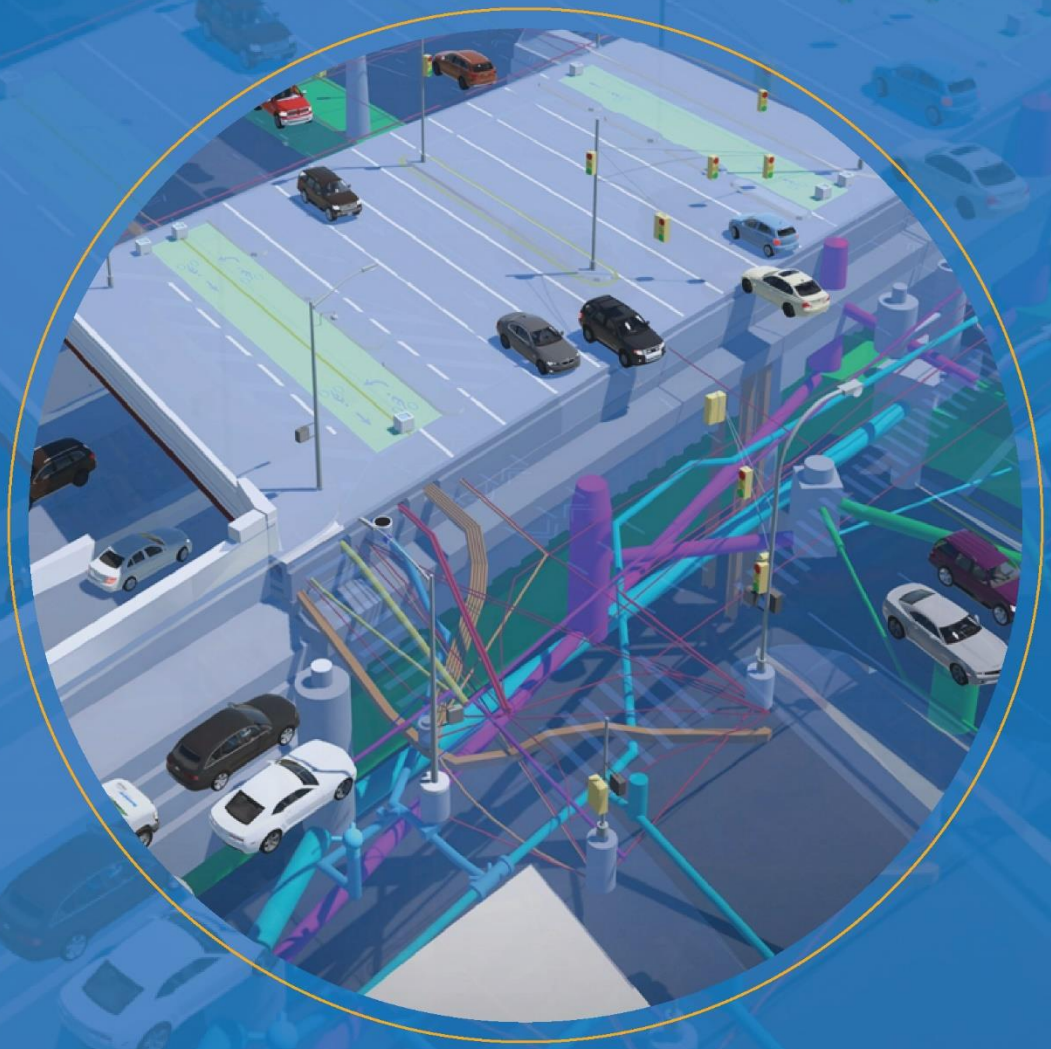
NEW YORK
STATE OF
OPPORTUNITY.

Advancing Lifecycle Management of Subsurface Roadway Asset Information

FY 2024 Advanced Digital Construction Management Systems Program

July 30, 2024



Technical Application

NEW YORK STATE OF OPPORTUNITY. Department of Transportation

KATHY HOCHUL
Governor

MARIE THERESE DOMINGUEZ
Commissioner

July 18, 2024

The Honorable Peter Buttigieg,
Secretary, United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

RE: **Advancing Lifecycle Management of Subsurface Roadway Asset Information Project**
Fiscal Year 2022-2026 Advanced Digital Construction Management Systems (ADCMS) Program Grant Application

Dear Mr. Secretary:

The New York State Department of Transportation (NYSDOT) is pleased to submit the **Advancing Lifecycle Management of Subsurface Roadway Asset Information Project** grant application through the Advanced Digital Construction Management Systems Program for Fiscal Year 2022-2026 (ADCMS). NYSDOT has prepared this grant application to advance New York State's significant efforts to develop a framework to establish a future Building Information Modeling (BIM) modeling practice that supports the efficient flow of data and information from design to construction to asset management. If awarded, this grant will investigate BIM modeling practices on completed projects to determine if models and practices can be used to support asset management through digital as-built handoff, as well as develop new standards to advance the to-be state of NYSDOT's future digital delivery program. The Project will pursue these activities through application of the proposed process via targeted assets, to include small culverts and underground utilities.

NYSDOT seeks an ADCMS grant of $4,000,000 with a $1,000,000 commitment from NYSDOT. Funding will cover expenses and activities including but not limited to, personnel time, consulting services, and partnership opportunities such as the development of training courses by staff at the University at Buffalo to advance this critical digital delivery project for the State of New York. Without the FY 2022-2026 ADCMS funds, the Project may be delayed, preventing the development of statewide data modeling practices for NYSDOT and its regions, leading to significant delays in integrating asset data into digital delivery platforms.

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This Project supports the Federal Highway Administration's goals for the ADCMS grant program by accelerating the adoption of ADCMS throughout the construction lifecycle, enabling more timely and productive information sharing among stakeholders, developing technology training and workforce development, and enhancing worker safety.

NYSDOT is committed to adopting digital delivery practices that integrate asset information from design to construction to asset management, which is a critical investment in New York State's efficient management of its transportation infrastructure. This letter serves as a commitment from NYSDOT to provide the local match for the Project, as well as a commitment that NYSDOT will ensure this Project is completed.

On behalf of NYSDOT, I appreciate the opportunity to apply for this grant and thank you in advance for your consideration to fund the **Advancing Lifecycle Management of Subsurface Roadway Asset Information Project** through the ADCMS grant program.

