: none"> Develop standards and information requirements Update/streamline processes Create procedures for 3D reviews Create training Determine which projects will be model-based 	<ul style="list-style-type: none"> Update department manuals with new digital methodology Update contractual language - consultant agreements construction specs and general provisions 	<ul style="list-style-type: none"> Procure software for viewing 3D models during construction 	<ul style="list-style-type: none"> Develop information and modeling requirements for digital as-builts
IMPLEMENT	Collaborate with project teams, stakeholders (contractors/consultants/sister agencies) and partners (software vendors) 				
	<ul style="list-style-type: none"> Start exploring signing and sealing approach Work with state board of registration Implement 3D modeling software 	<ul style="list-style-type: none"> Select and conduct pilot projects (e.g., roadway, bridge, drainage) Deliver just-in-time training and assist pilot project teams Collect feedback and refine process Report outcomes of pilot projects 	<ul style="list-style-type: none"> Report progress and outcomes Institutionalize practices 	<ul style="list-style-type: none"> Select and conduct pilot projects for digital as-builts Institutionalize practices 	

Joint Technical Committee on Electronic Engineering Standards

Mission:

To champion and coordinate the implementation of open data standards and schema development with the goal of enhancing seamless information exchanges throughout the lifecycle of all assets, with the goal of improving management of transportation systems and assets.

Connecticut	Florida
Iowa	Kentucky
Minnesota	Mississippi
Montana	South Carolina
Utah	FHWA

Joint Subcommittee on Data Standardization (J-STAN)

BIM FOR BRIDGES AND STRUCTURES ROADMAP TPF-5(372)

BACKGROUND

The desired outcome of the work under the TPF-5(372) Project is to establish a standard for bridge semantic and geometric information that is common in the United States, which is a continuation of a previous effort known as the IFC Bridge project to create international standards. The resulting products from the TPF-5(372) may be used by States as a baseline for future projects to further refine standards at the local level. The work under this project will be conducted in a series of activities in a five-year timeline to accomplish four major goals:

OUTCOME 1:

Development of Information Delivery Manual (IDM)

OUTCOME 2:

Creation of Model View Definitions (MVD)

OUTCOME 3:

Development of Software Certification Materials

OUTCOME 4:

Deployment of Stakeholder Training

PROJECT SPONSORS

Total Commitments Received: **\$2,100,000.00***

*As of March 2021

<https://www.pooledfund.org/Details/Study/624>
<https://www.bimforbridges.com>

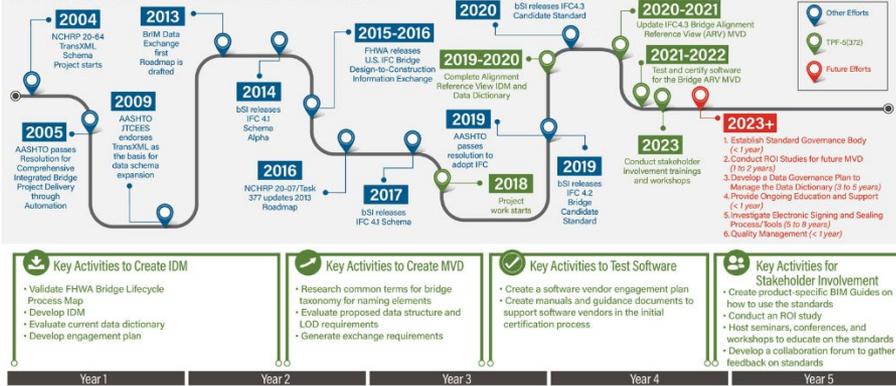


24 PARTICIPATING STATES PLUS FHWA*

Potential AASHTO Publications

- BIM for Bridges IDM
- BIM for Bridges MVD
- BIM Guide for MVD certification

TPF-5(372) ADVANCES U.S. NATIONAL STANDARDS



Transportation Pooled Funds: BIM for Structures and Infrastructure

Why Digital Delivery Matters

- The world has gone Digital
- Data is the new oil / gold rush
- We are constantly generating or collecting data
- Integrated/enterprise data is far more valuable than silo'd data

Digital Delivery for NCDOT

- NCDOT is early on in the Digital Delivery initiative.
- We are completing a gap analysis to determine what works best for us.
- NCDOT is reviewing how Digital Delivery fits into our processes
 - i.e., What works best for us.

