

Integrating Work Zone Data Exchange in Illinois for a Safer Roadway System



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Executive Summary

Developing, standardizing, and maintaining a reliable and sustainable Work Zone Activity Data (WZAD) Program is critical to improving work zone safety, mobility, operational decision-making, and traveler information services throughout Illinois. Through the USDOT SMART Grant-funded Work Zone Activity Data initiative, IDOT evaluated existing data practices, engaged stakeholders across the agency and partner organizations, documented current systems and workflows, and developed a scalable Work Zone Data Hub (WZDH) framework to support future statewide integration, performance management, and data sharing. The project also established an IDOT statewide Connected Work Zone (CWZ) 1.0-compliant work zone data feed, which was published to the USDOT Work Zone Data Exchange (WZDx) Registry on May 1, 2026.

The evaluation phase identified key opportunities to strengthen the collection, management, integration, and dissemination of work zone activity data across Illinois. Building on stakeholder input and the WZDH framework developed through this initiative, this document outlines priority program development areas to guide the continued advancement of IDOT's WZAD Program. These priorities provide a roadmap for enhancing statewide capabilities and supporting future implementation activities.

Introduction and Project Overview

The Connected Work Zone (CWZ) Standard provides a nationally harmonized data exchange format for describing both planned and real-time work zone conditions. These include the type of work, location, hours of operation, lane-level impacts, detour routes, and worker presence. The CWZ defines a standardized set of Work Zone Activity Data (WZAD) elements and a prescribed data exchange format. While the CWZ was originally developed in part to support connected and automated vehicle applications, the availability of timely WZAD is now widely recognized as essential for improving work zone safety for all road users, including motorists, bicyclists, pedestrians, and workers. Achieving this goal, however, requires a foundational WZAD management framework for the collection, integration, and normalization of diverse work zone data sources.

The Illinois Department of Transportation (IDOT) USDOT Stage 1 SMART Grant project conducted outreach, planning, and prototype activities to develop and evaluate a framework for advancing CWZ-compliant systems. At project initiation, IDOT lacked a comprehensive inventory of work zone data sources, a formal assessment of data quality, and a complete understanding of existing data architecture. Combined with the lack of common data standards across the industry at that time, these gaps made it difficult and costly for both IDOT and third parties to implement safety solutions that rely on accurate and timely data to inform road users and stakeholders (i.e., contractors, emergency responders, etc.).

During this Stage 1 SMART project, the IDOT project team conducted stakeholder outreach to document existing WZAD sources and practices, performed technical planning for a centralized, standards-based work zone data feed, and developed and evaluated a prototype information system platform to support WZAD integration, transformation, and dissemination. Project tasks included:

- Evaluating statewide work zone data availability
- Identifying existing data collection processes
- Evaluating data systems architecture
- Identifying gaps in data elements and business processes

Stakeholder outreach included engagement with all nine IDOT districts and multiple Central Office bureaus to document existing WZAD practices, identify integration opportunities, and support statewide implementation planning. Technical planning focused on automating data flows and reducing inconsistencies to improve the management, integration, and dissemination of work zone data. The systems integration platform and resulting work zone data feed were developed in accordance with the Connected Work Zone (CWZ) 1.0 standard, enhancing third-party accessibility and interoperability.

The Stage 1 SMART Grant’s testing and evaluation efforts centered on the key technology of *systems integration* through the prototype WZDx system. The system design builds upon IDOT’s existing investments in work zone data collection by developing a centralized Work Zone Activity Data Hub (WZDH) that serves as a lightweight yet scalable solution for data harmonization and data exchange services. The WZDH integrates diverse data sources into a unified WZAD model, enabling both internal data management and the external deployment of a CWZ 1.0-compliant feed. The system supports real-time dissemination of the CWZ feed, which has been published on the WZDx Registry since May 1, 2026.

WZDH Data Sources

The WZDH currently integrates five primary work zone activity data sources representing statewide highway operations, District 1 lane closure management systems, Illinois Tollway operations, and real-time maintenance activities. Together, these sources provide the foundation for statewide CWZ data generation and dissemination. A general description of these datasets is provided in the IDOT Work Zone Data Summary Technical Memorandum, developed under Task 2 of the SMART Grant, which documents the available data and their characteristics. The memorandum is included as an attachment.

Data Source	Maintainer	Coverage	Update Frequency	Format	Access Method
ITAP OPS Roadway	IDOT BIP	Statewide	Daily M-F	ESRI Feature Layer	IDOT AGO
D1 Lane Closure System (LCS)	D1 / UIC	District 1	Variable	Custom XML	UIC Rsync
D1 Arterial Construction Tracking System (ACTS)	D1 / UIC	District 1	Variable	Custom XML	UIC Rsync
Illinois Tollway WZDx	Tollway	District 1	Near Real-Time	WZDx 4.2	Tollway API
Traveling Work Zones	IDOT BIP	Statewide	Real-time	ESRI Feature Layer	IDOT AGO

Table 1. Summary of the five implemented WZDH data sources.

ITAP OPS Roadway Data

The ITAP OPS Roadway Data is maintained by the IDOT Bureau of Information Processing (BIP). This dataset is based on IDOT’s electronic OPER 2410 process, which supplies manually approved construction, utility, and maintenance related work zone restriction information to IDOT’s oversize / overweight freight permitting system. This data is post-processed through the ITAP geo-spatial database system and is made available to the WZDH through two IDOT AGO data interfaces representing linear and point features. The AGO feature layers are typically updated nightly. The OPS Roadway dataset contains information similar to the Getting Around Illinois dataset, as both are derived from the ITAP database. However, OPS Roadway was

developed specifically to support WZDH operational integration and dissemination needs. IDOT has made improvements to its quality, consistency, and completeness over the course of the SMART Grant project.

D1 Lane Closure System (LCS) Data

The IDOT District 1 (D1) LCS data source tracks lane closures on the D1 expressway network. The LCS system is maintained by the University of Illinois – Chicago (UIC) on behalf of D1 and serves as a data source for both operational needs for D1 and information dissemination through the Travel Midwest traveler information system. The D1 LCS data is provided to the WZDH in XML format through an rsync-based data exchange interface established by UIC for this project. UIC has plans to eventually provide the XML data over a web service interface. The XML data update cycle varies from one to several days or longer. In some cases, D1 LCS entries will prompt OPER 2410 submissions, leading to potential overlap between the D1 LCS and ITAP OPS Roadway data sources.

D1 Arterial Construction Tracking System (ACTS) Data

The District 1 ACTS data source tracks construction and utility lane closure requests for arterial roadways in D1. The ACTS system is maintained by the University of Illinois – Chicago (UIC) on behalf of D1 and serves a similar, complementary role to D1 LCS as a data source for both operational needs for D1 and information dissemination through the Travel Midwest traveler information system. The D1 ACTS data is provided to the WZDH in XML format through an rsync data exchange interface that was established by UIC for this project. UIC has plans to eventually provide the XML data over a web service interface. The XML data update cycle varies from one to several days or longer. In some cases, D1 ACTS entries will prompt OPER 2410 submissions, leading to potential overlap between the D1 ACTS and ITAP OPS Roadway data sources.

Illinois Tollway WZDx Data

The Illinois Tollway maintains a WZDx v4.2 compliant work zone data feed covering work zone activity on Illinois Tollway facilities. The feed endpoint is published in the WZDx Registry and is accessible via an API key. The Tollway WZDx data feed is incorporated in its entirety into the WZDH, with minor changes to convert the representation into a CWZ 1.0 aligned format. Work zone records in the Tollway WZDx feed are regularly updated.

Traveling Work Zones Data

Traveling work zone data provide real-time, geo-located activity status from IDOT's highway maintenance fleet. This data source consists of GPS point locations, provided at fixed intervals, that are activated by fleet drivers when commencing maintenance activities. Point transmission is terminated algorithmically when the maintenance vehicle exceeds 40 mph. This data source is provided to the WZDH by IDOT BIP via an access-restricted AGO layer.

Together, these five data sources provide a diverse mix of planned, active, and mobile work zone information and served as the basis for the Stage 1 SMART Grant CWZ data feed and prototype evaluation described in the following sections.

WZDH Description

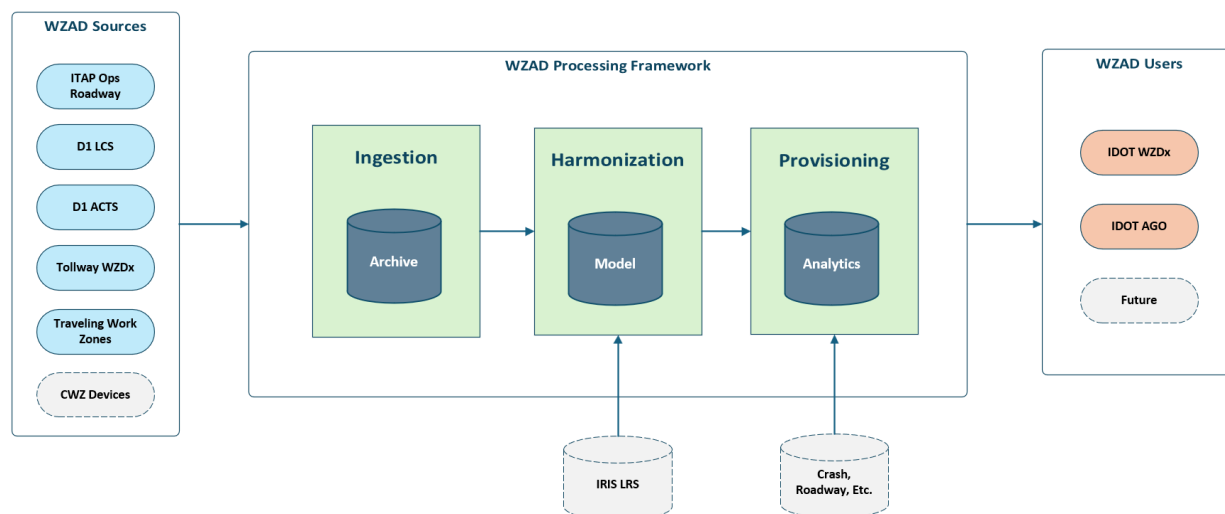


Figure 1. IDOT Work Zone Activity Data Hub (WZDH) conceptual architecture. Components drawn with dashed outlines represent future (planned) development.

The WZDH decouples three primary data processing functions: data acquisition, transformation, and dissemination, enabling scalable integration of multiple WZAD sources and consistent delivery of harmonized outputs. The WZAD sources (inputs) and users (outputs) are described in subsequent sections. The internal framework consists of three primary components:

- **Ingestion** – The ingestion layer captures WZAD from multiple external source systems using source-specific interfaces and update frequencies. Source data are archived in their original formats to preserve provenance and support traceability. Processes execute on a recurring 1-minute cycle, during which incoming records are compared against previously ingested data to identify new or modified records for downstream processing.
- **Harmonization** – The harmonization layer transforms and integrates ingested WZAD into a unified internal representation that supports consistent dissemination, analysis, and operational use. This layer normalizes attributes across disparate sources, aligns spatial and temporal information, and consolidates related records into a single, statewide view of work zone activity. The harmonized representation is managed through a common data model based on the Connected Work Zone (CWZ) 1.0 standard, extended to support broader analytical, operational, and historical WZAD needs within IDOT. By decoupling source-specific formats from internal data management and dissemination requirements, the harmonization layer provides a normalized data foundation for downstream processes.
- **Provisioning** – The provisioning layer prepares harmonized WZAD for consumption by external systems and applications. This includes formatting data for real-time APIs, map services, and analytical tools, as well as exporting selected data elements into tabular representations for reporting and analysis. Provisioning services currently operate on a 5-minute cycle to support the two primary dissemination endpoints: the IDOT CWZ 1.0 data feed and the AGO WZAD Analytics Tool. In addition to supporting prototype evaluation activities, the AGO WZAD Analytics Tool

provides a prototype operational interface for statewide WZAD visualization, monitoring, quality assurance, and management.

The WZDH is designed as a lightweight, modular platform that supports incremental addition of new data sources, evolution of the data model, and future operational and analytical applications. The successful deployment and operation of the prototype demonstrated the viability of statewide WZAD integration through the WZDH architecture. A general description of the WZDH is provided in the IDOT Work Zone Data Matrix Technical Report, developed under Task 4 of the SMART Grant, which documents the WZDH architecture, WZAD data model, and transformation services. The technical report is included as an attachment.