Sincerely,

Marie Therese Dominguez
Commissioner

c: Stephanie Winkelhake, Chief Engineer
Richard D. Wilder, Deputy Chief Engineer Design
James Flynn, Deputy Chief Engineer Structures

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Advanced Digital Construction Management Systems	
Entity Type	State DOT
Organization Name	New York State Department of Transportation
Project Name	Advancing Lifecycle Management of Subsurface Roadway Asset Information
Previously Incurred Project Cost	$0
Future Eligible Project Cost	$5,000,000
Total Project Cost *(from all funding sources)*	$5,000,000
ADCMS Program Funding Request	$4,000,000
Non-Federal Share for ADCMS Program Funding Request	$1,000,000
Total Federal Funding *(including ADCMS Program)*	$5,000,000

1. Project Description

1.1 Introduction/Overview

The New York State Department of Transportation (NYSDOT, or the Department) has made significant strides in digital delivery over the past 5 years, particularly through the implementation of professionally sealed digital data in lieu of plans on Design-Bid-Build (DBB) projects and inclusion of a Civil Integrated Management provision requiring 3D/4D/5D CAD models and Digital As-Builts on several industry leading Design-Build (DB) projects.

Building on a strong foundation of 3D CAD Modeling and model utilization in construction, NYSDOT has advanced its digital delivery program through the Department's hybrid digital delivery (HDD) and model based digital delivery (MBDD) (model as the legal document) approaches. The adoption of these processes has resulted in the successful award of over 25 moderate to complex digital delivery projects across all NYSDOT Regions. NYSDOT is also known for its robust enterprise-level geographic information (GIS), location referencing, and asset management systems and is rapidly working to integrate digital delivery together with these systems to establish a comprehensive lifecycle solution.

NYSDOT aims to establish a future Building Information Modeling (BIM) practice and a digital as-built (DAB) practice that can be seamlessly implemented into both the DBB and DB delivery methods that ensure efficient data and information flow from design to construction to asset management, aligning with the Federal Highway Administration's (FHWA's) BIM for Infrastructure National Strategic Roadmap.

This proposed ***Advancing Lifecycle Management of Subsurface Roadway Asset Information Project*** ("the Project") will leverage 3D CAD Modeling data from completed projects and implement a method to extract asset level data from design models to support asset management through a digital as-built exchange. The Project will focus on NYSDOT's DBB program and on modeling subsurface assets. The Project will also develop new standards to advance NYSDOT's future digital delivery. NYSDOT is requesting $4.0 million in Fiscal Year (FY) 2024 Advanced Digital Construction Management Systems (ADCMS) Program funding and committing $1.0 million in state funds to match the ADCMS request.

1.1.1 Strategic Advantages

By applying BIM principles to subsurface assets, namely, closed drainage networks, small culverts, and underground utilities, the Project will advance the state-of-the-practice not only within its State but also nationally. Modeling of these assets is rarely tackled programmatically within digital delivery programs, primarily due to their complexity. Leveraging its decades of high-quality enterprise GIS experience and data governance, users will be able to utilize enhanced management and integration of these assets through the Department's System of Engagement (SoE), which is a central repository of GIS viewers customized for specific functional purposes. This will provide benefits across many business uses ranging from infrastructure performance management, to efficient maintenance operations, to climate resilience adaptation and beyond.

1.1.2 Alignment with ADCMS Program Goals:

The Project supports all the ADCMS Program goals of advancing cost savings, reducing project delivery time, improving safety, and reducing congestion, as demonstrated in Section 1.4 Program Goals. It addresses vital Merit Criteria, including promoting efficient information sharing in new practice areas (i.e., underground assets modeling), accelerating technology adoption, safety, supporting workforce development, and equity, as demonstrated in Section 4 Responsiveness to Merit Criteria.

1.1.3 Key Components and Benefits

The ***Advancing Lifecycle Management of Subsurface Roadway Asset Information Project*** exemplifies NYSDOT's commitment to advancing digital delivery, digital as-builts and digital asset lifecycle management practices. By strategically modeling complex subsurface assets pre-construction and leveraging advanced digital tools and frameworks with the intention of scaling this process to include all applicable assets in the future, NYSDOT can significantly improve asset management, support sustainable infrastructure development, and align with national strategic goals. Key benefits can be summarized as follows:

- **Proven Digital Framework:** NYSDOT's transition to hybrid and model-based digital delivery (HDD and MBDD) integrates advanced technologies and digital workflows. The adoption of contractual 3D models and digital data exchange has improved project outcomes by reducing information loss, enhancing collaboration, and streamlining construction processes. This project builds on this proven framework representing NYSDOT's desire for continuous improvement and advancement in its BIM practices.
- **Focus on Subsurface Assets:** By extending NYSDOT's nascent BIM capabilities, specifically for subsurface assets, NYSDOT will create comprehensive digital twins covering both visible infrastructure and critical subsurface components. This approach will enable detailed visualization, clash detection, and lifecycle management of drainage systems, small culverts, underground utilities and other subsurface elements.
- **Enhanced Data Management:** Subsurface asset information will be integrated into NYSDOT's existing enterprise-level asset management systems and web-based GIS viewers. This centralized repository facilitates seamless data sharing and retrieval, providing stakeholders with a holistic view of known assets, aiding decision-making, planning, and maintenance operations.
- **Improved Efficiency and Safety:** Leveraging digital delivery for subsurface information reduces risks associated with incomplete or inaccurate data. Enhanced accuracy contributes to reduced construction conflicts and maintenance confusion, as well as safer and more efficient construction and maintenance operations, thus enhancing the efficiency, reliability and sustainability of New York's transportation infrastructure.

1.2 Scope of Work

As with any major transformational endeavor, the general philosophy of NYSDOT's plan and scope is to explore and document its current state, develop improvements, test the improvements, conduct targeted pilot studies to understand how the improvements function, iterate as necessary, and implement. To do this, the Project will be organized into 16 Tasks (Task 1-16) that are grouped into six (6) overarching categories (Category I-VI, Roman numerals). The tasks and categories are introduced here in the Narrative at a high strategic level. ***Please refer to the Scope of Work -Supplemental***

document (in Supporting Documentation.pdf) ***for a more detailed version of categories and tasks, with NYSDOT's vision for multiple integrated subtasks and implementation.***

In order to conduct this Project with a manageable number of assets, Tasks 1 through 14 (in Categories I through V) are applied primarily only to closed drainage network elements and small culverts. Task 15 (in Category VI Mainstreaming) provides a method of integration with NYSDOT Operations that includes subsurface utility assets. The Project is designed to be scalable, and with the lessons learned from the outcomes of this Project, NYSDOT will be ready to document the process to share with other State DOTs and expand the scope to other groups of assets.

