

**Volume 1 - TECHNICAL APPLICATION**

**Grant Application for:**  
**Advanced Digital Construction Management Systems**  
***WorkerShield***

Submitted by:  
Maryland Department of Transportation

On behalf of:  
Expanded Digital Work Zone Cohort

<b>Advanced Digital Construction Management Systems Cover Page</b>	
<b>Entity Type</b>	State DOT
<b>Organization Name</b>	Maryland Department of Transportation
<b>Project Name</b>	Collaborative for Worker Protection Geospatial Automation in Field Environments (WorkerShield)
<b>Previously Incurred Project Costs</b>	\$
<b>Future Eligible Project Costs</b>	\$
<b>Total Project Cost (<i>from all funding sources</i>)</b>	\$6,250,000
<b>ADCMS Program Funding Request</b>	\$6,250,000
<b>Non-Federal Share for ADCMS Program Funding Request</b>	\$1,286,026
<b>Total Federal Funding (<i>Including ADCMS Program</i>)</b>	\$4,963,974

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## I. Project Description

The Maryland Department of Transportation State Highway Administration (MDOT SHA) leads a diverse partnership of state Departments of Transportation and industry stakeholders in advancing construction project management through the Collaborative for Worker Protection Geospatial Automation in Field Environments (WorkerShield or “the Project”).

The Project aims to develop and implement WorkerShield – a next-generation, dynamic worker presence feed – by incorporating new worker presence data sources and integrating maintenance activities within states’ existing Advanced Digital Construction Management Systems (ADCMS) platforms. A worker presence feed is a geospatial data feed that tracks and communicates the status of active workers on a roadway to agencies and the traveling public. Most safety feeds today rely on traditional, static construction planning data that provides limited information on worker presence. Following the award of funding, WorkerShield will deploy focused worker presence feeds utilizing new, automated data sources such as materials and machine data, and will expand coverage to new work areas, including maintenance operations and mobile work zones. Ultimately, WorkerShield will provide a comprehensive, high-fidelity worker presence feed that operates automatically and *in real time*, ensuring that accurate, timely, and actionable information is communicated to motorists.

The primary goal of the Project is to enhance safety for workers and the traveling public. As partner agencies execute ambitious capital improvement programs leveraging unprecedented investments from the Bipartisan Infrastructure Law, roadway safety improvements are a priority for State DOTs, the transportation construction industry, and the public. All WorkerShield partners agree that utilizing new and innovative technologies is essential for elevating work site safety. In this spirit, every new digital capability is seen as a potential safety sensor to protect our workers and the public.

By incorporating new sensors and connected systems alongside the deployment of the ADCMS across partner agencies, the Project will also continue to increase overall interoperability. These connections are crucial to both safety and the advancement of Building Information Modeling (BIM) for Infrastructure practices and will result in significant operational efficiencies and sustainability benefits. Most sensors ready to report on worker presence are devices, systems, and workflows originally intended for survey, construction, maintenance, or the protection of personnel. Therefore, each new connection is also an opportunity for increasing project quality and insights, and enhancing data sharing.

The non-Federal match will be provided by state DOT partners, as well as through in-kind contributions of program and technology support by HaulHub Technologies, our current ADCMS partner. Additional project partners also include the Ohio, Iowa, Virginia, West Virginia, Delaware, Pennsylvania, and Idaho Departments of Transportation. This robust partnership confirms the Project can be easily replicated by peer agencies across the country, providing for a new practice-ready standard of automated worker presence protections.

## A. Project Goals, Benefits & Outcomes and Alignment with ADCMS Program Goals and Administration Goals

**Improved Work Zone Safety:** WorkerShield’s primary goal is to improve work zone safety for workers and the traveling public by improving communication to the public about activity in work zones. The Project will create an underlying system that can both consume and consider a wide range of inputs across road miles to create a simple answer to: “*Are workers currently present?*” To do so, the Project will connect existing systems within agencies and expand the automation of real-time safety reporting. In addition, a confidence interval and supportive reasoning will create a feed that is functional for third parties, while also capable of growing and adapting as new digitally capable inputs are available. The dynamic WorkerShield system will allow worker protections to keep pace with industry innovation while fostering a robust, collective Safety Culture via improved communications.