Statutory Relevance

Consistent with the objectives of the USDOT SMART Grant Program, the long-term vision for the IDOT WZAD Program is to leverage advanced data, technology, and systems integration to improve transportation operations across Illinois. Through statewide implementation of the WZDH framework and Connected Work Zone (CWZ) data services, the program is intended to:

- **Improve the safety and integration of transportation facilities and systems** by providing more complete, timely, and standardized work zone information for operational decision-making, traveler information services, and future Connected Work Zone applications.
- **Improve the reliability of existing transportation facilities and systems** through enhanced work zone coordination, monitoring, performance management, and field verification capabilities.
- **Promote connectivity among roadway infrastructure, travelers, connected technologies, and transportation information systems** through statewide integration and exchange of standardized work zone activity data.

Prototype Evaluation Findings

Evaluation Overview

Results of the prototype evaluation follow the Evaluation Matrix developed under the SMART Grant Stage 1 Evaluation Plan. The evaluation focused on the performance, reliability, and quality of the IDOT CWZ feed and consisted of two primary components:

1. An assessment of overall CWZ system performance during an evaluation period from June 15 through July 31, 2026
2. A focused analysis of data quality across five Illinois interstate corridors and the statewide Traveling Work Zone system.

CWZ Feed Performance Evaluation

The IDOT CWZ feed was officially deployed and published through the WZDx Registry on May 1, 2026. After an initial stabilization period, system performance data was collected at hourly intervals from June 15 through July 31, 2026. The evaluation period extended beyond the formal grant performance period to

capture a larger sample of operational data and provide a more representative assessment of system performance. Hourly monitoring included eight automated health checks designed to assess CWZ feed availability, compliance, timeliness, completeness, and stability:

CWZ Health Check Category	Description
CWZ 1.0 Schema Compliance	Pass / fail check from real-time validation of the IDOT CWZ feed against the CWZ 1.0 JSON schema.
CWZ Feed Refresh Rate and Download Latency	<u>Refresh Rate</u> : Pass / fail check on whether the CWZ feed has been updated within the last 10 minutes <u>Latency</u> : Time required in seconds to download the CWZ feed
CWZ Total Work Zone Records Net Change	Net change in total work zone records from the previous 24 hours. This provides a measure of CWZ feed stability.
CWZ Data Source Subtotals and Most Recent	Count of active records per CWZ data source along with the elapsed time per data source since the most recent event update.
Work Zone Record Date Validity	Breakdown of active, past, future, and missing start and end dates fields. Currently, all work zone events in the IDOT CWZ should be active, meaning their start and end dates span the current time.
Work Zone Record Roadway Name Validity	Total valid, unknown, blank, null, or other road name values. A road name is considered valid if it is a non-empty character string.
Work Zone Record Roadway Direction Validity	Total valid, undefined, unknown, blank, or null road direction fields. Road direction formats are specified by the CWZ standard.
Cross-Source Spatial Overlap Occurrences	Total potential overlapping closures across data sources, based on shared coordinates within a 0.01 miles threshold. This check provides representative cases for further investigation and is not a definitive count of overlap.

A total of 1,123 hourly health reports were aggregated over the evaluation period to generate a profile of overall CWZ system health. Collectively, these measures provide an operational view of CWZ feed health by evaluating schema compliance, timeliness, completeness, source system activity, and potential data integration issues.

While the system performance assessment provided a quantitative evaluation of feed health and operational reliability, the corridor review provided a qualitative assessment of data accuracy, completeness, and consistency across diverse work zone environments.

Focused Corridor WZAD Analysis

A qualitative evaluation of data quality was conducted using an ArcGIS Online (AGO) WZAD management tool developed through this project to visualize CWZ feed outputs and compare them against other available data sources. This tool provides a low-code user interface to visualize closure information in the CWZ feed and overlay additional data sets for comparative analysis. While the AGO tool was primarily used for

evaluation, it was also developed to serve future capabilities as a primary interface for the WZDH and to support both real-time monitoring of the CWZ and future operations-oriented work zone safety and performance management objectives.

Table 2. Tabular List of IDOT SMART Grant CWZ Evaluation Corridors

Corridor	Description
I-80	The Illinois portion of Interstate 80 spans 163 miles east-west, from the Iowa to Indiana state lines. This corridor also includes a segment that runs concurrently with the Illinois Tollway.
I-57	The Illinois portion of Interstate 57 spans 344 miles north-south, from Chicago to the Missouri state line.
I-55	The Illinois portion of Interstate 55 spans 294 miles north-south, from Chicago to the Missouri state line.
I-70	The Illinois portion of Interstate 70 spans 160 miles east-west, from the Indiana to Missouri state lines.
I-64	The Illinois portion of Interstate 64 spans 130 miles east-west, from the Indiana to Missouri state lines.
Illinois Tollway	Illinois tollway facilities in IDOT Districts 1 and 2.
Traveling Work Zone System	Rolling maintenance work zone data from the IDOT Station One Traveling Work Zone system. This system provides driver-initiated time and location data corresponding to the start, path, and end of a rolling maintenance work zone. Although the system has been deployed statewide, the SMART Stage 1 pilot evaluation focused on selected rolling work zone activities based on maintenance unit participation.

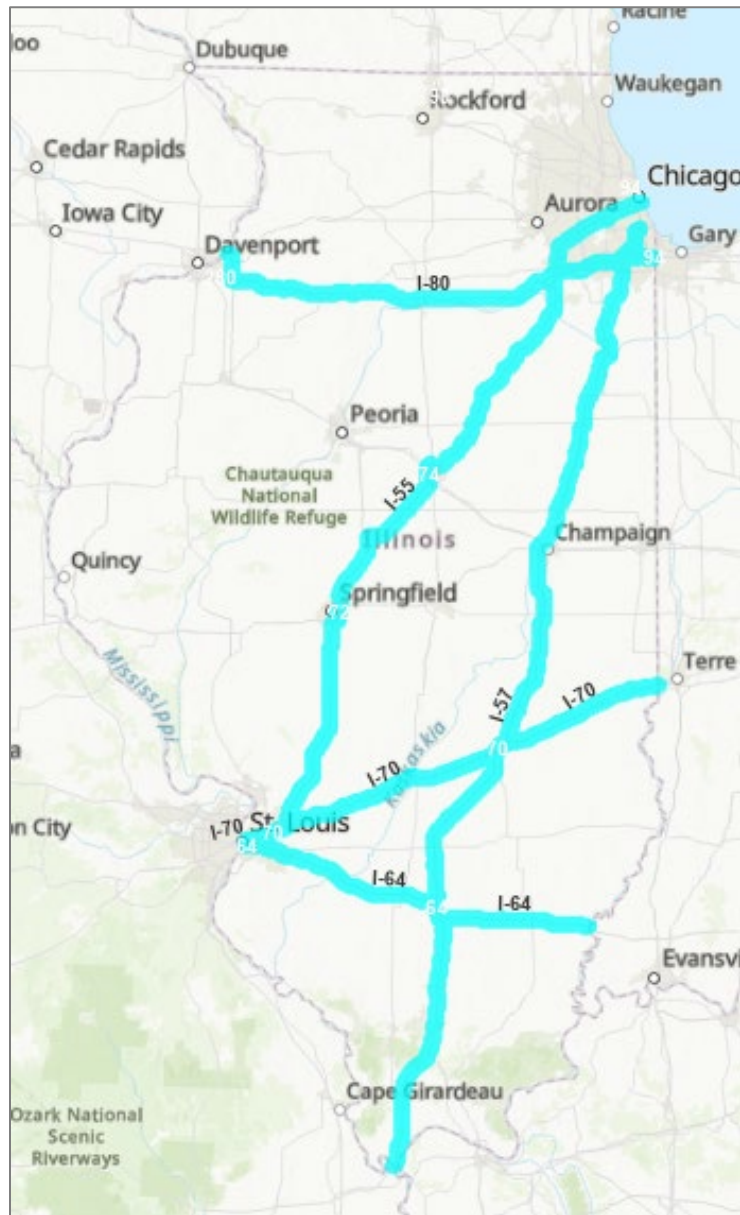


Figure 2. Combined Map of IDOT SMART Grant CWZ Evaluation Corridors.

Evaluation Results

The SMART Grant Stage 1 evaluation results that follow are organized around nine performance measures described in the Evaluation Metric submitted with the project Evaluation Report in June 2026.

Evaluation Question #1	Performance Measure	Performance Measure Target
Are IDOT's data management practices fully understood?	Stakeholder engagement and state of practice summarized	1. All major stakeholders are engaged 2. Data formats and update frequencies of major WZAD sources are documented

Evaluation Result: Met Objectives

1. Stakeholder outreach activities conducted under Task 2 engaged all major stakeholder groups involved in the collection, management, dissemination, or use of WZAD. Participants included:
 - Staff from all nine IDOT transportation districts
 - Key IDOT Central Office bureaus
 - The Travel Midwest Group (University of Illinois Chicago)
 - The Illinois Tollway
2. A *Work Zone Data Summary* report was developed under Task 3 to document existing WZAD sources, data formats, update frequencies, and operational data flows. The report includes an "as-is" characterization of IDOT work zone data systems and workflows and was reviewed by participating stakeholders to ensure completeness and accuracy.

Finding: The stakeholder engagement and documentation activities established a comprehensive understanding of IDOT's current WZAD environment and provided the foundation for subsequent data integration, architecture development, and prototype implementation activities. The assessment also established a framework for continuous improvement of source data quality, consistency, and completeness, several elements of which were implemented by IDOT BIP during the project.

Evaluation Question #2	Performance Measure	Performance Measure Target
Does the WZDx provide work zone data in a timely manner?	Timeliness	1. Changes to WZAD source data are reflected in the WZDx within 15 minutes from the time of transmission to the WZDH. 2. Work zones are added to the WZDx based on their start date and time attributes. 3. Work zones are removed from the WZDx based on their completion date and time attributes.

Evaluation Result: Met Objectives

1. WZDH data acquisition, harmonization, and CWZ feed generation each operate on five-minute processing cycles, resulting in a maximum expected latency of approximately 15 minutes from source data acquisition to publication in the CWZ feed. Analysis of 1,123 hourly health reports collected during the evaluation period found that system throughput was consistent with design expectations.
2. The WZDH automatically adds active work zone records to the CWZ feed based on planned start dates and times contained within the source data. This approach provides a consistent and automated mechanism for activating work zones in the statewide CWZ feed. The primary limitation is that activation is generally based on planned schedules rather than real-time field conditions. The Traveling Work Zone data source, which originates directly from field activity, is not subject to this limitation.
3. The WZDH automatically removes work zone records from the CWZ feed based on planned completion dates and times. This approach provides a consistent and automated mechanism for removing completed work zone records. The primary limitation is that removal is generally based on planned schedules rather than real-time field conditions. The Traveling Work Zone data source is not subject to these limitations because work zone status originates directly from field activity.

Finding: The prototype met the timeliness objectives established for the Stage 1 evaluation. The WZDH successfully automated the addition and removal of work zone records while maintaining the targeted processing latency. The evaluation also identified real-time field verification as a key opportunity for future implementation. While the current system provides consistent statewide management of work zone status based on planned schedules, integration of field verification and connected work zone technologies would improve the timeliness and accuracy of work zone information.

Evaluation Question #3	Performance Measure	Performance Measure Target
Does the WZDx provide accurate work zone activity information?	Accuracy	1. WZDx work zone start- and end-locations align to within 0.1 miles of the WZAD source data. 2. Work zone start- and end-times align to within 15 minutes of the WZAD source data. 3. Work zone field verification data is incorporated into the WZDx when available

Evaluation Result: Partially Met Objectives

The project team was unable to conduct field testing to assess ground truth accuracy of the CWZ feed. While preliminary planning and procurement efforts were initiated, active CWZ device integration was also not available for the Stage 1 project. Instead, the project team manually inspected a sample of CWZ work zone records to evaluate their mapped geometric representations with respect to available project description text.

1. IDOT CWZ work zone geometry was taken directly from the source data. Manual review of CWZ work zone records across all five evaluation corridors confirmed that mapped work zone geometries were consistent with source descriptions and aligned to the underlying roadway network. However, this analysis did not provide ground truth verification of actual start and end locations.
2. IDOT CWZ work zone start and end times are taken directly from the source data. For Ops Roadway and D1 LCS and ACTS, these times are based on planned schedules. Consequently, schedule accuracy is dependent upon the accuracy and timeliness of updates within the source systems. The Illinois Tollway is a WZDx 4.2 conforming data feed and includes field-verified accuracy flags. The Traveling Work Zone data is based on real-time transmissions from maintenance trucks in the field.
3. With the exception of Illinois Tollway, work zone field verification was not available for the Stage 1 SMART Grant. To ensure a CWZ 1.0 conforming feed, the CWZ time- and location-verified attributes were set to "false" when field verification data were unavailable.