Figure 1 conveys the overall strategic flow diagram for this Project, and it conveys the iterative process anticipated as each stage of BIM development undergoes the necessary prototyping, testing/piloting and review feedback loops. The diagram is modeled on the flow of pilots in the BIM for Infrastructure National Strategic Roadmap (NSR). NSR emphasizes the importance of doing "early pilots" followed by "advanced development pilots" and "implementation pilots" before operationalizing and mainstreaming. NYSDOT has deep and timely experience in delivering digital delivery pilot projects since 2018, but the focus has been on building 3D models as opposed to building BIM models that hold asset information (as per ISO-19650) and that can be delivered to asset managers using the common data environment (CDE) as recommended in the NSR. NYSDOT plans to leverage the continuum of progress made since 2018 with the early pilots by evaluating the data architecture, modeling standards & specifications and information systems that have been developed for building 3D models (Tasks 1-3); and integrating the guidelines from the BIM Transportation Pooled Funds (TPF5-480 and TPF5-372). This ADCMS project will help NYSDOT advance their Development Pilots (Tasks 4-10) and Implementation Pilot tasks (11-14), in an iterative manner (orange loops) to improve BIM Maturity Level and implement data architecture, standards, specifications and information systems for development and exchange of BIM models.

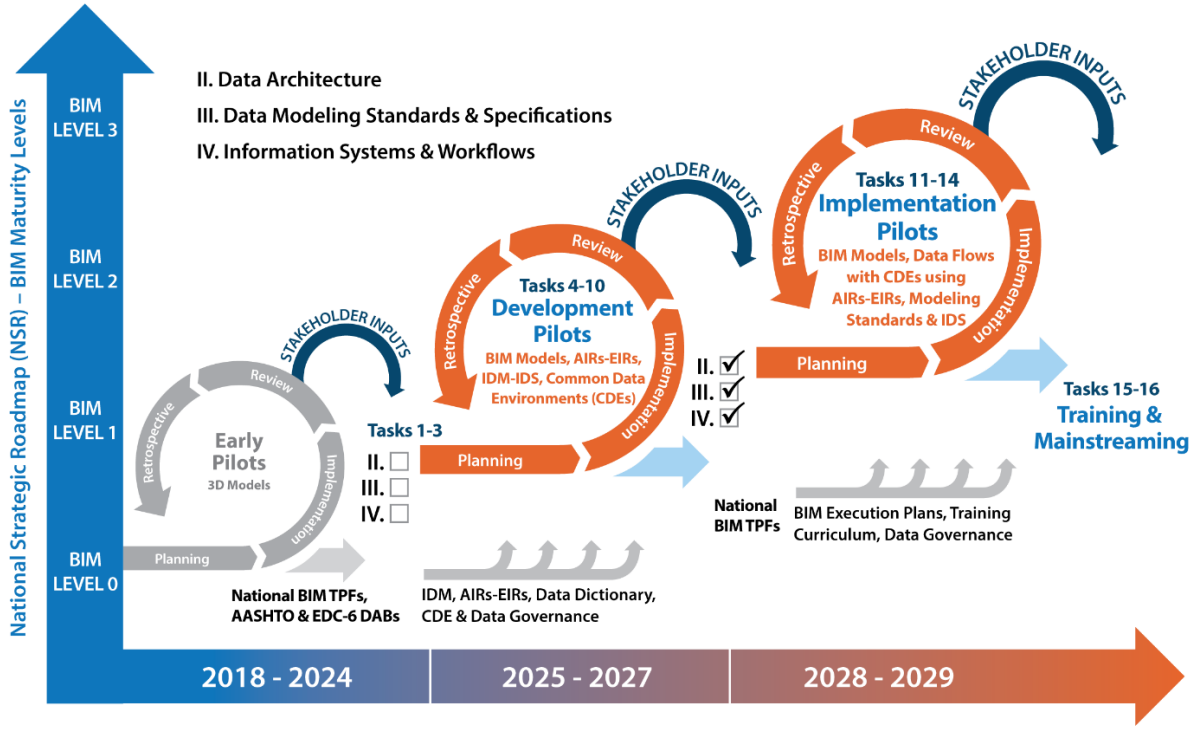


Figure 1: Digital Delivery Program Capability and ADCMS Project Progression

I. To-Be State Definition Tasks (Tasks 1-3)

Task 1: Project Management: Kickoff, Coordination, and Communication

This task will involve establishing a project management plan that lays out Task 1-16 outlined in this section. These tasks will establish expectations about the goals, objectives, envisioned outcomes and to-be state. Project tasks will be used to establish roles and responsibilities across team members and stakeholders. Project leadership team will conduct four stakeholder workshops as shown in Section 3.2 – Project Schedule) for continuous outreach and coordination.

NYSDOT has used the BIM for Infrastructure National Strategic Roadmap (NSR) and Every Day Counts Round 6 (EDC-6) to conduct a gap analysis. The Project's proposed tasks have been designed to address the identified gaps and incorporate NSR recommendations. Additionally, National guidance developed by the FHWA BIM for Infrastructure TPF5-480, BIM for Bridges TPF5-372 and AASHTO data integration program has been incorporated in the work plan for the identified tasks.

Task 2: Evaluate Current Design Standards and Specifications

The Department's experience with early pilots (**Figure 2**) will position this Project to begin at the "advanced developmental pilot" stage, more rapidly progressing the digital delivery program to enterprise level. To accomplish this goal, the project team will evaluate current digital design standards, specifications, policies, processes and data models used in the recent pilot projects (e.g.: Pilot #1 – Rt. 28 Over Esopus Creek and Pilot #2 - E. 138th St), so that they can be used as a baseline to establish the scope of the "advanced developmental pilots". NYSDOT project staff will also leverage experience in managing these pilots to identify opportunities for improvement.

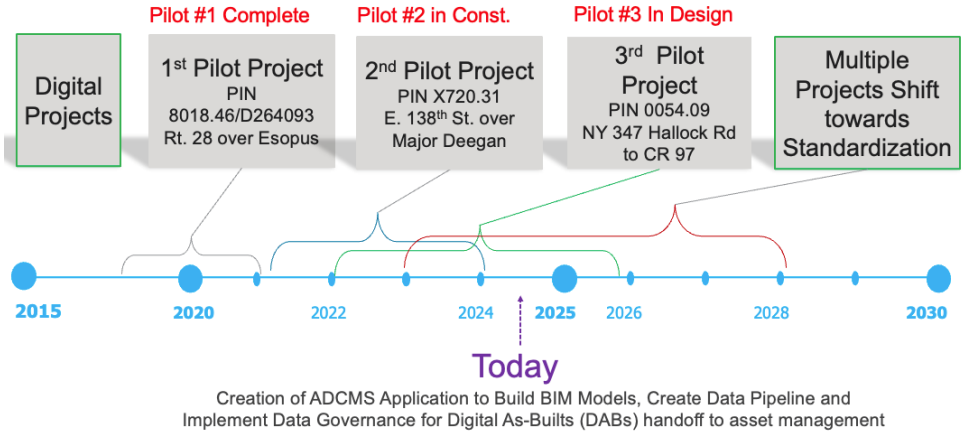


Figure 2: NYSDOT Digital Delivery Projects

Task 3: Prepare for and Conduct To-Be State Definition Workshop

A one-day workshop will be organized by NYSDOT to share information compiled as part of Task 2 on current design standards and practices and use that as the basis for driving discussion on envisioning future processes, standards and systems with the stakeholders. Focus will be on maturing the digital delivery practice for modeling and exchange of subsurface assets data.