Currently, consumer mapping applications, vehicle OEMs, and data aggregators struggle to utilize work zone and worker presence data from state agencies. In addition, several major consumer mapping applications do not accept planning-based data from state agencies. Inaccurate or insufficient worker presence data presents significant safety risks for workers and motorists by failing to adequately communicate the presence of workers or work zones on the roadway. In addition, failing to effectively communicate worker presence to the traveling public presents compounding safety risks by discouraging motorists from heeding future safety messages. In response, the Project will integrate new digital transmission-capable sensors to create an interoperable model that simplifies the generation of highly reliable, timely, and accurate worker presence feeds.. The model will reduce barriers to third-party data consumption by processing worker presence data from these sensors into simplified but dynamic outbound messages to the traveling public. By ensuring accurate and complete messages to the public, the Project will also increase confidence in outbound messages.

**Added Operational Efficiencies:** The Project also seeks to enhance operational efficiency by leveraging real-time data across existing systems. For example, by providing instant access to unified material and connected machinery data, the Project will enable analysis and maintenance of project quality, encouraging project partners meet or surpass standards.

By sharing early lessons and implementation information from the Project, partners will collectively benefit from connected machinery initiatives. This collaboration will allow the Project to integrate valuable insights from machinery data, improving the scope, accuracy, and efficiency of our inspections in partnership with our construction partners. Improved data yields more informed decision making, ultimately reducing project delivery times.

**Increased Environmental Sustainability:** The Project’s innovative use of work zone data will help reduce congestion around work zones. Specifically, the Project will develop work zone feeds that provide agencies and the public with real-time information on the location of work zones, equipment, and construction and maintenance employees on the roadway. Because the real time data can be used by third party mapping applications, this improved feed is expected to reduce nonrecurring congestion and resulting emissions by allowing for dynamic alternative routing.

In addition, as EDC-7's Environmental Product Declarations (EPDs) for Sustainable Project Delivery and Integrating GHG Assessment and Reduction Targets in Transportation Planning initiatives mature, most project participants plan to use the underlying system to manage project-level embodied carbon impacts by connecting EPDs and materials data. As participating agencies continue to connect industry machinery to the system in support of the Project, resulting emissions data will be made available to support ongoing environmental sustainability programs and to permit agencies to make better-informed decisions on equipment utilization.

MDOT SHA is also directly pursuing related enhancements alongside our Low Carbon Transportation Materials initiative. Insights and data gained from both programs will be shared to expand on opportunities to increase environmentally sustainable construction practices. This collaborative approach ensures all Project participants benefit from shared knowledge and advancements in sustainability.

**Broad Replicability, Adoption and Deployment:** Project partners are building upon existing ADCMS best practices and industry support to provide a system-agnostic framework designed to improve worker and motorist protections, reduce nonrecurring congestion, and enhance quality, efficiency, and sustainability. ADCMS enhancements will be made available to all peer agencies utilizing the system. This will allow for expanded data collection and testing opportunities, encouraging adoption readiness across the country. By sharing these advancements, the Project aims to create a unified approach that benefits all participants and sets a new benchmark for digital construction management that is replicable nationwide.

## B. Background & State of Knowledge

The Project advances several key initiatives relating to roadway risks and the challenge of creating an effective automated program for mapping providers. The Project acknowledges that technological advancements in digital construction management systems and connected machinery offer significant opportunities to enhance safety and efficiency. In addition, the Project recognizes that achieving interoperability across different systems and agencies is crucial for both creating a comprehensive and reliable safety program as well as a Digital Delivery program. The Project aims to solve challenges in integrating these various technologies into a cohesive, replicable system: WorkerShield.

## C. Scope of Work and Management Plan

The Project is broken into Planning, Communication, Integration, Live Projects, Evaluation, and Refinement Phases. The Project utilizes programmatic execution, featuring tailored procedures for each participant for deployment to their local construction projects. This management plan is designed to align with the highly effective approach of the Delaware, Louisiana, Iowa, and Nebraska DOTs in their existing ADCMS Project. As such, the supporting technology is in place for all participating agencies and field staff are already trained on the existing capabilities of the platform. All tactical, project level management will be completed in partnership with local DOT responsible personnel as part of their existing e-Ticketing management cadence, and all program level management will be the responsibility of the relevant dedicated ADCMS Project team.