Finding: The prototype evaluation demonstrated that CWZ spatial and temporal information was consistently translated from source systems into a CWZ 1.0-compliant feed. However, the evaluation was limited to consistency between CWZ output and source data and did not include ground-truth verification against actual field conditions. Incorporation of real-time field verification, particularly through CWZ device integration, remains an important priority for future implementation. Future work also includes integration of IDOT's IRIS linear referencing system to improve geometry standardization and interoperability with other business systems.

Evaluation Question #4	Performance Measure	Performance Measure Target
Does the WZDx integrate WZAD from multiple sources or districts?	Integration	1. The WZDx prototype successfully incorporates WZAD from three pilot locations 2. The WZDx prototype successfully unifies overlapping WZAD sources

Evaluation Result: Exceeded Objectives

1. While the original prototype and evaluation plan envisioned evaluation of CWZ capabilities along three pilot corridors, the WZDH ultimately integrated five operational data sources spanning all nine IDOT districts, District 1 work zone management systems, Illinois Tollway facilities, and statewide maintenance operations. As a result, the prototype established a statewide CWZ capability rather than a corridor-specific implementation. All five source systems were successfully transformed into the common WZDH data model and disseminated through a single statewide CWZ 1.0-compliant feed. During the evaluation period from June 15 through July 31, 2026, the IDOT CWZ feed contained an average of 867 active work zone records based on 1,123 hourly observations.
2. Integrating disparate WZAD sources introduces the possibility that a single work zone may be represented in multiple source systems. The current WZDH implementation preserves source records and does not automatically merge potentially duplicate work zone events. To assess the extent of overlap in the CWZ feed, a manual overlap analysis was conducted using a snapshot of all five data sources collected on July 1, 2026. Work zone records from different sources sharing more than two

coordinate pairs were flagged as potential overlaps. Traveling Work Zone records were not included because the snapshot contained no active records at the analysis time. The resulting overlap statistics are summarized below.

Data Source	Records Evaluated	Flagged Records	Potential Overlap Rate
D1 ACTS	39	26	66.67%
D1 LCS	120	71	59.17%
Ops Roadway	626	93	14.86%
Illinois Tollway	78	5	6.41%

These values represent an upper-bound estimate of potential duplicate work zones. Manual review of a sample of overlap cases found that many apparent duplicates were, in fact, distinct events occurring on adjacent ramps, crossroads, or related facilities. Even when records appeared to describe the same work zone, key attributes such as start and end dates frequently differed between sources. These findings demonstrate that identification and reconciliation of duplicate work zone records is more complex than simple geometric matching and represents an important area for future WZDH development.

Finding: The prototype evaluation exceeded expectations by integrating statewide work zone activity data from five operational source systems into a single statewide CWZ feed. While this enabled creation of a unified statewide CWZ feed, it also highlighted the challenges associated with identifying and reconciling overlapping work zone representations across independent source systems. Manual review demonstrated that apparent duplicates frequently differed in geometry, scheduling, and operational context, indicating that automated work zone conflation remains an important area for future WZDH development.

Evaluation Question #5	Performance Measure	Performance Measure Target
Does the WZDx provide a unified, standards-based data feed?	Uniformity	1. The WZDx prototype conforms to the CWZ 1.0 standard 2. Data elements required in the CWZ standard but missing in certain data sources are identified and documented

Evaluation Result: Met Objectives

1. The hourly health report performed a real-time schema validation check of the live IDOT CWZ feed against the published CWZ 1.0 JSON schema endpoint: <https://raw.githubusercontent.com/ite-org/cwz/main/schemas/1.0/WorkZoneFeed.json>. Based on 1,123 reports from June 15 through July 31, 2026, the IDOT CWZ feed passed validation 99.38% of the time. The remaining 0.62% were attributable to network timeout errors encountered while retrieving the CWZ schema and do not represent feed conformance issues.
2. The following required data element issues have been identified:

- Approximately 5% of IDOT Ops Roadway records are missing geographic coordinates and are therefore excluded from the CWZ feed. Manual examination of these records has found them to be largely incomplete and unsuitable for dissemination.
- Direction is a required enumerated data element in the CWZ 1.0 standard that describes the direction of travel along a roadway based on signed direction. The enumeration “unknown” is provided when road flow may have a signed direction, but the affected direction of travel is unknown. Direction values are generally unavailable in the Ops Roadway and Traveling Work Zone source data and are therefore set to “unknown” to maintain a valid CWZ feed. Overall, 81.89% of road direction values sampled from June 15 to July 31 were set to “unknown”.
- Vehicle Impact is a required enumerated data element in the CWZ 1.0 standard that describes the impact to vehicular lanes along a single road in a single direction. The enumeration “unknown” is provided when the vehicle impact is unknown. The Ops Roadway impacts fields are largely comprised of non-standardized text descriptions and are currently set to “unknown” to maintain a valid CWZ feed. Vehicle impact is also set to “unknown” for Traveling Work Zones.
- Recurrent work zones are modeled in CWZ 1.0 via the Related Road Event enumerated type. Currently, all Ops Roadway work zone records are limited to the planned start- and end-date values, even when recurrent schedule details are available in the source data. While the current implementation remains CWZ-conformant, support for recurrent time windows would significantly improve schedule accuracy and precision.
- The Ops Roadway data source was updated during the evaluation period to include persistent identifiers for individual work zones. This provides for a direct translation to the CWZ 1.0 Road Event Feature “id” property. Work is continuing to validate and ensure the stability of these identifiers.

Finding: The IDOT CWZ feed was demonstrated to be CWZ 1.0 conformant and capable of providing a unified statewide representation of work zone activity data from multiple source systems. The evaluation also identified several opportunities to improve the quality and completeness of CWZ content, particularly through the incorporation of recurrence windows and the provision of reliable road direction, vehicle impact, and field verification values. The evaluation period also saw improvements to source-system data quality, including the introduction of persistent work zone identifiers within the Ops Roadway data source. Future enhancements will focus on continued maturation of source data and expansion of additional CWZ attributes, including restrictions and moving work zone type values.

Evaluation Question #6	Performance Measure	Performance Measure Target
Does the WZDx provide a complete picture of work zone activity data?	Completeness	1. The WZDx prototype captures 85% of WZAD events from the pilot locations

Evaluation Result: Met Objectives

Approximately 95% of all source data records were incorporated into the CWZ feed, exceeding the evaluation target of 85%. The remaining 5% consisted primarily of incomplete source records lacking the minimum mandatory elements required for inclusion in a valid CWZ 1.0 feed.

To assess completeness beyond the source data itself, manual comparisons were conducted between CWZ feed snapshots and publicly available traveler information sources, including Waze and Google Maps, along the five statewide evaluation corridors (I-80, I-57, I-55, I-70, and I-64). Only one apparent discrepancy was identified during the review period.

Finding: The IDOT CWZ feed exceeded the completeness objective with respect to available source data and successfully incorporated approximately 95% of source work zone records. However, completeness of the CWZ feed is ultimately constrained by completeness of the underlying WZAD sources. Work zones that are not represented in source systems cannot be incorporated into the CWZ feed. While corridor-level comparisons did not identify significant coverage gaps, the evaluation highlighted the challenge of identifying operational areas where work zone activities may not be consistently represented in existing WZAD systems.

Evaluation Question #7	Performance Measure	Performance Measure Target
Does the WZDx support high availability requirements for traffic operations, emergency management and traveler information?	Reliability	1. The WZDx prototype was accessible 95% of the time over the pilot duration 2. The WZDx data feed was generated within the last 15 minutes for 90% of the time over the pilot duration

Evaluation Result: Met Objectives

1. The IDOT CWZ endpoint was successfully accessed 100% of the time with an average download time of 0.41 seconds based on 1,123 health check reports from June 15 through July 31, 2026.
2. The IDOT CWZ endpoint was refreshed within 15 minutes 100% of the time during the evaluation period. Based on hourly health checks, the CWZ feed had an average age of 3 minutes and a maximum observed age of 7 minutes.

Finding: The IDOT CWZ feed was demonstrated to meet system reliability objectives. Based on 1,123 hourly observations, the feed maintained 100% availability and was refreshed within the required 15-minute interval throughout the evaluation period. Because performance monitoring was conducted at hourly intervals, short-duration service interruptions may not be reflected in the reported statistics. Monthly server maintenance performed by the UW-Madison TOPS Lab, which hosts the service on behalf of IDOT, occasionally results in brief interruptions typically lasting less than five minutes.

Evaluation Question #8	Performance Measure	Performance Measure Target
What is the level of effort to expand the WZDx prototype to additional WAZD sources?	Scalability	1. A data mapping and configuration tool is successfully demonstrated to integrate new WZAD sources into the WZDx.

Evaluation Result: Exceeded Objectives

An important design goal of the WZDH was to provide a scalable platform for integrating additional WZAD sources through an online configuration interface. The interface exposes configuration settings for data acquisition, transformation, and harmonization of source data into the WZDH common work zone data model. Underlying configuration settings and transformation rules are managed as JSON object models within a Microsoft SQL Server database.

The interface was used to configure the five operational data sources incorporated into the Stage 1 prototype and was demonstrated to the USDOT SMART Grant project manager during a site visit to IDOT headquarters in Springfield, Illinois in May 2026.

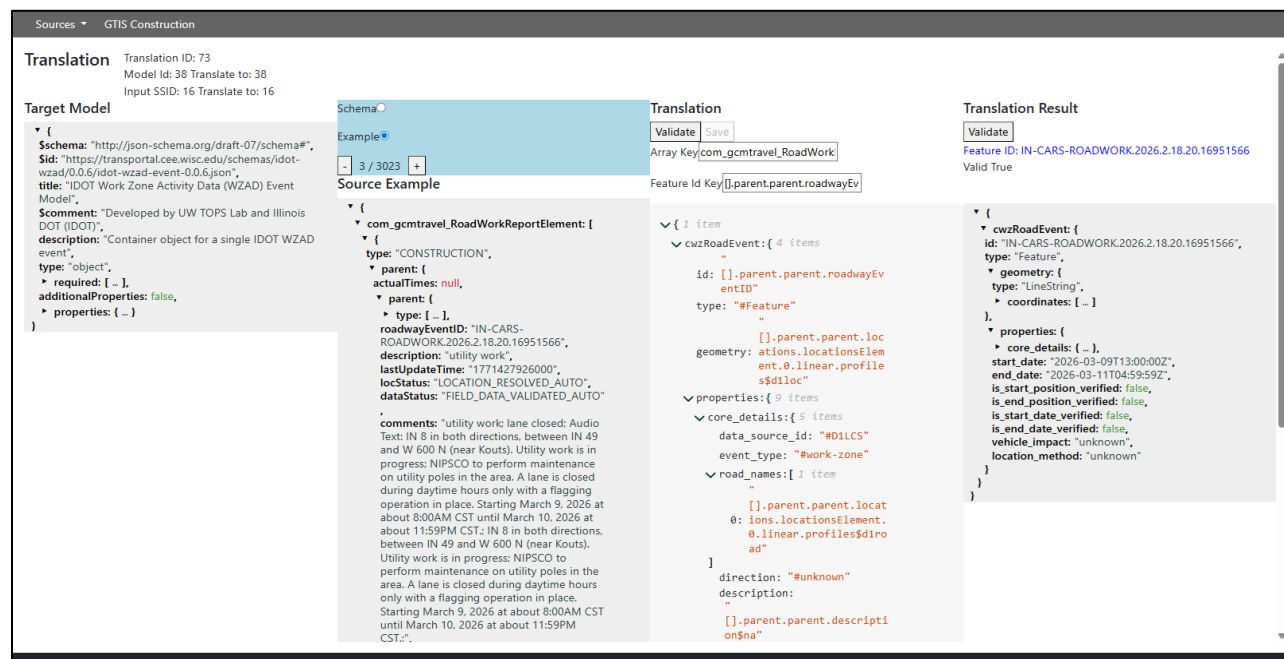


Figure 3. Screenshot of the WZDH Configuration Interface for the D1 LCS data source.

Finding: A generic configuration management tool was successfully implemented and demonstrated to support integration of diverse WZAD source systems through a common configuration framework. The successful deployment of five operational data sources demonstrated the scalability of the WZDH architecture and exceeded the original objective of demonstrating integration of new WZAD sources. While the framework successfully supports the mandatory elements required for CWZ 1.0 conformance, future work is needed to expand support for non-mandatory CWZ attributes, IRIS LRS integration, and performance management elements represented within the broader WZDH common data model.