Where **NCDOT** is today

Deliverables

Preconstruction

2d Plan Set
(Plans, Profile,
XSC)

3d Grading
Model ?
(only surface)



Construction

2d PDF Files

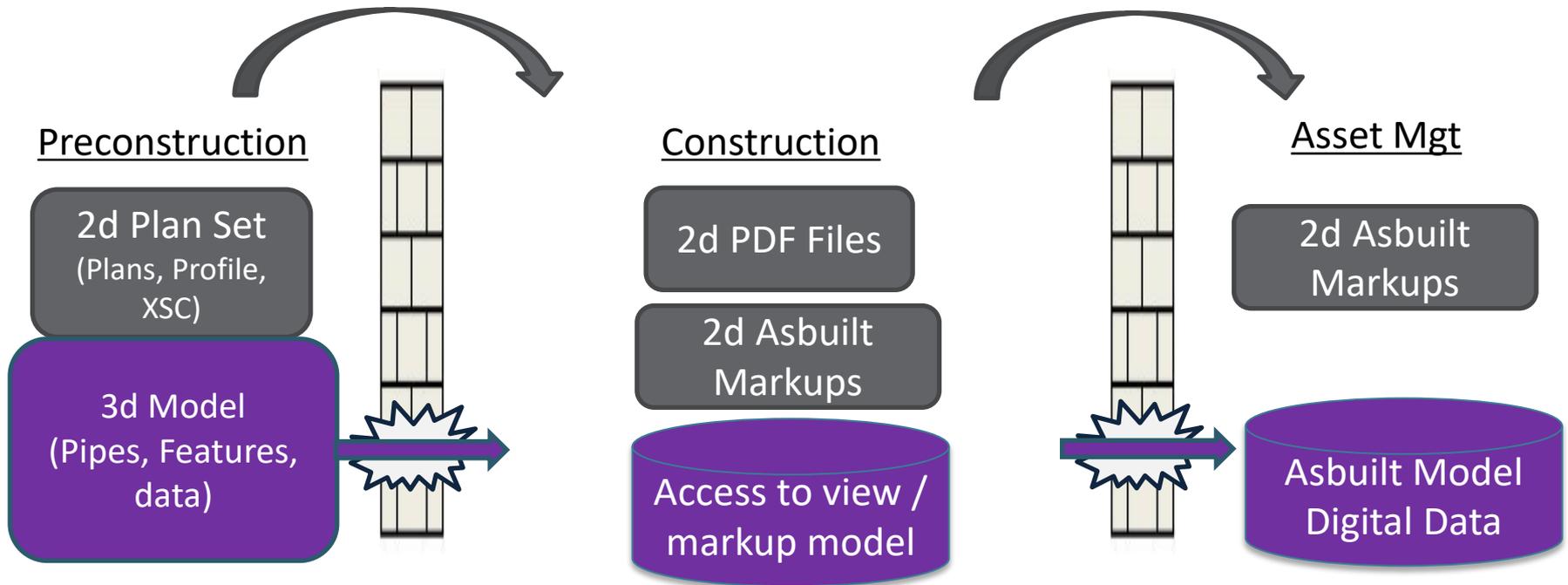
2d Asbuilt
Markups



Asset Mgt

OpenX Model Delivery

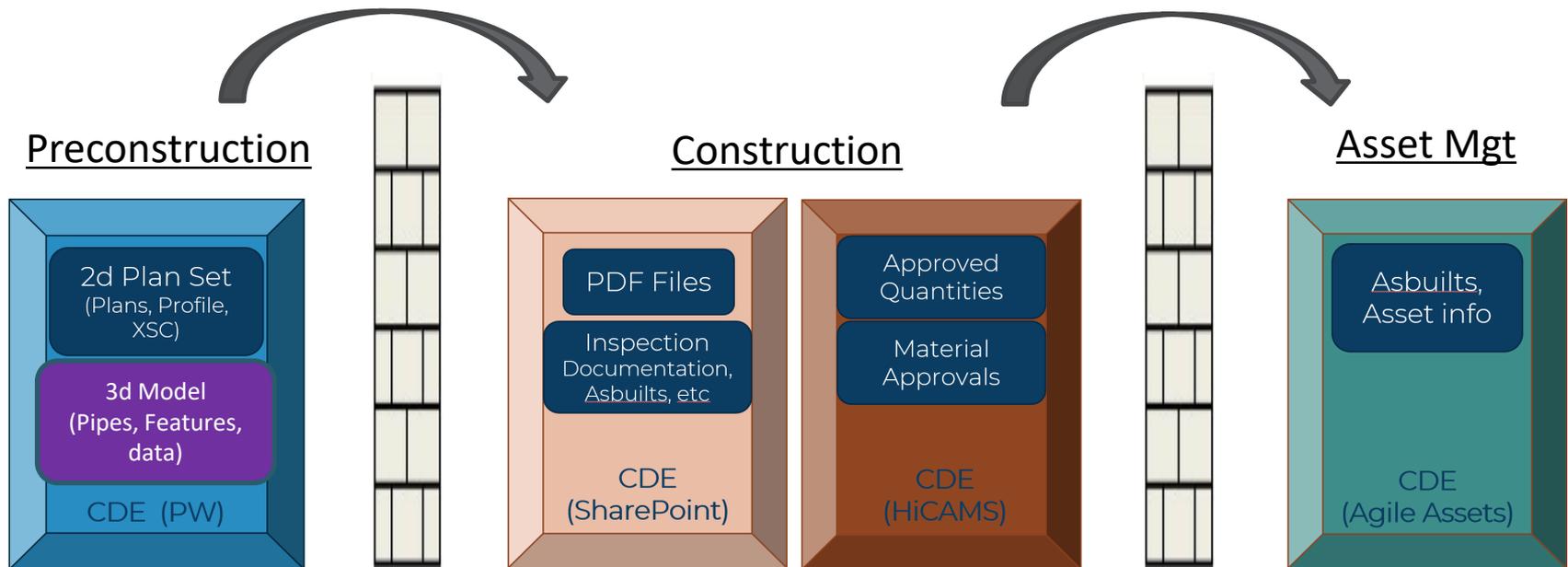
Deliverables



Digital Delivery - CDE

Common Data Environment

A central repository where all digital data and information is stored



Multiple CDEs + Not Connected =
Silo'd Data

Benefits of Digital Delivery

- More design information passed to construction = reduced risk
- Modeling of subsurface in design = reduced conflicts in construction
- Better asset visibility and reportability
- Improved inventory tracking
- Digital Twin of what is constructed can provide value years down the road when future changes occur



NCDOT's Approach to Digital Delivery

- Project Charter – posted on DD Website
- Executive Sponsorship
- Partner firms to assist
- Work closely with OpenX
- Work closely with Industry
- Not a project but a business transformation
- 5-year plan ... broken out into 6-12 month chunks

What is Next ?

- Partner together and embrace the change!
- Assessment of Digital Delivery readiness .. Coming soon
- When we are ready .. piloting

Stay Informed!

Digital Delivery Updates planned for inclusion in PDN Newsletter

Connect NCDOT
BUSINESS PARTNER RESOURCES

Home Help Team Sites Site Map

Doing Business Bidding & Letting **Projects** Resources Local Governments

Search...

Planning Construction Research Roadway Design Work Zone Contracts Toolkit Bike & Pedestrian **Project Management** Value Management

Project Management

To provide resource information on project management to project managers working on NCDOT transportation projects.

Connect NCDOT > Projects > Project Management

Welcome

Project management is critical to successful project delivery. This webpage provides the latest information and guidance to support project managers in their roles and responsibilities regarding scope, schedule, budget and project quality. New project management resources, guidance and tools will be added to this site as they are developed, so please check back often.

SAVE THE DATE: NCDOT's Preconstruction Workshop will be held May 16th and 17th, 2023 at the McKimmon Center.

Newsletters & Comm

2023 Winter Project Delivery Newsletter

If you are interested in signing up for our monthly Project Delivery Newsletter, click the button below.