Phase	Description	Milestones
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<b>Planning</b>	<p>Upon award, an initial meeting establishes the monitoring timeline to outline deployment scale and available resources for local plans. Vendors and partners present data collection techniques and tech development plans. This phase aligns expectations for a unified project progression.</p>	<ul style="list-style-type: none"> <li>○ Association and Local Industry Outreach Schedule Created</li> <li>○ Identify Specification Gaps and Begin Review Cycles</li> </ul>
<b>Communication</b>	<p>Each agency tailors the phase to local needs, emphasizing the importance of local industry support. Some participating agencies have already deployed relevant specifications for project device usage and data collection.</p> <p>The team will begin engaging contractors and existing vendors to include net new data sources.</p>	<ul style="list-style-type: none"> <li>○ Association/Industry Knowledge Sessions Complete</li> <li>○ Special Provisions and Specification Deployment</li> <li>○ New data source vendor engagements begin</li> </ul>
<b>Integration</b>	<p>For local projects following the “Connected Machinery” practice developed by DelDOT, the integration phase is an involved implementation process that begins with pre-construction meetings with the contractor, their vendor, and the ADCMS team to establish machine connections. This process will be followed closely and can be found in more detail within DelDOT’s 6-month ADCMS report.</p> <p>For net new integration activities, new vendors, devices, and systems, the team will begin the iterative technical process for discovery, design, development, deployment, and refinement. Each new integration will fall within its own process and monitoring plan. While the Connected Machinery practice is available immediately for deployment, new integrations are anticipated to be added at an accelerated pace following award.</p>	<ul style="list-style-type: none"> <li>○ Pre-Construction Meetings Held</li> <li>○ Initial Trainings Completed by responsible partners for Local Industry and Agency staff</li> <li>○ Submittals Received by Contracting Partners for Covered Project Costs and Connected Machinery</li> <li>○ Connections with Submitted Connected Machinery Are Tested</li> <li>○ Connections for new data sources are tested</li> <li>○ Automated Reporting Mechanisms Configured Ahead of Live Project Starts</li> </ul>
<b>Live Projects</b>	<p>In this phase, the emphasis transitions from preparation to active engagement. Every live project serves as a platform for system implementation, adjustment, and validation.</p> <p>Teams and vendors closely track project progress, ensuring seamless deployment and addressing any issues. Data collected during this phase will guide further evaluation, offering insights into practical applications and effects.</p>	<ul style="list-style-type: none"> <li>○ Continuous verification of live safety feed data sources</li> <li>○ Automated report generation</li> <li>○ New data sources – source vendor feedback gathered</li> <li>○ Field Interviews and Feedback Gathered</li> <li>○ End consumer feed verification (consumer map feedback and live tests by ADCMS team)</li> </ul>
<b>Evaluation</b>	<p>After a Live Project implementation phase is finalized and the system becomes operational, we concentrate on a thorough assessment of the applied strategies. We utilize defined performance indicators to gauge efficiency, safety enhancements, and environmental impacts, comparing them to our initial objectives. This evaluation, conducted in collaboration with stakeholders, aids in understanding the system’s effectiveness and highlighting areas for potential enhancement.</p>	<ul style="list-style-type: none"> <li>○ Field User Experience Inspection Enhancement Requests Documented</li> <li>○ Field User Experience Safety Enhancement Requests Documented</li> <li>○ Data Consumer Requests Documented</li> <li>○ Environmental and Sustainability Data Usage and Availability</li> <li>○ Automated Reporting Mechanisms Adjusted Based on Preliminary Findings if Required</li> </ul>

<b>Refinement</b>	From insights in the Evaluation Phase, we continuously refine our system based on performance and feedback. Whether it is enhancing safety features, streamlining data integration, or reducing environmental impact, each adjustment serves to align systems more closely with Agency and industry needs. This phase is a recurrent process. As we learn from live projects and as technology and industry standards evolve, the refinement phase ensures that our systems stay relevant, effective, and at the forefront of industry innovation.	<ul style="list-style-type: none"> <li>○ System Data Expansion Goals and Action Plans Created</li> <li>○ HaulHub Roadmap Changes Distributed to Project Team</li> <li>○ Other Vendor Roadmap Change Discussions and Commitments Distributed to Project Team</li> </ul>
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#### D. Monitoring Plan

This comprehensive monitoring plan, incorporating the Plan-Do-Check-Act (PDCA) method, establishes the baseline for regular evaluation of the Project's progress, allowing Project partners to promptly tackle challenges, make informed decisions, and stay focused on Project goals.

**Monthly Full Group Meetings:** Each month, the grant stakeholder leadership will assemble for a comprehensive taskforce meeting consisting of Project participants as well as state and industry subject matter experts. This forum facilitates holistic project assessment, strategic dialogues, and informed decision-making. It offers an opportunity for all stakeholders to share updates, review progress reports from tactical project managers, and deliberate on subsequent steps.

**Regular Tactical Meetings:** Supplementing the monthly meetings, we will convene regular tactical working groups to address immediate project requirements, review progress, and strategize for the week ahead. These meetings will focus on short-term objectives and operational challenges, thus confirming the Project advances as planned.