Evaluation Question #9	Performance Measure	Performance Measure Target
What considerations are made to secure the data and the system?	Cybersecurity	1. The WZDx prototype security requirements were approved by the IDOT Data Governance and Information Technology offices.

Evaluation Result: Met Objectives

The project team worked closely with the IDOT Bureau of Information Processing (BIP) throughout the project to ensure that system architecture, hosting, and cybersecurity controls aligned with IDOT standards and best practices. Prior to publication of the CWZ feed on the WZDx Registry, the final system was presented to IDOT BIP, Data Governance, and agency leadership. This review served as the project's final governance milestone and confirmed organizational support for public deployment of the service.

The following specific security steps were implemented:

1. While the CWZ feed is designed to be publicly available, end users must request an API key and include the key with each request. Adding API keys to CWZ feed endpoints has become common practice and enables providers to track usage, communicate with end users, and implement rate limiting and other strategies to maximize availability for all users.
2. Although the CWZ service is hosted at UW-Madison, it is published through the IDOT domain, <https://wzad-idot.illinois.gov/>, using redirects and domain management services implemented by IDOT BIP in coordination with the project team.
3. The CWZ endpoint infrastructure at UW-Madison is actively monitored and maintained using enterprise cybersecurity practices. The service operates behind an enterprise firewall, enforces modern HTTPS encryption for all communications, and is subject to routine security patching and system maintenance to address vulnerabilities and maintain operational security.

Finding: The IDOT CWZ feed met the cybersecurity objectives established for the Stage 1 prototype. Security considerations were incorporated throughout development and deployment, including API-based access controls, an IDOT-managed public endpoint, and hosting within a monitored and secured infrastructure environment. The system was also reviewed with IDOT Data Governance, Information Technology, and agency leadership as part of the project's governance process prior to public deployment.

Anticipated Costs and Benefits of At-Scale Implementation

The development, standardization, and maintenance of a reliable and sustainable Work Zone Activity Data (WZAD) Program is critical to improving work zone safety, mobility, operational decision making, and traveler information services throughout Illinois. Through the USDOT SMART Grant-funded Work Zone Activity Data initiative, IDOT evaluated existing work zone data practices, engaged stakeholders from across the agency and partner organizations, documented current work zone data systems and workflows, and developed a Work Zone Data Hub (WZDH) framework to support future statewide data integration and sharing.

The assessment revealed several opportunities to strengthen the collection, management, integration, and dissemination of work zone activity data across Illinois. Building upon the stakeholder engagement findings and prototype evaluation results, this section identifies priority program areas for continued advancement of IDOT's WZAD Program. These program areas represent logical next steps identified through stakeholder engagement and prototype evaluation and provide a framework for continued advancement of statewide WZAD capabilities. A detailed implementation roadmap document has been prepared under Task 7 of the Stage 1 SMART Grant.

At-Scale Implementation Plan

The prototype evaluation demonstrated that the foundational WZDH architecture and statewide CWZ feed are technically feasible and scalable. Future implementation activities are therefore focused less on core systems integration and more on expanding source-data coverage, improving data quality, incorporating field verification, and developing operational applications that build upon the WZDH framework. Based on the evaluation findings, a three-year phased implementation approach has been identified to advance the WZDH framework and statewide WZAD capabilities established through the Stage 1 SMART Grant. For planning purposes, implementation has been organized into six primary focus areas.

Focus Area 1: WZDH IRIS Integration

Existing Conditions: The Stage 1 stakeholder engagement and prototype evaluation identified multiple location referencing methods currently used throughout the work zone data environment. Work zone information is presently stored using geocoded points, route descriptions, and various district-specific approaches.

Program Need: As statewide WZAD capabilities continue to evolve, improved integration with IDOT's statewide linear referencing system (IRIS) will provide a common statewide spatial framework that supports interoperability between work zone records and other transportation datasets such as crash data, roadway inventory, traffic volumes, and future performance measures. This integration will also improve the consistency and quality of work zone road event geometry within the IDOT CWZ feed.

Intended Outcome: This focus area would establish a common statewide spatial framework for work zone activity data, improving interoperability with roadway, traffic, crash, and performance management datasets while enhancing consistency of CWZ roadway geometry.

Focus Area 2: Connected Work Zone Device (CWZ) Testing and Integration

Existing Conditions: While the prototype WZDH demonstrated consistent integration of IDOT planned work

zone source data, the lack of temporal and spatial field verification was repeatedly identified as a gap in CWZ feed quality improvements. Stakeholders also consistently identified a lack of real-time updates and limited integration of CWZ technologies. While districts do deploy CWZ devices and have access to vendor portals, this information is generally not incorporated into statewide work zone data systems. The assessment also documented IDOT's traveling work zone program, which currently collects location information through GPS-enabled maintenance vehicles.

Program Need: Field verification is necessary to improve confidence that statewide work zone information accurately reflects actual conditions in the field. Connected Work Zone technologies provide a mechanism to automate portions of work zone reporting while improving the timeliness and accuracy of work zone activity data.

Intended Outcome: This focus area would improve the ability of the WZAD Program to represent real-world work zone conditions through automated field verification, real-time updates, and integration of connected work zone technologies.

Focus Area 3: IDOT Lane Closure System Planning and Development

Existing Conditions: Stakeholder engagement revealed significant variation in lane closure management processes across Illinois. District 1 utilizes the LCS and ACTS platforms, while other districts rely primarily on OPER 2410 workflows designed primarily for oversize / overweight permitting needs, and localized business processes. The Stage 1 prototype evaluation was also largely focused on the major interstate corridors, resulting in less clarity of coverage on how data is collected, managed, and disseminated along the remaining portions of the highway system.

Program Need: A statewide work zone data program requires timely, accurate, and consistent lane closure information while minimizing impacts to district staff workloads.

Intended Outcome: This focus area would improve statewide consistency, coverage, and timeliness of work zone activity data collection while reducing reliance on localized business processes and minimizing impacts to district staff workload.

Focus Area 4: Work Zone Safety Performance Measures

Existing Conditions: Stakeholder engagement identified limited ability to consistently evaluate work zone safety and operational performance across Illinois. While numerous data sources exist, including crash records, lane closure information, traveler information systems, and emerging connected work zone technologies, these datasets are not currently integrated in a manner that supports routine performance monitoring. Stakeholders expressed interest in improved visibility into work zone impacts but noted that existing reporting capabilities are limited by inconsistent data collection practices and varying levels of spatial accuracy. Emerging requirements under Subpart J of the Federal Rule on Work Zone Safety and Mobility have also created a need and timeline for statewide work zone performance metric reporting.

Program Need: The WZDH framework enables integration of work zone, roadway, traffic, and crash datasets needed to support performance-based decision making. Standardized work zone records linked to these datasets provide a basis for evaluating safety, mobility, reliability, and operational impacts. Establishing meaningful performance measures will support both internal program management and fulfillment of external reporting requirements.

Intended Outcome: This focus area would establish a foundation for performance-based work zone management by supporting statewide safety, mobility, reliability, and operational performance monitoring and reporting.

Focus Area 5: CWZ Work Zone Data Feed Maintenance and Enhancements

Existing Conditions: The stakeholder engagement process identified multiple work zone data sources and dissemination pathways that support traveler information, permitting, and operational decision making. The WZDH framework and CWZ feed establish an important mechanism for sharing standardized work zone information. However, stakeholders recognized that data standards, source systems, and operational requirements will continue to evolve over time.

Program Need: A sustainable statewide work zone activity data program requires ongoing maintenance of data feeds and continued adaptation to changing technologies, business processes, and national standards. Continued support will be necessary to ensure the CWZ feed remains reliable, interoperable, and aligned with future WZDH enhancements.

Intended Outcome: This focus area would ensure the long-term reliability, interoperability, and continued evolution of the statewide CWZ feed as business needs, technologies, and national standards change over time.

Focus Area 6: WZDH Framework Maintenance and Support

Existing Conditions: Throughout stakeholder engagement, district and bureau representatives emphasized the importance of minimizing staff workload while maintaining reliable work zone data systems. The WZDH framework introduces new opportunities for statewide data integration and management, but long-term success depends on maintaining system functionality and coordinating future enhancements.

Program Need: A sustainable work zone activity data program requires ongoing technical support, system administration, and coordination among business and information technology stakeholders. Continued maintenance activities will help preserve investments made through the SMART Grant and subsequent implementation efforts while ensuring the WZDH remains responsive to changing operational needs.

Intended Outcome: This focus area would provide the technical support, system administration, and stakeholder coordination necessary to sustain and expand the WZDH as the foundation of the statewide WZAD Program.

Estimated Costs

IDOT has begun planning and coordination to advance the future program development areas described above through internal funding sources. A phased implementation approach is assumed that builds upon existing capabilities while minimizing disruption to current operations. The approach is intended to establish foundational capabilities during the initial planning period, followed by successive enhancements, integration activities, and operational deployment efforts that support the continued maturation of the WZDH and statewide work zone activity data program. The anticipated level of effort is approximately 3,600 subconsultant hours per-year over a three-year implementation period. The estimate reflects implementation, integration, maintenance, and support activities associated with operation and continued advancement of statewide WZAD capabilities. Additional costs for CWZ device procurement, the

procurement of third-party operations data, and potential expansion of statewide lane closure system capabilities beyond the initial framework development described above are not included in this estimate.

Statutory Relevance

Through the findings identified in the prototype evaluation and the implementation focus areas described above, at-scale implementation of the WZAD Program is anticipated to:

- **Improve the safety and integration of transportation facilities and systems** by providing more complete, timely, and standardized work zone information for operational decision-making, traveler information systems, and future Connected Work Zone applications.
- **Improve the reliability of existing transportation facilities and systems** through enhanced work zone coordination, monitoring, performance management, and field verification capabilities.
- **Promote connectivity among roadway infrastructure, travelers, and transportation systems** through statewide integration and sharing of standardized work zone activity data using the WZDH framework and CWZ data feed.

Challenges and Lessons Learned

Statewide integration was more achievable than originally anticipated.

The original prototype concept focused on selected pilot corridors and demonstration deployments. However, the availability of operational statewide data sources and the flexibility of the WZDH architecture enabled development of a statewide CWZ capability during Stage 1. As a result, the project was able to evaluate work zone activity data at a substantially larger scale than originally anticipated.

Source-data quality drives CWZ quality.

The prototype evaluation demonstrated that the WZDH is capable of integrating, standardizing, and disseminating work zone activity data from multiple sources. However, the quality, completeness, and consistency of CWZ information are ultimately constrained by the quality of the underlying source data. Improvements to source-system data collection practices therefore represent one of the highest-value opportunities for future program advancement.

Field verification is the most significant remaining gap.

While the WZDH successfully incorporated planned work zone information, the evaluation repeatedly identified a lack of field-verified time and location information across many source systems. Improved integration of field verification processes and Connected Work Zone technologies would significantly improve the timeliness, accuracy, and operational value of statewide work zone activity data.

Conflation of overlapping work zones is more complex than expected.

The integration of multiple operational data sources revealed that apparent duplicate work zone records often differed in geometry, timing, roadway relationships, and operational context. The evaluation demonstrated that reliable reconciliation of overlapping work zone records requires more than simple geometric matching and remains an important future development area.

Common work zone data management tools are needed.

Stakeholder engagement and prototype evaluation identified a significant difference between District 1 and the remainder of the state in the availability of structured work zone management systems. While District 1 maintains dedicated lane closure management tools, many other districts rely primarily on business processes that were not originally designed to support comprehensive work zone data collection and dissemination. The evaluation demonstrated that statewide integration is achievable, but also highlighted the importance of structured work zone data collection and management capabilities to support a more complete and consistent representation of work zone activity across Illinois.

Stakeholders are supportive of automation but sensitive to workload impacts.

Stakeholders consistently expressed interest in improved work zone data quality, automation, and performance monitoring capabilities. However, stakeholders also emphasized the importance of minimizing impacts to existing business processes and avoiding additional workload for district personnel. The project demonstrated that operational efficiency remains a significant consideration when evaluating future WZAD enhancements.

Sustained stakeholder engagement produced tangible program improvements.

Stakeholder engagement was initially conducted to document existing work zone data practices, develop an understanding of the current operating environment and support implementation planning. However, the engagement process evolved into an ongoing collaboration with district, bureau, and partner organization staff. Several source-data enhancements were implemented during the performance period as a direct result of stakeholder discussions and feedback. The project demonstrated that sustained stakeholder engagement contributes not only to organizational support and program buy-in, but also to measurable improvements in data quality and operational outcomes.