Development Pilot Tasks (Tasks 4-10)



II. Data Architecture Tasks (Tasks 4-6)

Task 4: Develop Asset and Exchange Information Requirements (AIR, EIR)

The task objective is to coordinate with subsurface asset managers and stewards to:

a) Extract subsurface asset information requirements from BIM for Infrastructure TPF5-480
b) Identify the subsurface data collection, creation, and acquisition processes at NYSDOT
c) Document the AIRs for the subsurface assets corresponding to each of the process steps
d) Identify data exchanges and define EIRs for the data exchanges in the life of subsurface assets
e) Align the AIRs and EIRs data compiled as part of the steps above with ISO-19650 template
f) Publish documented AIRs and EIRs to stakeholders at NYSDOT for review and updates

Task 5: Embed Model Element Table into Geospatial Data Environment

This task will involve alignment of NYSDOT's design and construction model elements with the data entities (object types) in NYSDOT's geospatial data environment for use in the system of engagement (SoE). The objective will be to bridge the gap between the data models created during design, construction, asset management, asset operations and maintenance.

Task 6: Build Enterprise Data Dictionary

The team will build an integrated enterprise data dictionary (DD) for the subsurface assets using the design, construction and asset management systems.



III. Data Modeling Specifications and Standards Tasks (Tasks 7-8)

Task 7: Architect Future Design Standards and Specifications

Using AIRs, EIRs and the Enterprise DD developed as part of Tasks 4 & 6, respectively, this task will establish what data needs to be integrated into the design models and what model elements, item types, feature definitions and workspace configurations need to be standardized to create intelligent BIM design and construction models for enabling BIM-GIS data migration.

Task 8: Create Information Delivery/Exchange Specifications Documentation

This task will develop information delivery manual (IDM) and information delivery specifications (IDS) for the data exchanges associated with subsurface assets. The IDM development guidelines, IDM Information Architecture and IDS published by BIM for Infrastructure TPF 5-480 and BIM for Bridges TPF5-372 will be used as the starting point and will be customized based on the NYSDOT specific subsurface asset AIRs, EIRs, DD and future design standards and specifications developed as part of tasks 4, 6 and 7. The project team will coordinate with these National TPFs to ensure compliance.

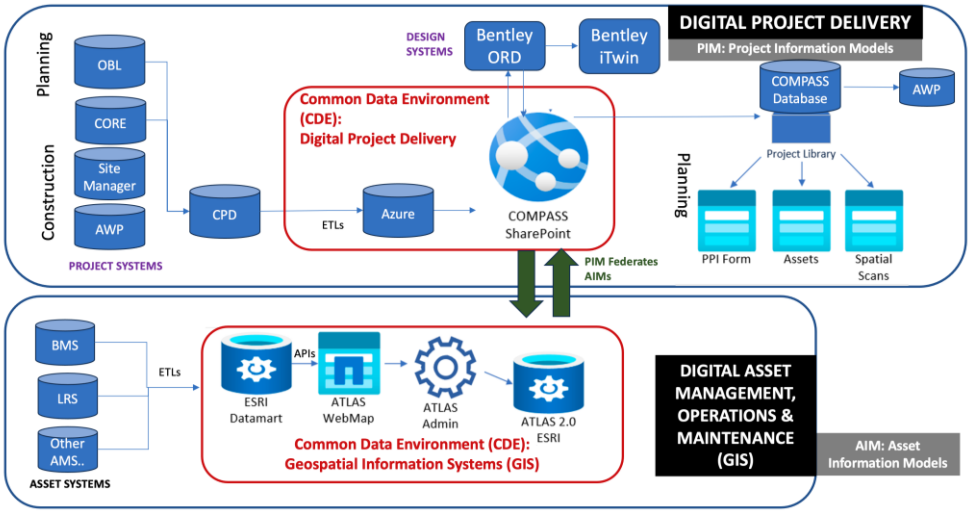


IV. Information Systems and Workflows Tasks (Tasks 9-10)

Task 9: Establish Data Integration & Common Data Environment

This task includes establishing the common data environment (CDE) for storage of integrated and transformed data, and for sharing/provisioning of data from authoritative systems-of-record through use of system-specific Application Programming Interfaces (APIs). CDE data management and governance guidelines recommended by BIM TPF5-480 will be

leveraged. Existing databases, file directories and enterprise systems will be connected to the CDE so that existing systems can be modernized and upgraded for more governed management of structured and unstructured data (documents, photos, lidar, etc.). Through this ADCMS effort, NYSDOT will improve the maturity of its enterprise data platform to serve as a scalable enterprise CDE that aligns with ISO-19650 and with emerging modern approaches for CDE(s) deployment such as in **Figure *3*** for Connecticut DOT.



Source: Bhargava, A. (2023), AASHTO JTCEES Conference, Connecticut DOT CDEs for Digital Delivery and Asset Management

Figure 3: Digital Delivery and GIS Connected Data Environments at Connecticut DOT

Task 10: Design and Construction Data Model Validation Tools

This task will involve development of data model validation tool(s) to test that the BIM/CAD and DAB data models created during design and construction are as per the standards and specifications established in Task 7. The data extracted from the data models in the source system for delivery and handoff to asset management will be validated using the IDS created as part of Task 8. Open standards such as BIM Collaboration Format (BCF) will be used. This task will involve collaboration with software vendors (Bentley, Esri, Leica, Cyclomedia (for digital street views), who are project partners) so that the source systems can also be enabled with these validation tools.



V. Implementation Pilot Tasks (Tasks 11-14)

Task 11: Building Information Modeling and Digital As-Built Pilot

This task will involve building prototype BIM and DAB data models as part of digital delivery "implementation pilot" projects that utilize future design standards and specifications (created as part of Task 7). Focus will be on development of models as per BIM standards, wherein asset attribute information is captured in the model.