**Key Performance Indicators (KPIs) Tracking:** Our project's performance will be measured against several KPIs:

<p>Learning System – Data Sets</p> <ul style="list-style-type: none"> <li>• Single Input Source – Retroactive Worker Presence Inferences</li> <li>• Input Source Combinations – Retroactive Inferences</li> <li>• Actual/Known Worker Presence Control Data</li> <li>• Forward predictive dataset w/progressively narrowed time intervals</li> </ul>	<p>System Usage Metrics</p> <ul style="list-style-type: none"> <li>• User experience in system tracking <ul style="list-style-type: none"> <li>○ Contractor</li> <li>○ Subcontractors</li> <li>○ Maintenance Personnel</li> <li>○ Inspectors</li> <li>○ Administrators</li> <li>○ Agency Staff (non-inspection)</li> </ul> </li> </ul>
<p>Data source Connections (System Calculated)</p> <ul style="list-style-type: none"> <li>• Type of connections</li> <li>• Number of Connections</li> <li>• Number of Participating Data Providers</li> <li>• Quality and Availability of the data feeds</li> </ul>	<p>Worker Presence Safety Feeds</p> <ul style="list-style-type: none"> <li>• Number of Safety Feeds (per state)</li> <li>• Number of transmitted feed objects</li> <li>• Adoption by consuming systems</li> </ul>

Staff Feedback <ul style="list-style-type: none"><li>• Contractor</li><li>• Agency</li></ul>	Budget Administration Metrics <ul style="list-style-type: none"><li>• Budget Allocation Submittals Reporting for Covered Costs</li></ul>
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**Reporting Types:** Effective reporting is a crucial component of the Project’s monitoring plan, enabling the tracking of project metrics, progress assessment, and data-driven decision making.

- **Regular Usage/Support/Issue-spotting Reports:** HaulHub, our technology partner, will submit regular reports to MDOT SHA detailing system usage, provided support, and issues encountered. Regular reporting will ensure leadership and working groups are informed of ongoing operations and potential challenges.
- **Automated Reporting:** Automated reporting will track key performance indicators including active projects, machine connections, new data source connections, safety feed events, and safety feed uptime. These metrics will help measure project performance and the efficacy of our safety measures.
- **Implementation Playbook:** To remain transparent and promote knowledge sharing, we will produce a comprehensive implementation report and playbook for the deployment of the utilized system or comparable system.

**Plan-Do-Check-Act:** To encourage effective project management and the timely resolution of potential challenges, we will employ the Plan-Do-Check-Act (PDCA) methodology. This continuous improvement model ensures a systematic approach to problem-solving and allows us to anticipate and address potential hurdles effectively.

## II. Project Team Information

### A. Proposed Project Team and Staffing Plan

Maryland DOT SHA will provide program-level oversight, assuring progress tracking, challenge resolution, and compliance from all non-agency participants. John Hampton, eConstruction Program Manager, will lead on behalf of MDOT SHA, coordinating meetings, facilitating multilateral discussions, managing non-agency partnerships, preparing USDOT reports, and making informed decisions based on project reporting and outcomes. HaulHub’s Senior Vice President of Strategy, Corey Paradis, and Director of Strategic Initiatives, Joel VanDusen, will be partnered with John Hampton to provide direct executive and program management support.

Each agency participant will track and report progress on their local projects, while engaging their specialist e-Construction, digital workzone, and operations staff in local program management. Agencies will continue their existing weekly tactical e-Construction meetings which will be supplemented with objectives from the Project. Management of this Project is not expected to significantly encumber local project management.



**Lead Applicant:**

- Maryland Department of Transportation
  - John Hampton, eConstruction Program Manager
  - Raissa Essaka – eConstruction Systems Administrator
  - Ben Butler – eConstruction Technology Manager
  - Jimmy Hovatter – eConstruction Business Manager
  - Jim Wright – eConstruction Support Engineer
  - John Veronick – Regional Construction Engineer