Newsletter Subsc

Project Delivery Newsletter
Connecting the Dots in Preconstruction

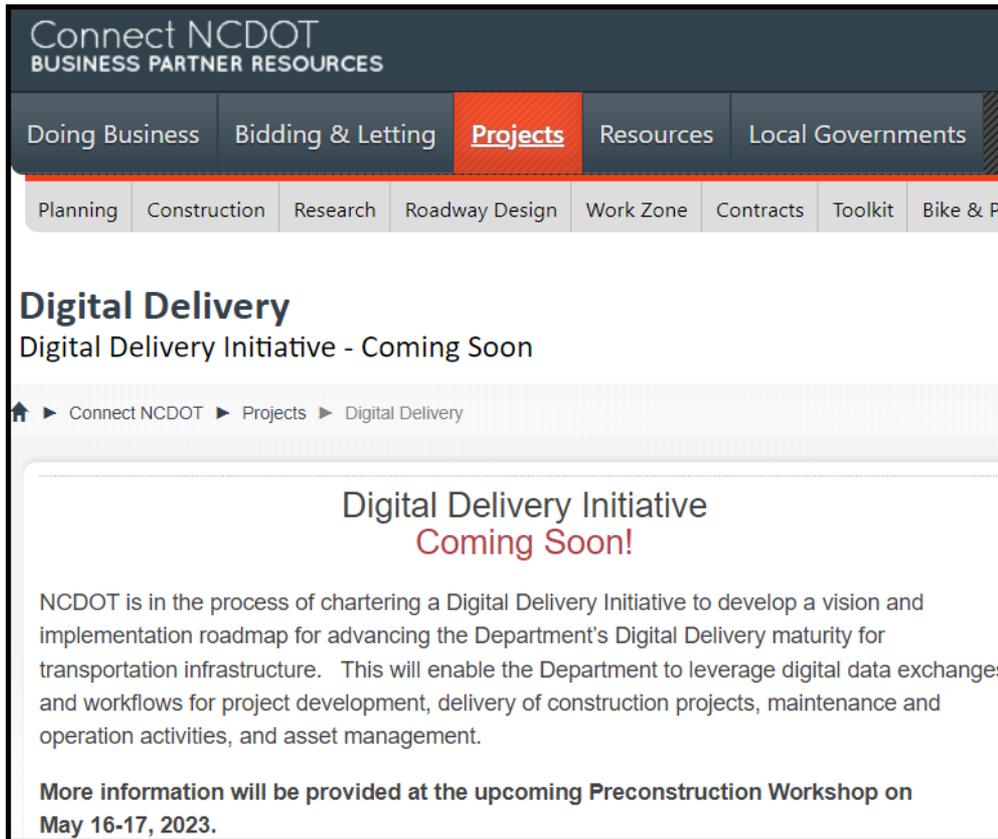
Winter 2023

Bentley OpenX Platforms – What's Next?

NCDOT is in the process of making a major change in the required software to be used for Project design. For the last several years, GEOPAK V8i Select Series 2 (SS2) corridor modeling tools have been used for producing Plans, models, and cross-sections. The change is underway to fully implement Bentley's OpenX platform for all Project design work.

Stay Informed!

Digital Delivery Website



Connect NCDOT
BUSINESS PARTNER RESOURCES

Doing Business Bidding & Letting **Projects** Resources Local Governments

Planning Construction Research Roadway Design Work Zone Contracts Toolkit Bike & Pe

Digital Delivery

Digital Delivery Initiative - Coming Soon

Home > Connect NCDOT > Projects > Digital Delivery

Digital Delivery Initiative Coming Soon!

NCDOT is in the process of chartering a Digital Delivery Initiative to develop a vision and implementation roadmap for advancing the Department's Digital Delivery maturity for transportation infrastructure. This will enable the Department to leverage digital data exchanges and workflows for project development, delivery of construction projects, maintenance and operation activities, and asset management.

More information will be provided at the upcoming Preconstruction Workshop on May 16-17, 2023.

Contact Us

For questions, comments, or Digital Delivery ideas please send to: DigitalDelivery@ncdot.gov

Questions?

David Clodgo, PE, PMP
Design Development & Support Lead,
Divisions 7 & 9-14
NCDOT Roadway Design Unit
djclodgo1@ncdot.gov

Bryan Edwards, PE, CPM
Electronic Construction Systems Engineer,
NCDOT Construction Unit
bedwards1@ncdot.gov

Kevin Martin
Transportation Digital Delivery Services Advisor,
HDR
Kevin.Martin@hdrinc.com



Results of Survey