Task 12: Data Conversion Tool Pilot

This task will involve development and testing of data conversion tools that can be used to extract data from the pilot BIM and DAB data models that are created during Task 11, and transform it for use by stakeholders. Being an active member of the National BIM TPF programs for Advancing BIM for Infrastructure (TPF5-480) and BIM for Bridges (TPF5-372), NYSDOT recognizes the emphasis these

pooled funds and the NSR have placed on the need and explained the approach for use of Industry Foundation Classes (IFC) for data exchange. Software vendors have been upgrading their software to support IFC 4.3. This task will leverage the National guidance and evaluate the support for BIM data modeling and exchange across these software platforms to develop and deploy the strategy for building data pipelines that support BIM standards-based data exchange and Extract, Transform, Load and Extract, Load, Transform (ETL/ELT) execution as per IDM/IDS.

Task 13: Data Provisioning to Common Data Environment Pilot

This task will leverage BIM-TPF5-480 recommendations on CDE and data governance to establish how data created using authoritative systems will be managed and provisioned to enterprise stakeholders through CDE. As shown in **Figure *3***, Connecticut DOT uses ETL/ELT tools (to be developed as part of Task 12) for extracting data from authoritative systems, transform and provision it into the digital delivery CDE.

Task 14: Document data migration process

Based on information architecture developed as part of Tasks 7-13, documentation on data modeling and migration across authoritative systems of record and CDE will be developed. Additionally, the team will create a plan to monitor and assess the benefits from improved lifecycle management (See 1.3.1 Monitoring and Assessment Plan).



VI. Mainstreaming Tasks (Tasks 15-16)

Task 15: Full Integration with NYSDOT Operations

The goal is to further integrate the Project's outcomes into NYSDOT's operations. Guidance on BIM Execution Plans (BEPs) development from BIM-TPF5-480 will be used to focus on following essential elements associated with mainstreaming BIM into the DOTs operations. See more items to be implemented in "VI. Mainstreaming Tasks" in the Scope of Work Supplemental document.

Task 16: Training Material and Documentation

Training curriculum & material will be developed using NSR & BIM-TPF5-480 to:

- Share details about the approach, tips and tricks for developing digital design and as-built models using the standards and specifications created as part of Task 7.
- Communicate how data models created during design and construction can be used to extract information required by asset managers using IDM/IDS, and how these models can be provisioned for shared data use using the common data environment.
- Demonstrate how data model and data exchange validation tools can be used to ensure quality of the data models created and data exchanged.

The training material and supporting reference documentation (e.g., AIRs/EIRs, data dictionary, data standards and specifications, data validation tools manual, digital delivery process models) will be made available to all stakeholders (NYSDOT staff, consultants and contractors, and National BIM pooled partners). They will also be made available to University at Buffalo for education and training of future design engineers to ensure that they are ready to work in the modern digital delivery work environments at DOTs and/or design/construction consulting, contractor agencies.

1.3 Technical and Management Plan

1.3.1 Monitoring and Assessment Plan

NYSDOT has been advancing its digital delivery program for over five years and is striving to evolve and grow the program rapidly but responsibly. The evolution will occur as innovation in the digital industry becomes more attainable and will be implemented through adoption of the best practices throughout NYSDOT and the wider digital delivery ecosystem. NYSDOT is anticipating that this Project will contribute substantially to this evolution and growth, nationwide.

NYSDOT has implemented a series of logically sequenced and targeted pilot programs to test and provide prototypes for better processes and procedures in digital delivery. Along with those pilot programs, NYSDOT has been assessing progress and capturing metrics that demonstrate and quantify improvements. The NYSDOT Digital Delivery Committee will develop a monitoring plan, to quantify and guide improvements to digital delivery and asset management. The monitoring and assessment plan will incorporate and provide reporting on key metrics for time savings, reduction in time for project delivery, reduction in delays and congestion, and improvements in safety.

1.4 Program Goals

FHWA's program goals for ADCMS provide broader societal benefits and align well with other FHWA programs such as Every Day Counts (EDC), whose workshops NYSDOT has participated in. "EDC is a State-based model that identifies and rapidly deploys proven, yet underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce traffic congestion, and integrate automation. Proven innovations promoted through EDC facilitate greater efficiency at the State and local levels, allowing delivery of more projects." Similar to EDC, ADCMS grant funding aims to foster innovation throughout the country.

NYSDOT has been a leader in innovation related to digital delivery, and we have selected these subsurface roadway assets for the scope of work specifically because we have full control over their design and installation. Additionally, they are not readily visible after construction, making detailed information about them harder to gather and maintain once constructed. NYSDOT will find ways to quantify the benefits by the monitoring program mentioned above in each of these areas. Some of the assessment plan may be derived from the methodology for analysis and quantification of benefits or reduction in delays as performed in typical FHWA benefit-cost analyses.

1.3.2.1 Saving Cost

To the degree possible, our metrics will also capture information about previous activities that may no longer be necessary because of improved information assets. For example, with better geospatial information about as-built small culverts, the field work to capture those locations will be greatly reduced, such as before or after major storm or flooding events. The more easily accessible subsurface asset digital data will reduce the time staff workers spend on low-value inspection activities at worksites, freeing up their time for higher-skilled and more productive work. There will be GIS CDE ability to query assets instead of having to physically collect inventory. (e.g., How many 12" corrugated metal pipe locations do we have? Where are inlets over 75 years old?)

1.3.2.2 Reducing Project Delivery Time

As a result of the improvements from this ADCMS grant program project, there will be savings of time and costs for multiple phases across the project's or asset's lifecycle, including planning, design, project startup, construction, capturing of as-builts, asset inventory, maintenance, operations, asset repair, and asset replacement. In all of these phases, there will likely be some time savings associated with the large projects or small tasks that are normally associated with an asset or an asset category. Having the standard specifications, data dictionary and CAD settings synchronized will result in reduced delivery time by designers and a digital as-built ready product.

The plan will find metrics that capture the reduction in time and effort to access key data and information about assets, especially the degree to which field investigation is reduced or no longer needed. Another metric to consider is how often certain elements of the geospatial database are accessed, by whom, and for what purpose.

1.3.2.3 Reducing Congestion

Better digital information and lifecycle management for the selected classes of subsurface roadway assets will result in reduction of the need for road closures and work zones for many activities associated with small culverts, such as field investigation, locating outfalls, normal maintenance, cleaning before or after storm or other flooding events, inspection of quality, repair and replacement. Similarly, this Project has the potential to reduce road closures for the range of activities associated with underground utilities, such as utility location, checking depth to top or bottom of utilities, setting no-dig zones, etc. The monitoring plan will find ways to capture and quantify this information, including the economic societal benefits from reduction of wasted traveler time.