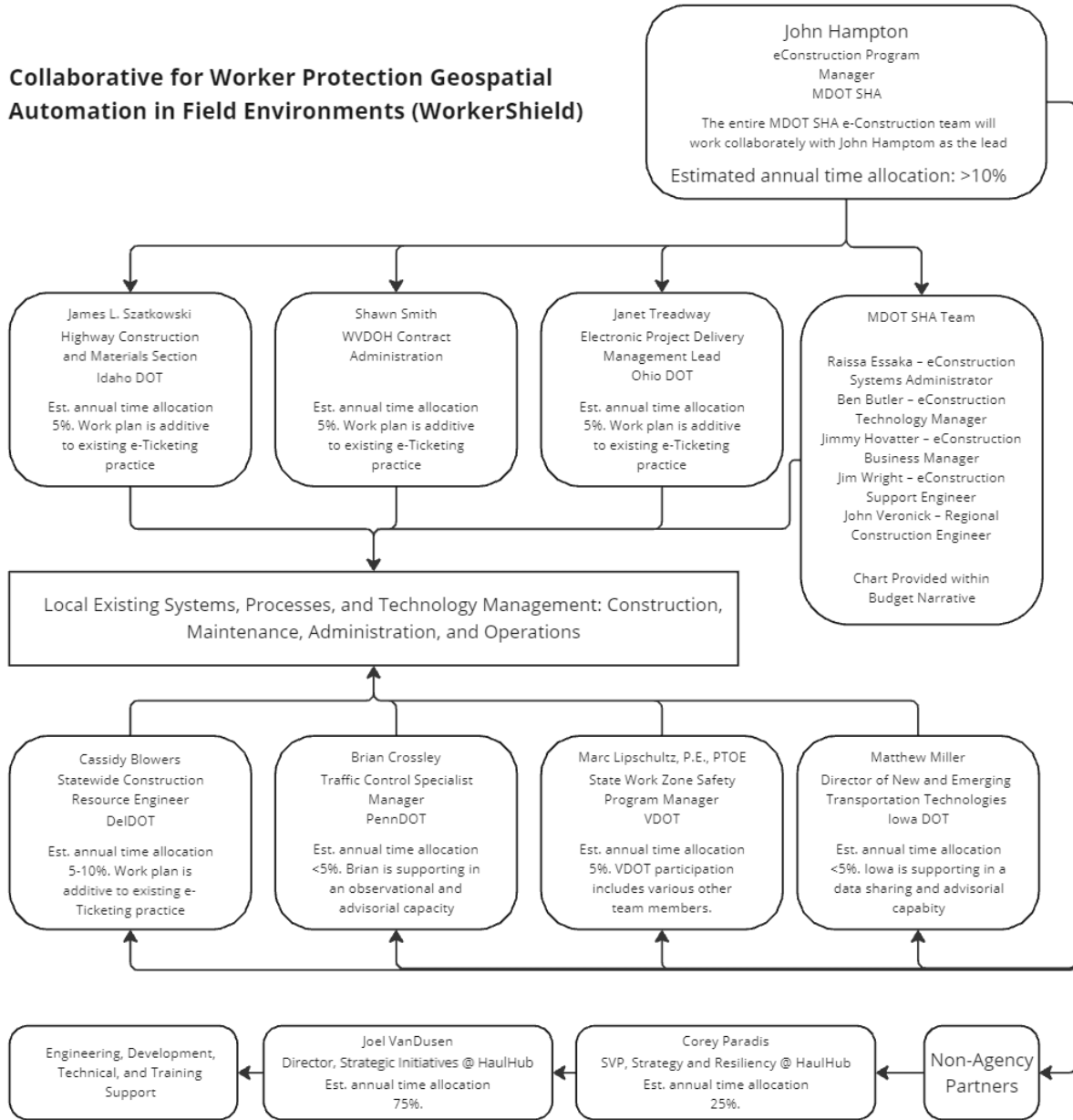
**Co-Applicants:**

- Ohio Department of Transportation
  - Janet Treadway, AASHTOWare Project Business Administrator & Electronic Project Delivery Management Lead
- Pennsylvania Department of Transportation
  - Brian Crossley, Traffic Control Specialist Manager
  - Jerome Frederick, Construction Quality Assurance Manager
- Virginia Department of Transportation
  - Marc Lipschultz, P.E., PTOE, State Work Zone Safety Program Manager
  - Justin Hsieh, P.E., CCM, Assistant State Construction Engineer
  - Jeff Jaeckle, E-Construction Initiatives Engineer
- West Virginia Department of Transportation
  - Shawn Smith, WVDOH Contract Administration
- Idaho Department of Transportation
  - James L. Szatkowski, P.E., F.NSPE, Hwy-Construction/Materials Section,
- Delaware Department of Transportation
  - Mark Buckalew, Head of Construction and Materials
  - Cassidy Blowers, Statewide Construction Resource Engineer
- Iowa Department of Transportation
  - Matthew Miller, Director of New and Emerging Transportation Technologies

**HaulHub Technologies:** HaulHub, as a pivotal non-agency partner, has committed to supporting the Project’s success through in-kind contributions of program management, industry relations, direct development, and technical support.