Deployment Readiness

The Stage 1 prototype demonstrated that the core components required for a statewide WZAD Program are in place. The WZDH architecture successfully integrated multiple operational work zone data sources into a common data model and supported deployment of a statewide CWZ 1.0-compliant data feed. The evaluation also demonstrated reliable system performance, successful statewide data integration, scalable source-data configuration capabilities, and implementation of cybersecurity and governance practices necessary to support public dissemination of work zone information.

IDOT is well positioned to advance the next phase of WZAD implementation. Stakeholder engagement established broad organizational support for continued development of the program, and the prototype evaluation confirmed the technical feasibility of statewide integration and data sharing. Remaining implementation efforts are focused primarily on improvements to data quality, field verification, data completeness, and operational maturity rather than development of core integration capabilities. Continued advancement of the program will require ongoing coordination among technical, operational, and governance stakeholders; however, the project demonstrated that the foundational architecture, organizational support, and implementation framework necessary to support at-scale implementation are in place.

Conclusion

The Stage 1 SMART Grant successfully demonstrated the feasibility of a statewide approach to work zone activity data management and dissemination in Illinois. Through stakeholder engagement, systems integration, and prototype deployment, IDOT established a scalable Work Zone Data Hub (WZDH), integrated five operational data sources, and deployed a statewide Connected Work Zone (CWZ) 1.0-compliant data feed. The evaluation confirmed that the WZDH architecture provides a reliable and scalable foundation for statewide work zone data integration and future operational applications. The project demonstrated that statewide WZAD integration is technically feasible within the Illinois operating environment and can be achieved by leveraging existing work zone data resources. The evaluation also highlighted opportunities to improve the completeness and consistency of those resources through future program development activities.

The project also demonstrated that future advancement of the WZAD Program depends less on core integration capabilities and more on improvements to source-data quality, completeness, field verification, and operational consistency. The Illinois approach focused on leveraging and integrating existing work zone data resources through the WZDH framework. The evaluation demonstrated that this approach is technically feasible and provides additional benefits for statewide data archiving, performance measurement, and integration of diverse work zone information sources. While the WZDH successfully demonstrated these capabilities during Stage 1, continued development will be necessary to expand support for additional data elements, field verification processes, performance management applications, and other functions required of a long-term production environment. Continued development of these capabilities, along with enhancements to work zone data collection and management processes, will support a more complete, accurate, and operationally useful representation of work zone activity across Illinois.

The Stage 1 prototype established the technical, organizational, and governance foundation necessary to support at-scale implementation of a statewide WZAD Program and provides a clear roadmap for continued advancement of work zone data capabilities within IDOT.



IDOT Work Zone Activity Data (WZAD)

Data Summary Technical Memorandum

Prepared for: Illinois Department of Transportation
Prepared by: University of Wisconsin-Madison and Lakeside Engineers

Date: November 7, 2025



1. INTRODUCTION

Work Zone Activity Data (WZAD) describes the operation aspects of a work zone deployment, including the type of work, duration, location, geometry, lane and shoulder impacts, restrictions, and detour routes. Modernizing how WZAD is collected, managed, and shared has been the subject of ongoing efforts at the national level, culminating in the recent ITE Connected Work Zone (CWZ) Standard and federal funding opportunities, such as the Strengthening Mobility and Revolutionizing Transportation (SMART) Grant. Illinois Department of Transportation (IDOT) was awarded a SMART grant in March 2023 to evaluate the state of WZAD and help improve safety through work zone data management.

The IDOT WZAD project is guided by three primary objectives: (1) develop a summary of existing work zone activity data based on stakeholder input, (2) create a statewide implementation plan that outlines a roadmap for system and process improvements, and (3) design a prototype WZAD management framework that includes a Work Zone Data Exchange (WZDx) feed and a pilot evaluation. The prototype will serve as a foundation for the implementation plan and will support future statewide scalability as additional data sources become available.

Through this summary effort, the project aims to establish a clear understanding of IDOT's work zone data sources. The purpose of this technical memorandum is to document the work zone data summary informed by stakeholder engagement and to present a snapshot of WZAD management.

2. OBJECTIVES OF STAKEHOLDER ENGAGEMENT

The stakeholder engagement and discovery phase of the IDOT WZAD project focused on understanding existing work zone data management practices to develop an “as-is” assessment of current work zone operations and data collection. The goal of this phase was to gather input on work zone data, identify gaps, and develop a data summary to guide the next steps of the WZAD project.

3. KEY TERM DEFINITIONS

The following terms provide background for understanding the systems, forms, and data processes described in this memorandum. These definitions are intended to clarify references to IDOT-specific tools and terminology related to work zone activity data collection, management, and sharing.

Term	Description
WZAD – Work Zone Activity Data	The operational aspects of a work zone deployment, such as the type of work, schedule, location, lane impacts and detour routes.
WZDx – Work Zone Data Exchange	National data specification from the Federal Highway Administration (FHWA) for sharing consistent work zone information across agencies and systems.
MOT Plan – Maintenance of Traffic Plan	A document that outlines how traffic will be safely managed during construction.
OPER 2410	An IDOT form that is used statewide to document road restriction information.
BSPE 725	An IDOT form that is used statewide for traffic control authorization requests.
BSPE 726	An IDOT form that is used to document construction traffic control inspections.
CWZ 1.0	Connected Work Zones Implementation Guide and Standard, which has replaced the WZDx specification.
ITAP – Illinois Transportation Automated Permit	Statewide system for managing oversized and overweight travel permits.
AGO – ArcGIS Online	Cloud-based mapping platform used by IDOT to store and share geospatial data such as road restrictions.

FME – Feature Manipulation Engine	A software tool that transfers and formats data between different systems.
GTIS – Gateway Traveler Information System	Data hub operated by the University of Illinois at Chicago that collects and shares road and work zone information through TravelMidwest.com.
JSON	A lightweight, human readable data exchange format.
GeoJSON	A geospatial data interchange format based on JSON, used by the WZDx.
LCS – Lane Closure System	A web-based tool used in IDOT District 1 to manage expressway lane closures.
ACTS – Arterial Construction Tracking System	A web-based tool in IDOT District 1 for managing lane closures on non-expressway roads.
WZDx Feed	Digital file or data stream formatted to the CWZ 1.0 WZDx standard, used to share work zone information in real time.
ATMS – Advanced Traffic Management System	System used to monitor and control traffic operations, including lane closures and incidents.
TMA Vehicle – Truck-Mounted Attenuator Vehicle	A safety vehicle equipped with crash-absorbing equipment and GPS tracking, used to protect road crews.
AVL – Automatic Vehicle Location	GPS-based system that tracks the location of vehicles in real time.
LRS – Linear Referencing System	Method for locating points or segments along a roadway using a route and distance measurement.
CMMS - Construction and Materials Management System	System used by IDOT for managing construction projects and materials related to transportation infrastructure.
IRIS – Illinois Roadway Information System	IDOT’s database for roadway location and reference information.
HERE – Here Technologies	A commercial provider of roadway and mapping data used in IDOT’s permitting systems.

4. STAKEHOLDER IDENTIFICATION

There are numerous stakeholders involved and invested in work zone data management efforts across Illinois. Key stakeholders that were engaged during this exercise included:

- IDOT
 - Bureau of Safety Programs and Engineering
 - Bureau of Operations
 - Bureau of Information Processing (BIP)
 - Station One Traffic Management Center
 - OSOW Permit Office
 - Districts (Traffic Operations, Construction, Utilities, Traffic Control, and Project Implementation Staff)
- Illinois State Toll Highway Authority (Illinois Tollway)
- University of Illinois at Chicago (UIC) – Gateway Traveler Information System (GTIS) and Travel Midwest (TravelMidwest.com)

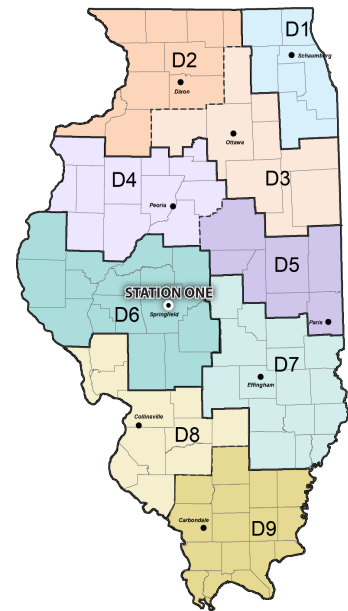


Figure 1: IDOT Districts and Headquarters

Stakeholders were identified and approved by IDOT project leadership based on their roles in creating, managing, or using work zone data. A complete list of all engaged stakeholders is provided as an attachment.

5. ENGAGEMENT APPROACH

A central component of the engagement effort was a series of interviews with IDOT bureau and district staff across operations, planning, and construction roles. Additional technical discussions addressed the traveling work zone pilot deployment, the OPER 2410 permitting form (IDOT form used statewide to document road restriction information), and the Illinois Transportation Automated Permit (ITAP) system database, which stores the OPER 2410 data. All stakeholder engagement activities were conducted virtually between May and July 2025. Interview guides, meeting summaries, and supporting materials are included as attachments.

6. FEEDBACK SUMMARY

Discussions with IDOT representatives provided valuable insights into current work zone data practices, challenges, and opportunities. The feedback gathered reflected both common themes and district-specific conditions related to how work zone activity data is collected, managed, and shared. This section outlines how work zone data is generated and describes the supporting data infrastructure and spatial referencing systems.

Work Zone Data Generation Methods

Work zone activity data is generated and collected through a variety of processes, tools, and IDOT personnel actions depending on the type, duration, and location of the work. Key data generation methods are described below.

Preconstruction Coordination

At preconstruction meetings, contractors and IDOT staff review the construction plans and discuss anticipated lane closures prior to construction start. These discussions form the basis of initial data entry, leading to the completion of OPER 2410 permitting forms.

Method	<i>Preconstruction Meeting</i>
Input Type	Maintenance of Traffic (MOT) Plan
Format	• PDF
Users	• Construction staff/contractors, operations staff
Output	• OPER 2410, BSPE725

Lane Closure Systems

In District 1, the Lane Closure System (LCS) is a web-based tool for tracking expressway closures. It includes geocoding, daily validation, and auto-generated reports. The LCS is coded for statewide use but is only used by District 1. The business rules are set up to work with District 1's lane restriction paradigm. District 1 engineers can edit the rules which are based on segments of highways, the time of day, day of week, and desired number of lanes to be closed. Other districts could add their own rules as long as they fit into the location, day of week, time of day, number of lanes schema. The geographic database of the LCS would also need to be expanded to support other districts as it is currently limited to District 1 roads.

The Arterial Construction Tracking System (ACTS) is used in District 1 for lane closures on non-expressway roads.

Method	LCS	ACTS
Input Type	Web-based form	Web-based form
Details	Geocoded locations (stored and transmitted by the system, not seen by end user)	Spatial component in development
Users	Operations staff, construction contractor, maintenance staff	Utilities, construction staff/contractors, operations staff
Output	LCS Database	ACTS Database

Manual Reporting and Logs

For maintenance activity and short-term closures, IDOT maintenance field crews may call or email operations staff, who then record the work zone activity manually. Some districts use Excel spreadsheets or paper filing systems to store this information. Longer term maintenance may trigger an OPER 2410 form submittal.

Permit and Notification Forms

The OPER 2410 form is the primary method for documenting lane restrictions in all districts and includes details such as location, duration, contact information, and detours. The form is used for any lane or roadway closure or restriction for construction, maintenance, or utility activities. An OPER 2410 is submitted by IDOT staff, construction contractors, or utility personnel, and is routed to various departments and systems (e.g., Illinois ArcGIS Online (AGO) database, Travel Midwest). IDOT is transitioning to a digital form that mirrors the content of the analog version, while adding functionality to pan and draw the project's extent. Additional forms such as IDOT's BSPE 725 (traffic control contact information) and BSPE 726 (construction traffic control inspection reports) also contribute relevant data. All referenced IDOT forms are included as attachments.

Method	OPER 2410	BSPE 725	BSPE 726
Input Type	Paper/Pilot of Web-Based Form	Paper Form	Paper Form
Format	- MS Word - Digital form created with ArGIS Survey 123; accessible via public URL	MS Word	MS Word
Users	Operations staff, construction staff/contractors, utilities	Operations staff, construction staff/contractors, utilities	Construction staff/contractors
Output	ITAP Database	- Project File - CMMS	- Project File - CMMS

Connected Work Zone (CWZ) Technology

In areas with advanced traffic control setups, connected work zone systems generate real-time data (e.g., speeds, queues) using devices such as sensors and portable message signs, with the data accessible through contractor-managed portals. This data is not currently integrated with IDOT systems, but it is made available through the vendor, as required by IDOT construction contract special provisions.