1.3.2.4 Improving Safety

Better digital information and lifecycle management for subsurface roadway assets will result in improvements in safety for the traveling public, construction workers, operations and maintenance staff, and other employees of public agencies and owners of infrastructure related to roadways. Small culverts were selected because of their prominence in storm events, coastal and riverine flooding, and the effects of climate change related to precipitation/drought and cycles of freeze-thaw and snowmelt. Subsurface utilities were selected for Scope element #14 because it is so difficult to capture information about them, and their locations have such an outsized effect on the ability for NYSDOT to perform roadway improvement work. The monitoring plan will capture reduction in road closures and work zones, combined with statistical analysis of the numbers of crashes and injuries/casualties/fatalities that are normally associated with closures and work zones.

2. Project Team Information

The ***Advancing Lifecycle Management of Subsurface Roadway Asset Information Project*** is a transformative project that will affect all parts of the NYSDOT organization. The approach of this project team and the management structure is aligned with Objective C3 of the National BIM Strategic Roadmap.

For many years, the foundations for this transformation have already been laid in an expanding collaboration among different units and disciplines within the agency and with external partners. The

ongoing development of the digital delivery initiative and this Scope of Work are led by five core NYSDOT professionals with a variety of functional expertise. These leaders will communicate regularly with Executive Management and with agency leaders serving as Stakeholder Liaisons to achieve a cohesive and consistent approach throughout the agency. Liaisons will coordinate with both internal and external stakeholders and facilitate partnerships throughout all phases of the Project. The Project Leadership Team will direct the Information Technology, Discipline Areas, and Consulting Support teams to deliver the Project. The Digital Delivery Committee, described in more detail below, will offer feedback, support, and direction to the Leadership Team.

Established in 2018, NYSDOT's active Digital Delivery Committee (**Figure 4*)*** is comprised of twenty-four members representing many functional groups and each of the 11 DOT geographic regions. This Committee serves as the key connection between the agency's staff and upper management. The Committee enables regular communication between design, construction, and technology teams and highlights NYSDOT's commitment to successful implementation of digital delivery and BIM.

2.1 Staffing Plan

As described above, the Project Leadership Team will take responsibility for the delivery of the Project, under the oversight of NYSDOT Executive Leadership, and will coordinate with the rest of the teams listed in the Organizational Chart below. NYSDOT is committed to dedicating ten percent (10%) of the staff time, annually, of the **Project Leadership Team** to advance the Project.

- **Eric Coulter, P.E. –** Highway Engineer, Co-Chair of the Digital Delivery Committee
- **Brenda Crudele, P.E.** – Structures Engineer, Co-Chair of the Digital Delivery Committee
- **Michael Rossi, P.E. –** Chief Data Officer and Asset Management Lead
- **Matthew France, P.E. –** Construction Automation Engineer
- **Jeff Barth -** Mapping and Automation Lead

Partners. The Project Leadership team will be supported by the Information Technology Team, Discipline Area Leads, and consulting firms, including Bentley, ESRI, and Cyclomedia, that are already working on NYSDOT's digital delivery initiatives. NYSDOT will partner with the Department of Civil, Structural, and Environmental Engineering at the University at Buffalo (Dr. Alan J. Rabideau) to develop two graduate courses for training NYSDOT staff in key digital delivery areas. Please see **letters of support** from Bentley, University at Buffalo, and WSP (in NYSDOT_FY24_ADCMS Grant_Supporting Documentation.pdf).