- Corey Paradis, Senior Vice President of Strategy
- Joel VanDusen, Director of Strategic Initiatives
- Michael Gallant, Director, Industry Engagement and Government Affairs
- Michael Lee, Head of Engineering
- Prajyot Bankade, Senior Product Manager

**B. Organizational Chart**



**III. Project Readiness**

The Project will be ready for implementation upon the award of funding. By leveraging existing technology, partner agencies will be ready to implement the Project immediately, with enhancements to the system being implemented at each agency throughout the lifecycle of the Project. Project partners are committed to the advancement of our collective ADCMS systems towards increasing interoperability and utilizing the resultant data ecosystems to further improve safety outcomes, reduce nonrecurring congestion, and continue to accelerate operational efficiencies in digital project delivery.

## A. Technical Feasibility

**Connected Machinery and Digital Inspection:** The Project builds on existing technology and the mature digital inspection practices in each of the state agencies, supporting high confidence of success for the Project.

WorkerShield will leverage existing advanced inspection capabilities developed by peer agencies to further enhance automated worker presence detection and reporting. This focus aims to improve worker presence detection by integrating and automating additional supportive data sources to ensure higher accuracy and reliability. The Project intends to utilize this commercially available capability immediately upon award and will test and adopt digital inspection enhancements developed by peer agencies, as available, including automated material verification, material as-built generation, and automated daily report creation. Project partners will share their findings with peer agencies, fostering collaboration and widespread benefits from Project enhancements. By building on existing, proven initiatives with improved worker feed data sharing, the Project maximizes likelihood of success in achieving its safety and operational goals.

**Expanded Worker Presence Safety Feed:** The technical feasibility of the Project's worker presence feeds is supported by FHWA's standardized Work Zone Data Exchange program and existing e-Ticketing based worker presence-focused feeds. By utilizing commercially available technologies, WorkerShield will expand upon existing automated safety feeds and further integrate them into our existing data ecosystem.

A growing number of devices supporting DOT operations are also data transmission ready. Incorporating new data into the ADCMS to infer worker presence will expand automated coverage within agencies supported by equipment providers. The Project also recognizes that no single data source should be considered the definitive or declarative source of worker presence. Each new source needs to be integrated, normalized, and compared against other relevant sources to determine worker presence at scale. The system must transform the collection of data sources into a singular feed with a determination of worker presence, a confidence interval, and the underlying reasoning for the conclusion. For example, a material load ticket dispatched at an asphalt plant indicates that work is about to be performed. Unless the location is inferable from project information or on the ticket itself, a secondary data source is necessary to confirm the work location. Currently, inspector activity and on-site machines work together to provide the requisite confidence of activity for our ADCMS. WorkerShield aims to expand that framework to include new types and sources of underlying data, significantly enhancing automation and coverage, and establishing a new benchmark of work zone safety.

Future data sources will further expand the system's capabilities. The system is designed to be intelligent, performing two functions in parallel. First, it creates worker presence feeds that utilize time thresholds to update the feed through digital activity indicators. Second, it reviews the previous day of activity to pinpoint and store worker presence with high precision. This accumulated data serves as a knowledge base, enhancing the system's ability to anticipate worker activity in the gaps between high-confidence data sources. The system's worker protections will grow as new data sources come online.

**Cost Basis:** We have a high level of confidence in the cost estimate for this Project; in part because the Project has been structured on the successful implementation and results of the DelDOT ADCMS program. Additionally, we have allocated 15% of the total budget for various contingencies We have also considered the existing costs of ancillary but similar systems in providing a comprehensive financial model. Additionally, the cost estimation accounts for the expected time and resources contributed by our Agency partners. This approach provides a realistic and well-founded financial framework to guarantee that all aspects of the project are adequately funded and supported. By leveraging proven cost structures and incorporating partner contributions, we also ensure efficient budget management and financial sustainability throughout the project's lifecycle.

**B. Project Schedule**

The phased work plan aligns with the fiscal year and construction season, ensuring all technical milestones are achieved within 12 months of the award. This includes initial safety feed deployment and the integration of new data sources across all participating agencies. Agencies may choose to fund deployments for multi-year projects or those starting in 2026 or later, so target dates may vary. As the Project aims to integrate these practices into standard operations, the team plans to continue refining the process over the entire four-year period.

**Estimated Project Schedule – Annually Recurring Phases**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
<b>Planning</b>												
<b>Communication</b>												
<b>Integration</b>												
<b>Live Projects</b>												
<b>Evaluation</b>												
<b>Refinement</b>												
<b>Bi-Annual Reporting</b>												

**C. Project Risks and Mitigation Strategies**

Project staff have a strong track record in managing complex projects and are committed to successful and timely execution. Project leaders have identified key risks associated with the successful start and completion of the Project and have devised mitigation plans to effectively manage potential risks.