Asset and Contract Management Systems

Some work zone activity is documented within broader systems such as the Construction and Materials Management System (CMMS), but data entry varies by district and is more focused on work zone inspections and project tracking rather than real-time lane closures.

Emergency and Incident Reporting

Closures resulting from emergencies are tracked through IDOT's incident management protocols, including reporting to Station One or communications centers, which may feed into formal databases. The OPER 2410 form may be used for emergencies/incidents since it includes an emergency classification for lane closures.

7. DATA SYSTEMS AND LINEAR REFERENCING FRAMEWORK

A range of systems support the management of work zone activity data across Illinois, from tracking lane closures and construction impacts to issuing travel permits and sharing information with the public. These systems, developed and maintained by IDOT, the Illinois Tollway, and their partners, are interconnected through a combination of manual processes, automated feeds, and shared geospatial frameworks. Together, they rely on a common linear referencing structure to ensure data consistency and integration across platforms, enabling accurate routing, coordination, and public communication. This section presents system components that were found to be integral to work zone activity data management.

Illinois Transportation Automated Permit (ITAP) ArcGIS Online (AGO)

The ITAP system manages over 270,000 permits annually, primarily for oversize and overweight vehicle travel across Illinois. ITAP auto-issues 99.4% of these permits based on user-entered route and vehicle data, using restrictions maintained in the GIS-based Obstructions and Restrictions layer to ensure safe routing. This layer includes data from multiple sources, most notably the OPER 2410 process, which feeds in manually approved construction, utility, or maintenance-related restrictions. A Feature Manipulation Engine (FME) is used to pull data from the OPER 2410 dataset into a host layer in AGO. Restrictions are coded by type (e.g., Permanent, Temporary, Obstruction, Road Construction) and by restriction category (e.g., dimension limits, height/weight restrictions, closures). The data is also published to Getting Around Illinois through an AGO service, allowing public access to real-time information on restrictions and closures. Updates to restriction data can be submitted through a separate link provided in the OPER 2410 process, allowing modifications to the data already in the database, such as start/end dates and road segments.

The Obstructions and Restrictions layer provides multiple endpoints from IDOT AGO, including Travel Midwest and Getting Around Illinois, and supports services such as temporary and permanent restrictions, vertical clearances, and public-facing road construction data.

Gateway Traveler Information System (GTIS)

The GTIS and its website (TravelMidwest.com) are operated by UIC in partnership with IDOT. The GTIS is the central data hub for the Travel Midwest system. GTIS collects, standardizes, and integrates work zone, incident, and Intelligent Transportation System (ITS) device data from multiple sources, including IDOT districts, the Illinois Tollway, and partner agencies, and disseminates it to the public, private-sector traveler information providers, and other transportation data systems. It supports multiple formats such as XML, GeoJSON, and WZDx, enabling interoperability across agencies and regions. IDOT and the Illinois Tollway occasionally provide real-time data updates to the GTIS control room. While these updates appear on Travel Midwest, they may not always be incorporated back into the source data.

District 1 LCS

The LCS is a web-based platform used by IDOT District 1 to manage and track lane closures on the expressway network. The system supports operational coordination by enabling contractors or IDOT personnel to submit requests for daily lane closures associated with utility, maintenance, and construction activities. Submitted closure requests undergo validation against pre-established criteria,

such as allowable hours, days of the week, and lane closure limits for specific locations. Although locations are geocoded, the system does not store complete geometry items to define the entire route of the work zone. It simply stores latitude and longitude coordinates for the start and end points without any accompanying linework. District 1 publishes its planned closure data daily to the UIC GTIS. PDF reports summarizing the closures are distributed internally and publicly. These PDF reports represent the only regularly generated summary of closure data from the LCS.

The system also handles long-term closures, which are entered by IDOT staff based on Maintenance of Traffic (MOT) plans approved by IDOT engineers. These records, largely text-based, include information on reduced speed zones and detour notices, but they do not contain detailed detour route geometry. OpenStreetMap is used for LCS, which is maintained by open-source contributors.

District 1 Arterial Construction Tracking System (ACTS)

ACTS is a web-based arterial lane closure request system for IDOT District 1. Construction or utility lane closure requests are entered, and an IDOT approval is transmitted to the contractor. The closure information is also automatically sent to appropriate IDOT staff and to Travel Midwest. Duplicate data in the District 1 LCS and the District 1 ACTS are filtered out. Both LCS and ACTS were designed to interface directly with Travel Midwest, and the data can be accessed through an existing XML data feed. IDOT is working with UIC to explore adding a spatial component to ACTS, which could enhance its tracking and mapping capabilities.

Illinois Tollway WZDx

The Illinois Tollway maintains its own WZDx feed, developed to meet FHWA standards. All work zone data originates from the Tollway's in-house LCS, which is managed internally. Field contractors are required to enter both daily and long-term lane closures into the LCS. These entries are automatically imported into the Tollway's Advanced Traffic Management System (ATMS) and uploaded daily to Travel Midwest.

The Tollway's WZDx feed is a direct output of this internal data pipeline. The same WZDx feed is transmitted to both the national WZDx repository and Travel Midwest, with each platform serving as an official endpoint. A data sharing agreement exists with Travel Midwest, which also receives Tollway incident data, dynamic message sign information, and other traffic-related inputs. Any external stakeholders not connected to Travel Midwest must subscribe to access the Tollway's WZDx public data feed.

Traveling Work Zones

IDOT's highway maintenance fleet includes vehicles equipped with Automatic Vehicle Location (AVL) systems. The vehicles are Truck-Mounted Attenuator (TMA) vehicles, and each has a tablet computer that features a "traveling work zone" action button. Drivers activate the button when commencing maintenance activity to identify their location as a work zone. The tablets are connected via the vehicle's radio system, which transmits a code and

GPS coordinates to IDOT's GIS team. After the work zone has been activated, if the truck approaches 40 mph, the tablet will send a stop work zone code and continue sending the code on a 5-minute cadence, if the truck is traveling 40 mph or faster. When the truck slows down again below 40 mph, the tablet will automatically send a start work zone code and continue reporting on the 5-minute cadence. The driver will see no changes on the tablet and the work zone will continually appear as active, staying active until



the driver turns it off. The interface was intentionally designed to minimize visual distractions for the driver. The primary objective of this system is to provide real-time work zone location data. These vehicles operate year-round and switch out maintenance equipment based on seasonal needs.

Currently, the tablets only capture location data. There is potential for additional data types to be incorporated in the future. Data is transmitted via WebSocket to the ArcGIS GeoEvent Server and IDOT's AGO platform, though it is not publicly accessible at this time.

Linear Referencing System

IDOT uses Illinois Roadway Information System (IRIS) key route and stationing as their primary Linear Referencing System (LRS) for planning purposes. IDOT is in the process of migrating this information to an Environmental Systems Research Institute (Esri) Roads and Highways Server, exposing the data via an application programming interface (API) and creating a custom web application for event editing. This data will not include any information pertaining to active work zones or permitting. ITAP currently uses Here Technologies (HERE) data to manage permit requests.

The data in ITAP and Travel Midwest are not currently linked to IRIS. The Texas Transportation Institute (TTI) at Texas A&M University is actively working with IDOT to conflate HERE and the IRIS/Esri LRS.

Connected Work Zones

Many work zones throughout Illinois utilize ITS-connected devices. Although IDOT district staff can access work zone data through the device vendor's portal, this information is not currently used to verify work zone timing and location in the field.

8. WORK ZONE ACTIVITY DATA FLOW

Through extensive interviews and technical discussions with IDOT bureau and district staff, the Illinois Tollway, and partner agencies, the project team developed a picture of how work zone activity data moves from the field to various internal and public-facing systems. Stakeholders described the processes, tools, and handoffs involved in creating, managing, and sharing lane closure and related activity data, revealing both common statewide practices and district-specific variations. This engagement helped map the current "as-is" data flow, from initial entry through permitting systems and databases to traveler information platforms, and identified issues, gaps, and opportunities for improvement.

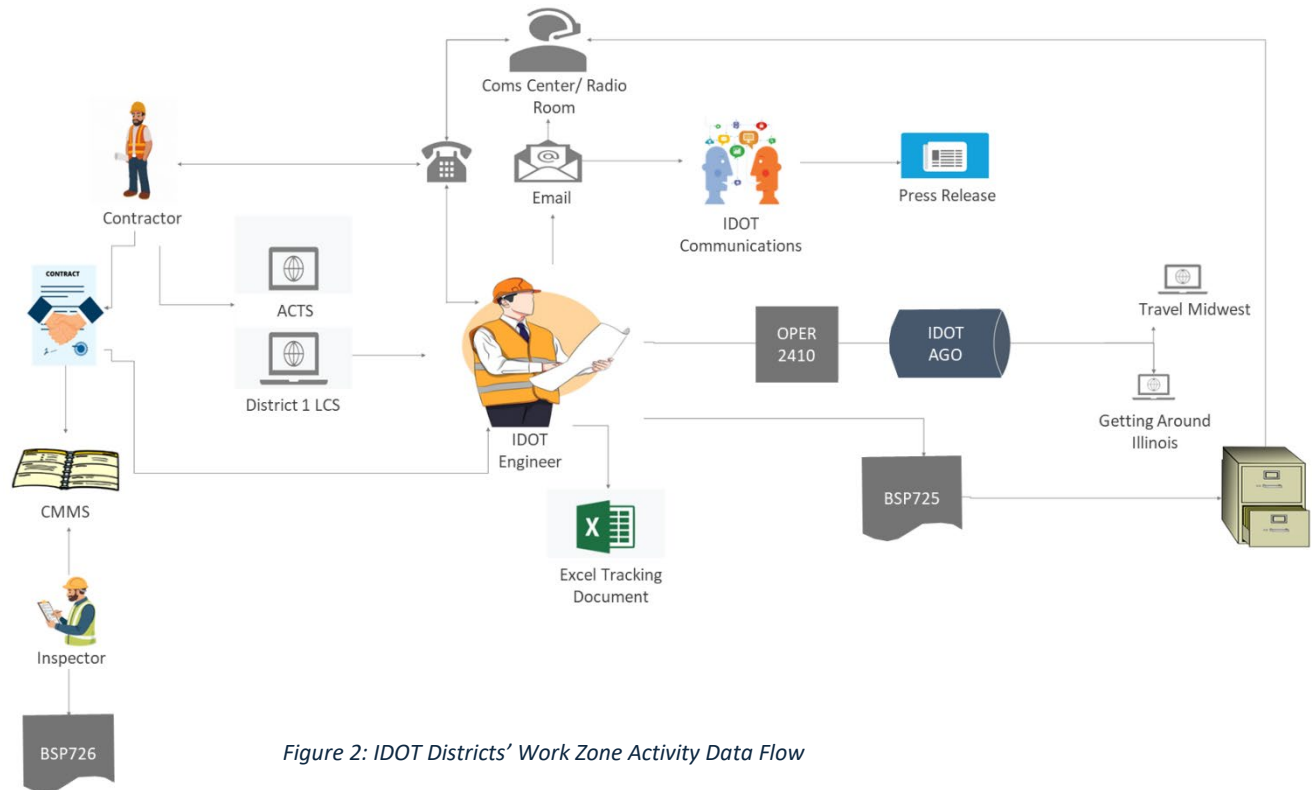


Figure 2: IDOT Districts' Work Zone Activity Data Flow

Recurring Issues and Concerns with Work Zone Data

Across all IDOT districts, stakeholders identified several recurring challenges that impact the consistency, accuracy, and accessibility of work zone activity data. These issues reflected limitations in current systems, variations in district-level practices, and gaps in data collection, tracking, and communication.

Data Entry and Redundancy

Multiple districts reported that OPER 2410 and related forms (BSPE 725/726) require repetitive manual entry. This can result in duplicate records for construction, maintenance, or other permitting actions.

Lack of Real-Time Updates

Current systems do not consistently reflect day-to-day changes in lane closures or detours. Field staff maintain the most accurate knowledge, but updates are not digitized or shared broadly in real time.

Inconsistent Use of Connected Work Zones

CWZ deployments vary widely with some districts using them only for high-ADT projects or emergencies. Access is granted, however, through vendor portals.

Detour Tracking and Mapping Gaps

Detour routes are often noted informally on forms or press releases, but they are not spatially tracked in a centralized database, which limits situational awareness for both internal teams and the public.