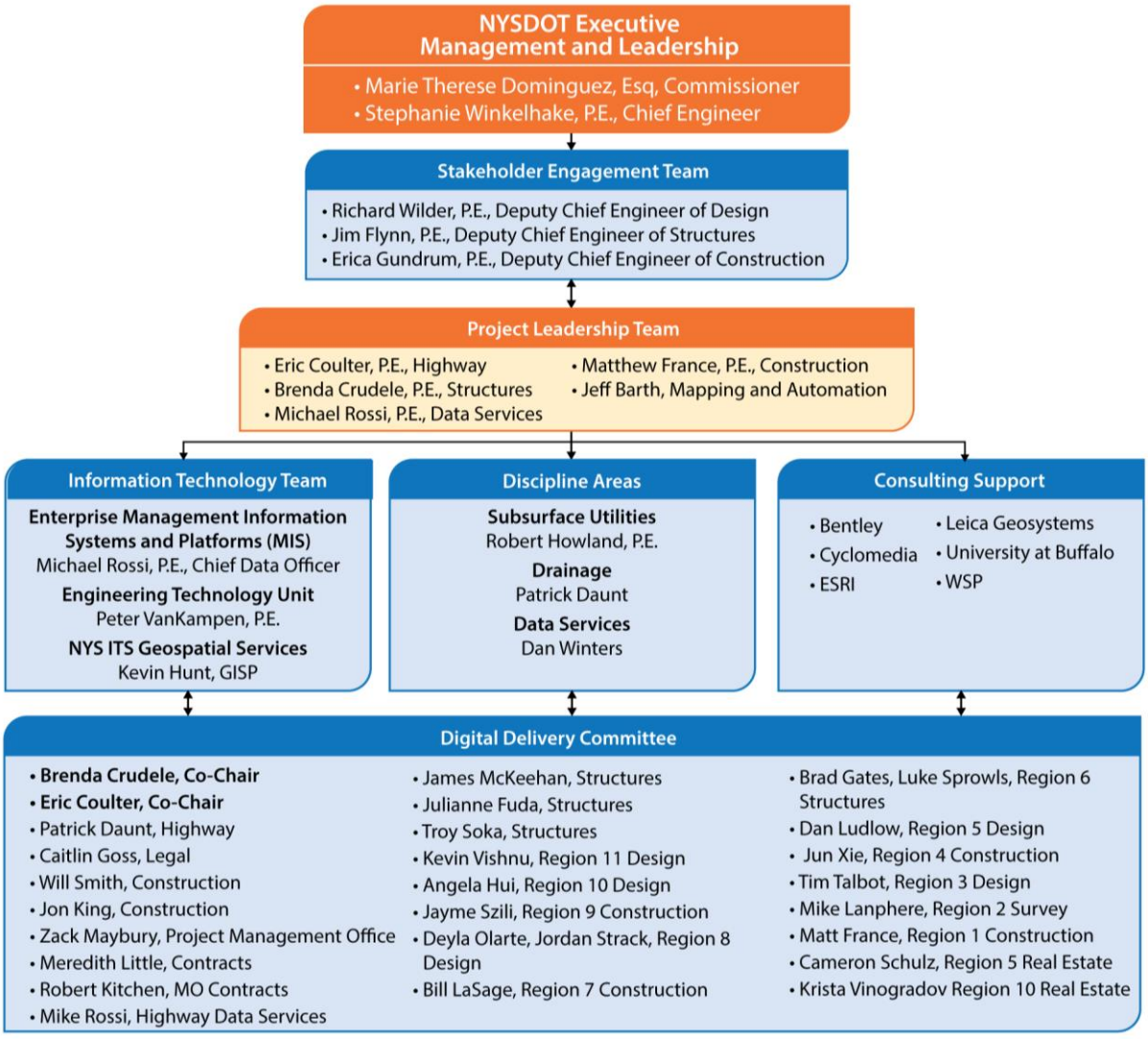


Figure 4: Organizational Chart

3. Project Readiness

NYSDOT is fully committed at all levels of the agency to the continuing development and implementation of a digital delivery program and an advanced lifecycle management program. The Executive Management and Leadership, starting with the Commissioner, Marie Therese Dominguez, Esq, stands behind this grant application and the full implementation of the scope of work. NYSDOT management across the agency, led by the Stakeholder Engagement Team (representing design, structures, construction and asset management) recognizes the range of benefits that will accrue from the transformation. NYSDOT has already been committing time and resources to this effort from across the organization, and the agency is ready to formalize and expand that effort upon award of the grant. The Project Team is in place to start implementing the Project upon award. Detail about the Project budget is provided in **Appendix A: Budget Narrative**.

3.1 Technical Feasibility

As shown in Project Team Information, NYSDOT has all the pieces in place to guide, oversee, and implement the Scope of Work. The Project Leadership Team has been working together to create the framework for the Scope, supported by the wider project team, including the existing Digital Delivery Committee. This team will plan, guide, manage, execute, review, and oversee all of the actions necessary to perform the Scope of Work. Several elements of the Scope will be performed by consultants, and their scopes of work will flow easily from this FHWA ADCMS grant application. Before the ADCMS grant tasks are completed, the Project Leadership team will develop plans to extend the same scalable framework into the next priority assets for implementation.

3.2 Project Schedule

NYSDOT expects to complete the whole project within four years, assuming NYSDOT receives a notice of award in late 2024 and receives work authorization within 1 month of award. The workplan would complete all program components and tasks within four years of the receipt of notice to proceed. (See **Figure 5**) To plan for timely completion, the majority of the substantive work on new processes, workflows, and pilots through Task 14 will be completed by the end of Year 3. Deeper integration with NYSDOT workflows and documentation (Tasks 15 and 16) would occur in Year 4.

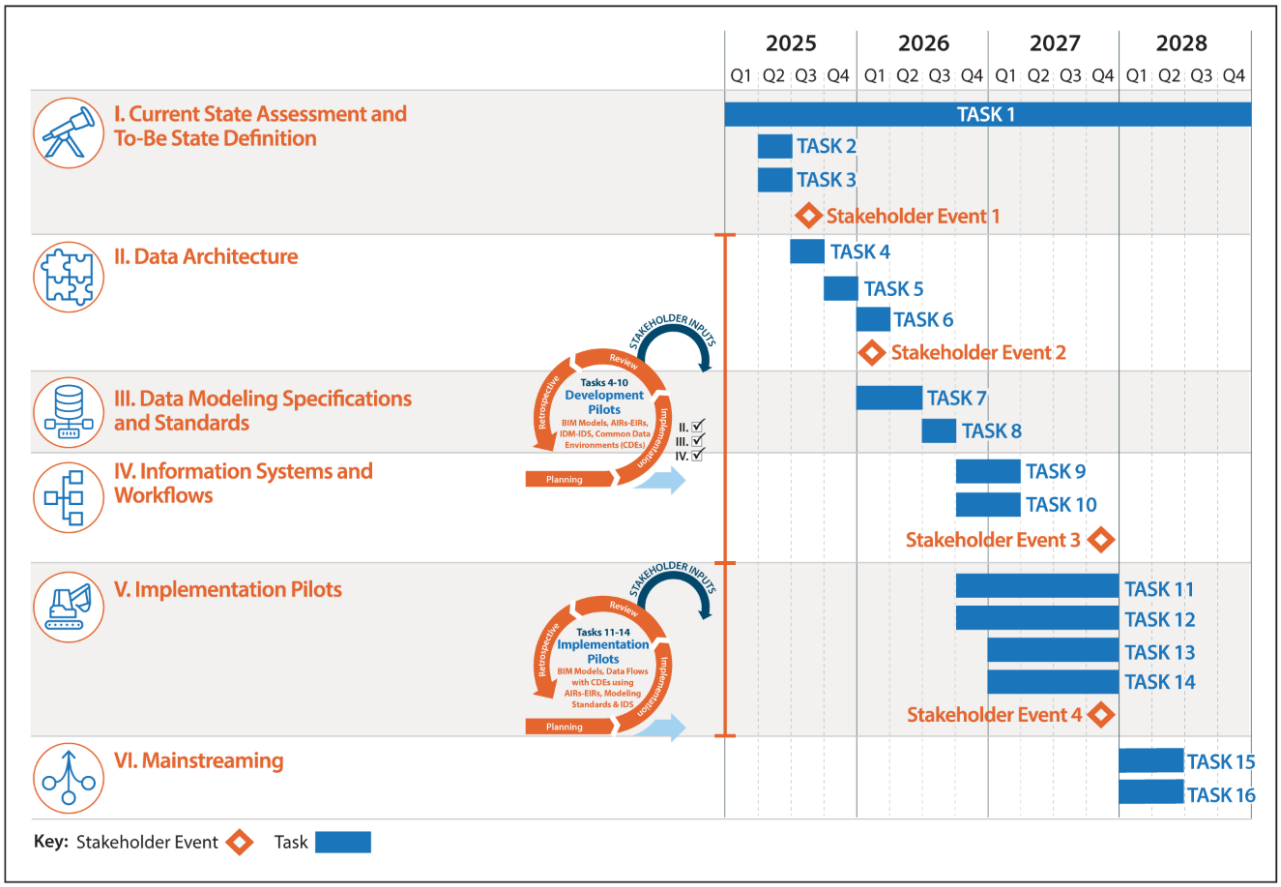


Figure 5: Project Schedule and Milestones

3.3 Project Approvals

As described above in the Staffing Plan and in the Organizational Chart, NYSDOT Commissioner Dominguez has stated her approval and executive support for this Project. Upon award, the Project Leadership Team will formally request approval from the NYSDOT Executive Management to authorize the agreed-upon NYSDOT matching funding.

3.4 Project Risks & Mitigation

As described in Section 1.1 Introduction/Overview, this Project will provide many benefits throughout the NYSDOT organization and digital delivery ecosystem. The widespread benefits will include the improvement of NYSDOT's nascent BIM practice that ensures efficient data and information flow from design and construction through to asset management; and the development of new standards to advance the digital delivery program. The expected risks and mitigation actions for this institutional transformation are shown in **Table 1**.