- 1. Difficultly Accessing New Quality Data Inputs:** By maintaining strong relationships with vendors and leveraging our adaptable system, we will encourage access to and utilization of new quality data inputs, including data sources currently found in proprietary systems or that require direct support from the associated vendors for utilization. The ADCMS team has already begun communication with new data source partners to facilitate future data access and collaboration.
- 2. Lack of Industry Support:** To gain industry buy-in, participating agencies have proactively engaged with stakeholders, on the Project. Ongoing communication with industry partners and stakeholders will encourage collaboration and reinforce that data-sharing is not intended for punitive measures. Present responses have been positive, with overwhelming support for the safety improvements and efficiencies provided by the Project.
- 3. Procurement Delays:** Each participating agency has already procured the core underlying system, and there is no expected delay in procuring additional components to initiate the Project. The main technology partner has committed to providing all direct development expenses for enhancements requested by the Project team as a match contribution to the Project. All procurements for any future enhancements to the system by a participating agency will follow relevant regulations and are not expected to affect this Project.
- 4. Technical Implementation Challenges:** The Project has an experienced technical team in place, capable of troubleshooting and resolving technical implementation issues swiftly. HaulHub has committed technical resources to aid in resolving technical implementation challenges. Partners plan to work closely with other technology providers, taking advantage of their expertise to anticipate and navigate potential challenges.
- 5. Staff Training:** To foster a smooth transition, training programs will be made available for all relevant personnel, well in advance of the full project rollout. This will ensure that all staff are familiar with new systems and processes, minimizing potential for delay or disruption.
- 6. Unforeseen Circumstances:** To mitigate other risks that may arise, project selection for the deployment of the system is intended to be flexible. Partners will closely monitor project progress and make necessary adjustments to maintain our timeline.

#### IV. Responsiveness to Merit Criteria

**Criterion #1 – Technical and Management Approach:** Project partners will implement a robust and feasible technical and management plan. Our objective is to expand current data-driven strategies, aligning them with our various Digital Delivery, Asset Management, and Modernization plans. This Project builds upon existing technology and is a critical step in improving safety outcomes by improving public awareness while advancing digital construction management. The Project will deliver substantial and critically needed safety, operational, and sustainability benefits identified by our organizations.

The Project's system is designed for interoperability and accessibility, providing tangible benefits to contracting partners and facilitating widespread adoption. Our team is experienced in deploying e-Construction technology at scale across entire state ecosystems. This extensive institutional knowledge guarantees that technical and management tasks are efficiently distributed and executed. In addition, the Project's Plan-Do-Check-Act (PDCA) methodology promotes improvement throughout the Project lifecycle. Project partners are also committed to the

utilization, maintenance, and enhancement of the Project's technology and data to improve safety outcomes across operations. By thoroughly considering potential project risks and developing comprehensive mitigation strategies, we are confident in our ability to successfully deliver the Project and achieve its objectives.

**Criterion #2 – Promotes efficient information sharing among stakeholders:** Our project is designed to significantly enhance the efficiency of information sharing among all stakeholders, a crucial factor for transforming digital inputs into reliable worker presence feeds. By leveraging a robust, interoperable ADCMS platform, we ensure that critical data is accessible, accurate, and timely, facilitating better decision-making and coordination at all project levels.

Efficiencies and Time Savings: The integration of connected machinery and digital inspection tools provides real-time data that is shared seamlessly with contractors, project managers, and Agency staff. This interoperability provides that all employees—from field workers to senior management—have real time access to the same information, increasing certainty and preventing delays in information sharing.

Reduction in Paper Documentation: Our underlying system supports efficient electronic data sharing across different platforms and devices, making data accessible to a wide range of users via e-Ticketing. By centralizing data in a unified portal, the Project enables stakeholders to access project information, safety updates, and other information virtually, eliminating the need for paper documentation.

Improved Information Sharing and Decision-Making: The Project promotes efficient data movement between all project stakeholders. The transformation of digital inputs into reliable worker presence feeds requires digitization, integration, and normalization of various data sources, such as material load tickets, digital traffic devices, inspector activity logs, and machinery data. This guarantees that information is readily available and easily interpretable, aiding stakeholders in maintaining high safety standards and operational efficiency.

**Criterion #3 – Accelerate technology adoption and deployment:** The Project aims to rapidly accelerate the adoption and deployment of ADCMS technology by developing innovative and replicable automated worker presence feed systems. By leveraging an interoperable platform and existing digital inspection tools and connected machinery data sources, WorkerShield seeks to develop a digital construction management system that can easily be adopted and deployed by other states, local governments, Tribes, and private industry, fostering a culture of continuous improvement and widespread technology adoption.