System Complexity and Staff Workload

Stakeholders voiced concerns about adding new systems or requirements that could increase the burden on engineering and field staff who are already managing reporting and daily inspections.

Common Ground and Key Differences

While each district operates within its own context, stakeholder feedback revealed several shared priorities, as well as distinct differences in how work zone activity data is managed. The table below highlights areas of consensus and alignment, as well as points of divergence that reflect variation in practices and available resources.

Areas of Consensus	Areas of Divergence
- Recognition that existing manual processes are burdensome and contribute to data gaps. - Agreement on the need for improved real-time work zone data sharing and centralization across districts. - Broad support for leveraging technology (CWZ, GPS-enabled fleet) if it reduces, not adds to, staff workload. - Shared understanding that public traveler information systems need consistent, accurate inputs to build trust and utility.	- Adoption of CWZ across the districts varies in deployment frequency and comfort with data integration. - While most agree system improvements are needed, concerns persist about implementation costs and added workload for field engineers, particularly in districts with fewer staff.

9. POTENTIAL ROADMAP IMPROVEMENTS

Feedback from stakeholder engagement, combined with analysis of current practices, points to several opportunities for strengthening IDOT's work zone data processes. These potential improvements focus on enhancing data consistency, streamlining workflows, expanding digital tools, and supporting more timely and accessible information sharing. The following ideas are intended to inform the development of a practical, scalable roadmap for statewide implementation.

- Centralized Digital Platform***
 A unified system for lane closure data would enable real-time access while reducing reliance on paper forms and individual staff knowledge. While centralization does not depend on perfect data, it sets the stage for ongoing quality improvements that enhance harmonization and provisioning efficiency.
- Integration of CWZ Data***
 Integrating CWZ data would enable automated field verification of work zone activity and facilitate the collection and sharing of traffic speed, queue, and incident data from contractor-deployed devices, thus reducing the need for manual reporting. It would enhance the currently limited work zone performance management by providing real-time work zone conditions.
- Spatial Tracking Enhancements***
 Improved mapping and geocoding for detours and lane closures would increase operational visibility and support more effective public information dissemination.

DATA SUMMARY TECHNICAL MEMORANDUM ATTACHMENTS

- 1: Stakeholder List – available in the ROSA P archive upon completion of project.
- 2: District Interview Questions - available in the ROSA P archive upon completion of project.
- 3: Stakeholder Meeting Minutes - available in the ROSA P archive upon completion of project.
- 4: OPER 2410 Form - available in the ROSA P archive upon completion of project.
- 5: BSPE 725 Form - available in the ROSA P archive upon completion of project.
- 6: BSPE 726 Form - available in the ROSA P archive upon completion of project.

IDOT Work Zone Activity Data (WZAD)

Work Zone Data Hub (WZDH) Technical Memorandum

Prepared for: Illinois Department of Transportation

Prepared by: University of Wisconsin-Madison and Lakeside Engineers

Date: October 8, 2026

Introduction

This technical memorandum documents the data processing framework of the Illinois Department of Transportation (IDOT) Work Zone Data Hub (WZDH). It catalogs the work zone activity data (WZAD) sources ingested by the platform, the processes used to transform and harmonize those data into a common model, and the mechanisms used to provision the data for analysis and dissemination.

The WZDH was developed as a foundational component of the 2022 IDOT SMART Grant to provide a scalable, centralized platform for IDOT work zone activity data management. As a primary outcome of the project, the WZDH serves as the operational engine behind IDOT's Connected Work Zone (CWZ) 1.0 data feed, published to the USDOT Work Zone Data Registry on May 1, 2026. Additional objectives include enabling work zone analysis, performance management, and road user information through standardized data sharing, while accommodating future data sources, technologies, and operational requirements.

A conceptual architecture of the WZDH is illustrated in Figure 1. The hub decouples three primary data processing functions - data acquisition, transformation, and dissemination - enabling scalable integration of multiple WZAD sources and consistent delivery of harmonized outputs. The WZAD sources (inputs) and users (outputs) are described in subsequent sections.

The internal framework consists of three primary components:

- *Ingestion* – The ingestion layer captures WZAD from multiple external source systems using source-specific interfaces and update frequencies. Source data are archived in their original formats to preserve provenance and support traceability. Processes execute on a recurring 5-minute cycle, during which incoming records are compared against previously ingested data to identify new or modified records for downstream processing.
- *Harmonization* – The harmonization layer transforms and integrates ingested WZAD into a unified internal representation that supports consistent dissemination, analysis, and operational use. This layer normalizes attributes across disparate sources, aligns spatial and temporal information, and consolidates related records into a single, statewide view of work zone activity. The harmonized representation is managed through a common data model based on the Connected Work Zone (CWZ) 1.0 standard, extended to support broader

analytical, operational, and historical WZAD needs within IDOT. By decoupling source-specific formats from internal data management and dissemination requirements, the harmonization layer provides a normalized data foundation for downstream processes.

- **Provisioning**– The provisioning layer prepares harmonized WZAD for consumption by external systems and applications. This includes formatting data for real-time APIs, map services, and analytical tools, as well as exporting selected data elements into tabular representations for reporting and analysis. Provisioning services currently operate on a 5-minute cycle to support the two primary dissemination endpoints: the IDOT CWZ 1.0 data feed and the AGO WZAD Analytics Tool.

The WZDH is designed as a lightweight, modular platform that supports incremental addition of new data sources, evolution of the data model, and future operational and analytical applications.

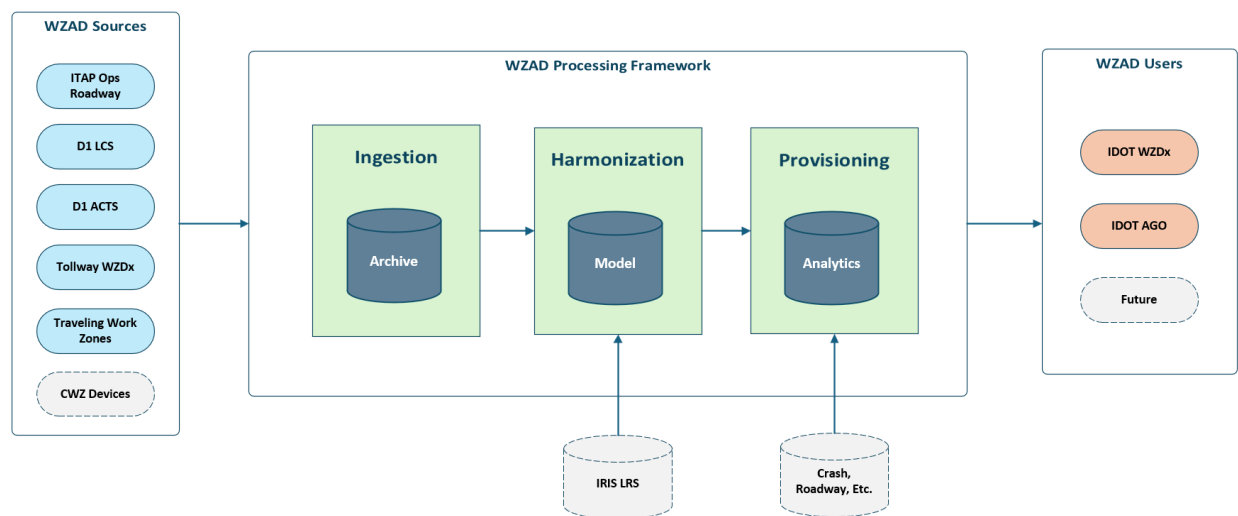


Figure 1. IDOT Work Zone Activity Data Hub (WZDH) conceptual architecture. Components drawn with dashed outlines represent future (planned) development.

The remainder of this document describes the data sources and the processes by which they are retrieved, archived, and transformed to a common data model. Transforming all incoming data into a common representation with known required and optional properties facilitates further processing used to generate exported records suitable for use to generate the CWZ and for other purposes. All processes described are scheduled to run at 5-minute intervals.

WZDH Data Sources

A primary goal of the WZDH was to provide a platform by which different data sources could be integrated into the common model framework without resorting to code changes or direct edits to a database. This is accomplished by a user interface that lets non-technical users define a new data source and connection configuration. The configuration contains the URL and desired update check

frequency as well as credential information dependent on the source including an optional user name and password, API key, and token generation endpoints as shown in Figure 2.

Sources ▾ Tollway WZDx

Connection Configuration

GET ☒

URL

Update Interval

POST ☐

Credentials ☐

Username

Password

Api Key ☐

API Key

URL Param

JWT ☐

Token URL

Refresh URL

Figure 2. Data source connection configuration user interface.

More complicated cases such as XML sources and sources without an accessible URL require configuration beyond that which can be reasonably accommodated in a self-service application. For these cases, additional customization is required to extend the retrieval interface which, as a modular component, plugs directly into the subsequent archiving and harmonization processes.

The WZDH currently ingests five primary work zone activity data sources with the names and access method given in Table 1. A general description of these datasets is provided in the IDOT Work Zone Data Summary Technical Memorandum, developed under Task 2 of the SMART Grant, which documents the available data and their characteristics.

This memorandum complements the Data Summary by documenting how those data are implemented within the WZDH. The descriptions that follow focus on how each source is acquired, structured, and used within the platform to support standardized data sharing and operational use. Data dictionaries for each source are included in the Appendix.

ITAP OPS Roadway Data

The ITAP OPS Roadway Data is maintained by the IDOT Bureau of Information Processing (BIP). This dataset is based on IDOT's electronic OPER 2410 process, which supplies manually approved construction, utility, and maintenance related work zone restriction information to IDOT's oversize / overweight freight permitting system. This data is post-processed through the ITAP geo-spatial database system and is made available to the WZDH through two IDOT AGO data interfaces representing linear and point features. The AGO feature layers are typically updated nightly. The OPS Roadway has similar content to the Getting Around Illinois Dataset – both are derived from the ITAP database, however, OPS Roadway has been created specifically for operational use by the WZDH. BIP has made significant improvements to its quality, consistency, and completeness over the course of the SMART Grant project. It has been observed in practice that the data feed updates daily

Monday through Friday with approximately 1000 features in the points layer and of those, 10 or fewer updates in a given day. The points and lines are complementary and are associated by the “submissionId” which serves as a unique identifier for a given work zone. Where an associated linear feature exists for a work zone represented as intermediary vertices in the points layer, only the linear feature is propagated to subsequent processes. Otherwise, if a work zone event exists in the points layer with no linear feature associated by submission Id, the point event feature is passed for further processing.

D1 Lane Closure System (LCS) Data

The District 1 (D1) LCS data source tracks lane closures on the D1 expressway network. The LCS system is maintained by the University of Illinois – Chicago (UIC) on behalf of D1 and serves as a data source for both operational needs for D1 and information dissemination through the Travel Midwest regional traveler information system. The D1 LCS data is provided to the WZDH in XML format via an *rsync* data exchange interface that was configured by UIC for this project. UIC has plans to eventually provide the XML data over a web service interface. In some cases, D1 LCS entries will prompt OPER 2410 submissions, leading to potential overlap between the D1 LCS and ITAP OPS Roadway data sources. The data retrieval script checks the D1 LCS source hourly and when a new record is detected, an XML to JSON transformer is applied to facilitate ingestion into the WZDH by the same means as the other sources. The data is relatively constant when compared to other sources, with fewer than 10 changes typically occurring over the course of several days.

D1 Arterial Construction Tracking System (ACTS) Data

The D1 ACTS data source tracks construction and utility lane closure requests for arterial roadways in D1. The ACTS systems is maintained by the University of Illinois – Chicago (UIC) on behalf of D1 and serves a similar, complementary role to D1 LCS as a data source for both operational needs and information dissemination through the Travel Midwest regional traveler information system. The D1 ACTS data is provided to the WZDH in XML format via an *rsync* data exchange interface that was established by UIC for this project. UIC has plans to eventually provide the XML data over a web service interface. The XML data is typically updated daily. In some cases, D1 LCS entries will prompt OPER 2410 submissions, leading to potential overlap between the D1 LCS and ITAP OPS Roadway data sources. Both ACTS and LCS are derived from the same source XML structure. The same XML to JSON process as a precursor to further processing described regarding the D1 LCS source applies. Similar to the D1 Source, there may be few or no changes over the course of a day.