Table 1: Risk Mitigation Strategies

Risk	Mitigation Strategy
Delays in procurement of consultants or software	NYSDOT is already under contract with the key consultants and technology providers that will be involved in this project. Contract extensions or changes may be necessary; the Project Leadership Team is coordinating.
Delays or difficulties obtaining asset data	Coordinating with utility providers to obtain their data for this Project will take time and a concerted effort. NYSDOT staff have already begun preparing a list of utility providers and contacts for the outreach effort.
NYSDOT staff changes or lack of availability	NYSDOT is institutionally committed to advancing BIM and digital delivery. The Digital Delivery Committee has been in place for nearly a decade and has procedures for adapting to staff changes. A dedicated Project Leadership Team will remain in place for the duration of the Project.

4. Responsiveness to Merit Criteria

4.1 Criterion 1- Technical and Management Approach

NYSDOT has been advancing an organized and sequential approach to instituting digital delivery since 2018, when it developed a process to allow electronic information to be included as part of legal contract documents for the agency's design-bid-build projects and established its Digital Delivery Committee (see Section 2). NYSDOT has launched more than 25 pilot projects to advance digital delivery, held a research peer exchange (partially sponsored by FHWA) in 2021, and in March 2024 published an Interim Guidance Document on Digital Delivery. As described in Section 1.3 Technical and Management Plan above, NYSDOT will leverage its existing program to implement this Project, building upon the existing efforts and pilot projects. NYSDOT is committed to providing sufficient staff resources and training to the Project to advance the Department's digital delivery program.

4.2 Criterion 2- Promotes efficient information sharing among stakeholders

NYSDOT has been actively engaged in knowledge sharing, peer exchanges, and stakeholder engagement for many years. Recently , NYSDOT made presentations at events including Georgia DOT Peer Exchange (2023), FHWA Every Day Counts 6 Digital As-Built Northeast Regional Workshop (2023), and NYSDOT Research Peer Exchange (2021). NYSDOT captured ideas and best practices for integration into NYSDOT practice and processes. NYSDOT also participate in FHWA Transportation Pooled Fund Studies, including BIM for Infrastructure and BIM for Bridges & Structures. NYSDOT will continue this outreach with other states, governments, Tribes, and private industry via Stakeholder Engagement Events planned for Q3 2025, Q1 2026, and Q4 2027. One goal will be to foster awareness to stakeholders in the industry about the proposed changes in NYSDOT contracts, workflow, expectations for delivery of documents and designs, and other elements of the Project.

4.3 Criterion 3- Accelerate technology adoption and deployment

A goal of Stakeholder Engagement activities will be to gather feedback to the planned improvements, to see how other organizations can adapt them without the need for significant capital investment; and to see whether the subsurface roadway assets is similarly a missing element for other agencies. These engagement activities will foster and accelerate adoption of integrated digital management systems and technologies in other jurisdictions and in the digital delivery industry, such as through the American Association of Highway Transportation Officials (AASHTO) and other peer exchanges.

4.4 Criterion 4- Safety

Incorporating subsurface and utility assets into the digital delivery process will improve safety outcomes for NYSDOT workers. With asset data available prior to design and construction, it will reduce, shorten, or eliminate the need for engineers and field staff to conduct potentially dangerous field visits to verify the existence of smaller assets such as culverts. Currently, when workers conduct design surveys in the field, they may rely on additional workers to close a roadway, putting staff at risk for activities such as obtaining an invert elevation from a drainage inlet, and impacting the traveling public. Work zones can be dangerous, with intrusion by vehicles a constant concern. In 2023 alone there were 413 work zone intrusions on New York state roads maintained by NYSDOT and the Thruway Authority . While workers will still need to conduct field reviews of assets to build the digital database, the Project will facilitate a unified vision for a common data schema, allowing for a more efficient alignment of resources. Current asset digitization efforts could merge into the Project.

Having subsurface and utility asset data at hand can substantially improve design timelines for emergency declaration projects, which for drainage assets, are often due to extreme weather events. Speeding up timelines on these critical projects can improve safety for the traveling public, reopening roads to ensure network accessibility and removing dangerous conditions of damaged assets.

4.5 Criterion 5- Workforce Development, Job Quality and Wealth Creation

NYSDOT has secured a partnership letter from the University at Buffalo, which will, as described in 2.1 Staffing Plan, develop two new graduate courses to aid in training NYSDOT staff in key digital delivery areas. This partnership will ensure that knowledge creation and sharing occurs both within NYSDOT and with external partners, enabling collaboration and building redundancy of crucial technological skills that will advance BIM at NYSDOT and throughout the transportation industry.

The Department also anticipates that there will be new skills, roles, and project positions as a result of this digital transformation. As part of this scope of work and the deployment of the improved lifecycle management program, a new role under development is "Digital Delivery Coordinator," which would collaboratively contribute to the effective implementation of digital delivery, lifecycle management, and BIM methodologies in engineering projects. Although Digital Delivery Coordinator is not yet an official NYSDOT job designation, the agency is considering adding digital delivery coordinators to the organizational structure for successful implementation of digital delivery/ BIM.

4.6 Criterion 6- Environment, Climate Change and Sustainability, and Equity

Subsurface drainage assets and small culverts are vital to the New York transportation system, providing necessary conveyance of surface and channelized waters. These assets are often vulnerable to climate change and extreme weather events, and their design standards are coming under review as flooding frequencies highlight increased roadway resiliency concerns. NYSDOT is advancing resilience and sustainability focused projects under the Promoting Resilience Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Program. These projects will benefit from more accessible digital subsurface drainage and utility asset data, enabling analysis and design of assets that currently may only exist on decades-old plan sheets, which may or may not be geospatially located or digitized.

NYSDOT's first digital delivery pilot, the *Route 28 Bridge Replacement Project* in Ulster County, involved flood mitigation. The use of 3D CAD models and supplemental digital data expedited decision making processes, enhanced comprehension and communication of project details, and ensured accurate execution through survey grade GPS systems and conflict resolution. Streamlining these processes helped to accelerate the replacement of this 800-ft bridge, located within a Federal Emergency Management Administration (FEMA) designated Regulatory Floodway.

Finally, this project will help bolster NYSDOT's commitment to equity. With the Project's anticipated advancements, NYSDOT capital program projects focused on revitalizing disadvantaged areas through resolving social, environmental and mobility inequities will include a more comprehensive method for managing and maintaining newly installed infrastructure assets. Projects such as Hunts Point Interstate Access Improvement Project, I-81 Viaduct and NYS Route 33, Kensington Expressway Project are focused on major transportation network reconfigurations to address community revitalization and include vast amounts of infrastructure asset data that, as a result of this Project, will be able to be carried more intelligently through the 21st century and beyond.