The Project includes a broad cohort of participating states and industry stakeholders equipped with technical expertise, trained personnel, and actionable data, dedicated to using the Project to fast-track the implementation of ADCMS. The Project's structured implementation plan encourages efficient execution by Project partners, while also facilitating future adoption by peer agencies. Comprehensive training and support by industry partners will ensure project personnel have the skills to effectively use the technology. This training provides foundational technical expertise, which can be offered to and leveraged by other transportation organizations during subsequent adoptions. By sharing insights and advancements from the project with peer agencies, the Project

will accelerate widespread worker presence feed adoption beyond the State agencies participating in the Project.

**Criterion #4 – Safety:** Safety is the Project’s primary goal and an essential focus of all project participants. The Project specifically intends improve worker and motorist safety by improving the quality and timeliness of worker presence information shared with the public, therefore increasing overall work zone safety. The Project specifically proposes to create accurate and usable geospatial safety data for transportation agencies, consumer mapping applications, and others, providing actionable information on into work zone status and scope for relevant stakeholders. This data will allow transportation agencies to make informed decisions about work zone status and will enhance public awareness of work zones and safety hazards.

Building on recent safety initiatives, the Project aims to further enhance roadway worker safety by integrating maintenance activities within the e-Construction platform, enhancing automated worker protections, and expanding interoperable technologies across construction, safety, and traffic disciplines. In connecting various digital data sources, including on-site equipment, the Project will create reliable worker presence feeds and enhance DOT processes. Our system builds on successful ADCMS implementations in peer agencies, providing real-time, accurate data on worker presence. This data is vital for informing motorists and adjusting traffic patterns to increase safety. The system's interoperability allows seamless integration of data sources, enhancing the reliability of safety feeds.

The Project's collaborative nature unites a broad cohort of states committed to improving safety through shared data and best practices. This collective effort addresses safety challenges more effectively, promoting quick implementation and refinement based on real-world feedback. Additionally, the Project’s comprehensive training programs ensure all personnel are proficient with the new technologies, maximizing safety measure effectiveness.

**Criterion #5 – Workforce Development, Job Quality and Wealth Creation:** Project partners are committed to enhancing job quality and equipping our State DOT workforces with the skills and training necessary for modern technology and project management. Through the contributions of project partners, the Project will expand employee skillsets and provide technical expertise through on-demand and in-person training during and following Project implementation. Project training and development will prepare agency employees for success in the ongoing digital transformations within horizontal construction and for future career opportunities. By reducing worker exposure to hazardous conditions and automating data collection processes, the Project also aims to create a safer work environment, which is essential for attracting and retaining our infrastructure workforce.

A significant component of this commitment is the collaboration with HaulHub Technologies. HaulHub will provide all participating agency staff with comprehensive access to on-demand, webinar, and in-person training focused on using the system's advanced digital inspection tools. These training sessions are led by HaulHub personnel who are technology experts and work directly with DOT project staff. This approach encourages continuous skills development where knowledge and best practices are collected and shared across the entire ecosystem of agencies.

**Criterion #6 – Environment, Climate Change and Sustainability, and Equity:** The Project will provide environmental benefits in two main ways: (1) improved machine and worker data will allow for more efficient utilization of construction equipment, requiring fewer machine hours of operation, thus reducing emissions, and (2) real-time work zone data to motorists will reduce work zone congestion via more efficient trip re-routing.

By providing real-time data on equipment emissions and other environmental impacts, decision-makers on the job site can make informed, data-driven choices to promote sustainable construction practices. For example, this integration optimizes machinery usage and reduces unnecessary emissions and encourages projects to meet or exceed their environmental benchmarks. The Project also promotes environmental justice by ensuring that our communities have access to accurate and transparent data on a project's environmental impacts. Access to environmental impact data promotes the equitable distribution of benefits from improved environmental practices, contributing to broader social and environmental justice goals.

Additionally, as the worker presence feeds continue to grow in scope and scale across states, more timely and relevant data about work zones and the expected impact on traffic operations will be available. This high-quality data about traffic operations can be shared within agencies and to third party partners to help further reduce nonrecurring congestion. Our initiative also advances sustainable construction by leveraging Environmental Product Declarations (EPDs) and integrating A4 and A5 emissions data to manage project-level embedded carbon impacts. As participating agencies connect industry machinery to the system, the resulting emission data will support the agencies' ongoing environmental sustainability programs.