Illinois Tollway WZDx Data

The Illinois Tollway maintains a WZDx v4.2 compliant work zone data feed covering tollway operations in D1 and D2. The feed endpoint is published in the USDOT Work Zone Data Registry and is accessible via an API key provided by the Tollway. The Tollway WZDx data feed is incorporated in its entirety into the WZDH, with minor changes to convert the representation into a CWZ 1.0 aligned format. Work zone records in the Tollway WZDx feed are regularly updated. Based on the update times provided in the Tollway WZDx feed, it is observed to update at ten minute intervals. Within the feed, fewer than ten events typically have an update in a given iteration.

Traveling Work Zones Data

Traveling work zone data provide real-time, geo-located activity status from IDOT's highway maintenance fleet. This data source consists of GPS point locations, provided at fixed intervals, that are activated by fleet drivers when commencing maintenance activities. The transmission of points is terminating algorithmically when the maintenance vehicle exceeds 40 mph. This data source is provided to the WZDH by IDOT BIPs via an access restricted AGO layer. As with the other sources, the source feed is polled at 5-minute intervals and any change will be conditionally saved. Different from the other sources, no start- or end-time is provided in the source feed. The start and end time for the traveling work zone event is conservatively set as two hours before or after the feed acquisition time.

CWZ Devices Data (Future)

Connected work zone devices, such as connected arrow boards and location markers, provide an opportunity to implement time and location field verification of scheduled work zones, along with the potential identification of work zone activity not captured by existing data sources. Integrating CWZ devices data into the WZDH is planned for future work.

Data Source	Maintainer	Coverage	Update Frequency	Format	Access Method
ITAP OPS Roadway	IDOT BIP	Statewide	Daily M-F	ESRI Feature Layer	IDOT AGO
D1 Lane Closure System (LCS)	D1 / UIC	District 1	Variable (typically daily)	Custom XML	UIC rsync
D1 Arterial Construction Tracking System (ACTS)	D1 / UIC	District 1	Variable (typically daily)	Custom XML	UIC rsync
Illinois Tollway WZDx	Tollway	District 1	Near real-time	WZDx 4.2	Tollway API
Traveling Work Zones	IDOT BIP	Statewide	Real-time	ESRI Feature Layer	IDOT AGO

Table 1. Summary of the five implemented WZDH data sources.

Data Retrieval

A scheduled task iterates over the configured data sources and connection information to retrieve updates from the source and conditionally creates a new archival record. The first step in this process is to retrieve from the database the most recent archive for a given source. The process exits early if the source specific desired update interval has not yet passed based on a comparison of the system time and the most recent archive record time. The data is then retrieved from the source typically as an HTTP request though the D1 LCS and ACTS sources go through an intermediary step to convert XML sources retrieved by rsync into a JSON structure compatible with subsequent processes used for other sources. The newly retrieved data feed is compared against that of the most

recent record. In cases where a difference is detected, a new archive record is created with a column recording the update time as represented in the feed when available or otherwise the system time. The conditional archive creation prevents unneeded work by subsequent processes during times that source data has not changed.

Common Model Transformation

A key step in the data workflow is to take the work zone entities represented in the source data in disparate formats and convert all to a common structure. While not completed in the first stage of the WZDH, a similar approach will be applied to incoming connected work zone device data under a future project phase. Due to its flexible nature, JavaScript Object Notation (JSON) was selected to describe the structure of the input data, the transformation logic, and the container for the common model output. The JSON schema convention permits definition of the data structure, property types (strings, numbers, dates, etc.), and the distinction between required and optional properties. Tooling allows validation of data against a defined schema and if data is found to be invalid, a readily available report to the reason why should it be a missing child data structure or incorrect property type.

The common model leans heavily on the established schemas available at:

<https://github.com/ite-org/cwz/tree/main/schemas/1.0>

Rather than build custom data structure to contain work zone and connected device information, the CWZ specification provides ready made and vetted structures for each form the basis of our common data model. Complementary data structures capture additional information such as text based locations and scheduling as this does not have a place in the CWZ specification.

Figure 3 shows a high level of the data structure represented a block diagram and a subset of the properties defined in the JSON Schema.

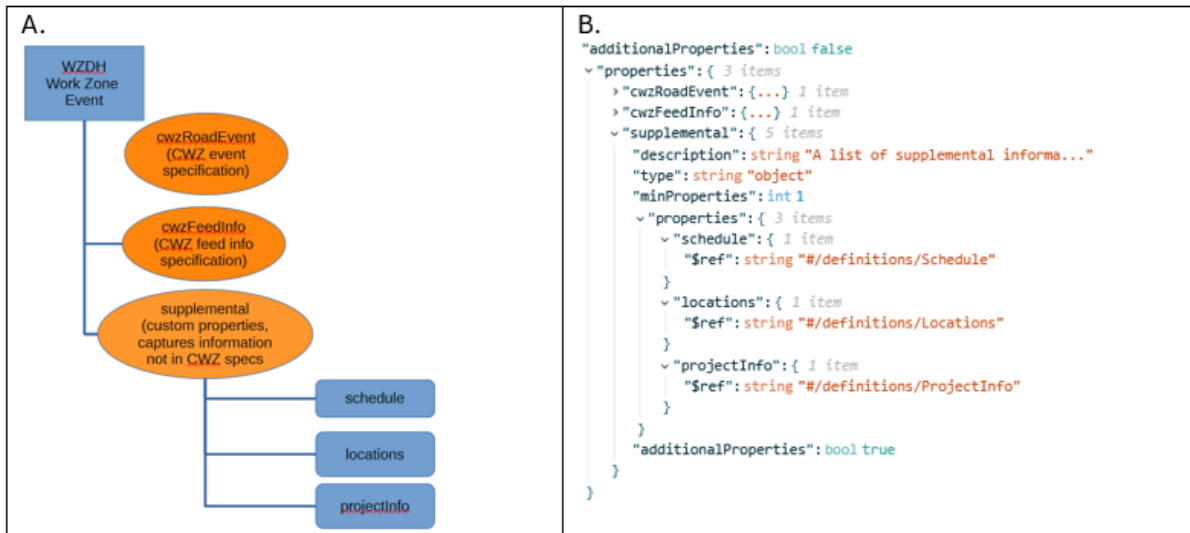


Figure 3. Minimal representation of the common data model represented as A. a block diagram and B. the JSON data schema

The structure of 'cwzRoadEvent' matches that of the CWZ specification. Optional supplemental properties such as the Schedule fully defined in the JSON specification document provide a space for properties not captured by the CWZ specification such as recurring schedules or construction activity by time of day. Such a structure stores and updates a work zone with a recurring schedule as a single entity from which a sequence of CWZ conforming events can be derived specific to the recurrence pattern.

As there is no expectation that the incoming data will have a schema provided, the schema of the source data can be inferred from the data itself. Automated tools inspect a sample of the data for a given source and deduce the structure and property types. Similarly, the common model is represented as a JSON data structure with the schema provided in Appendix 1. Finally the, transformation is defined for each source as a JSON rule set of key-value pairs where the keys correspond to the output structure and properties of the common object model and the values are the mapping to the properties in the source data using a custom syntax to allow descending into nested object structures. Documented post processing functions are triggered by a \$<suffix> flag. For example, a property mapping followed by <property>edata will trigger a custom catch all date processor on the property value as it exists in the data feed such that any date representation (timestamp, text, ...) can be appropriately converted to the format expected by later processes. Documentation for the translation and helper functions is available within the online user interface and also included in Appendix 2.

An interactive user interface has been developed to iteratively test and assure valid common model output of the translation representation. The interface has four columns to assist the user define the translation representation. From left to right in the interface shown in Figure 4 the columns show the common data model definition, either the data source schema an individual feature from the latest retrieval from the corresponding source, the translation definition as JSON key value pairs, and the

output of the translation which updates interactively as the user makes adjustments. A final step allows validation of the defined translation definition before persisting it to the database.

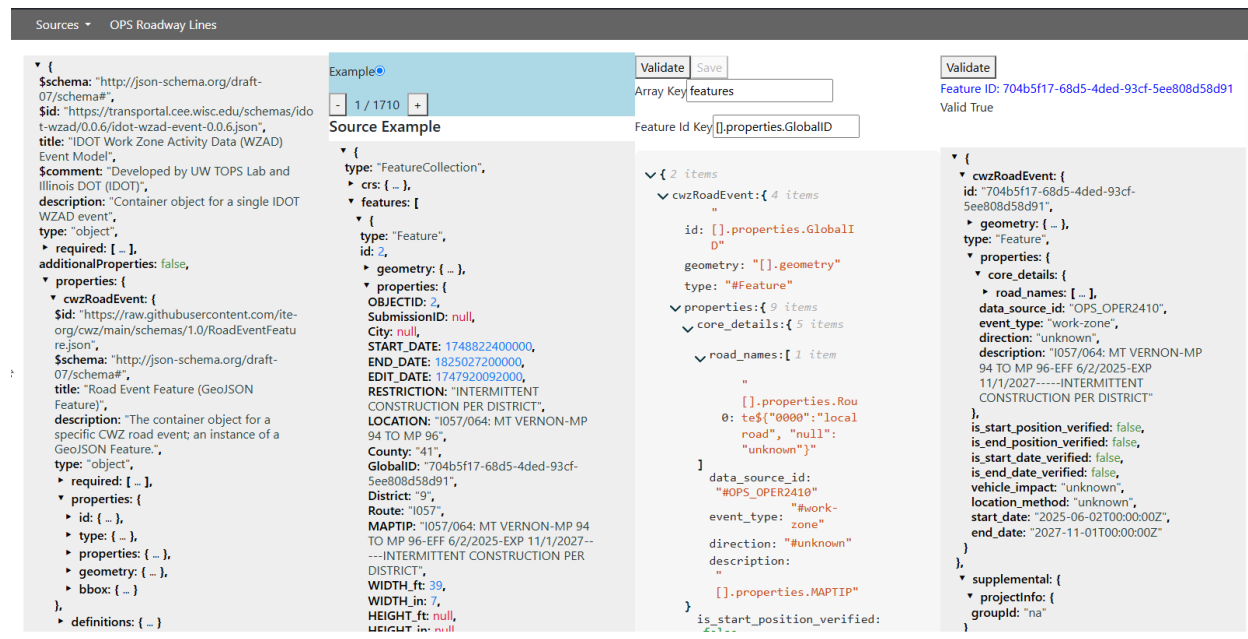


Figure 4. WZDA user interface for development and testing of source to common data model translation definitions.

As with conditional saving of archive records in cases where there has been a change, the same conditional approach is applied to individual road construction events. While the conditional archiving of data feed pulls applies to the source data pull as a whole – it will be different if any of the records has changed – conditional saving of the transformed records applies to the individual road work events. The common model transformation is applied to all records in the source data and saved to a temporary table. A process checks if a given roadway event exists in the transformed records table uniquely identified by an identifier in the source data feed. If it does and is identical in both geometry and properties to a record created by a previously seen data feed pull, no new transformed record is created. Otherwise – if the entity is new or has been updated – a new transformed record row is created uniquely identified by the construction event feature id and an integer record number which is zero for a newly seen feature or incremented by one if an existing feature was updated. The row contains the event information as the JSON common model and lifecycle tracking information such as the origin archive id and a reference to the transformation model that was applied.

Record Export

The flexibility of JSON makes it an ideal container for the common object model with its abundance of optional properties. However, its loose structure does not lend well to performance where a limited subset of required properties are needed or in cases where JSON data is not permitted. An export step was created to facilitate such use cases where a typical relational database table is more appropriate. An export table with a structure defined in the data dictionary in Appendix 3 is populated

by extracting the properties from the JSON common object model. The rows retain the lifecycle tracking information as with the transformed records table along with the columns that can be used by desktop GIS, ESRI map services supporting external applications, and in the interests of synchronization the same table is used to populate the CWZ feed described in the following step.

CWZ Generation

The export table is queried for rows matching the following criteria:

- CWZ flag is complete – this flag is populated during the transformation step and true indicates that the source data contains all required properties of the common data model such as start and end date and the work zone geometry
- The work zone is current – the system time is between the start and end datetimes for the work zone from the source data
- Current – the row is the most recent update for a given work zone event

The CWZ feed is populated from the relevant rows with the data shape conforming to the CWZ specification and ensuring that all required properties have valid values.

CWZ Source Data Snapshot

A snapshot of the IDOT WZDH data sources is provided in Figure 5, taken from June 18, 2026 at 12:00 PM CDT. There are potential overlapping records between the various data sources, in particular the D1 LCS and ACTS data with respect to the OPS Roadway. Methods to identify and merge overlapping WZAD records are still under development.

IDOT Work Zone Data Feed - Data Source Composition

Snapshot: 6/18/2026 12:00 PM CDT

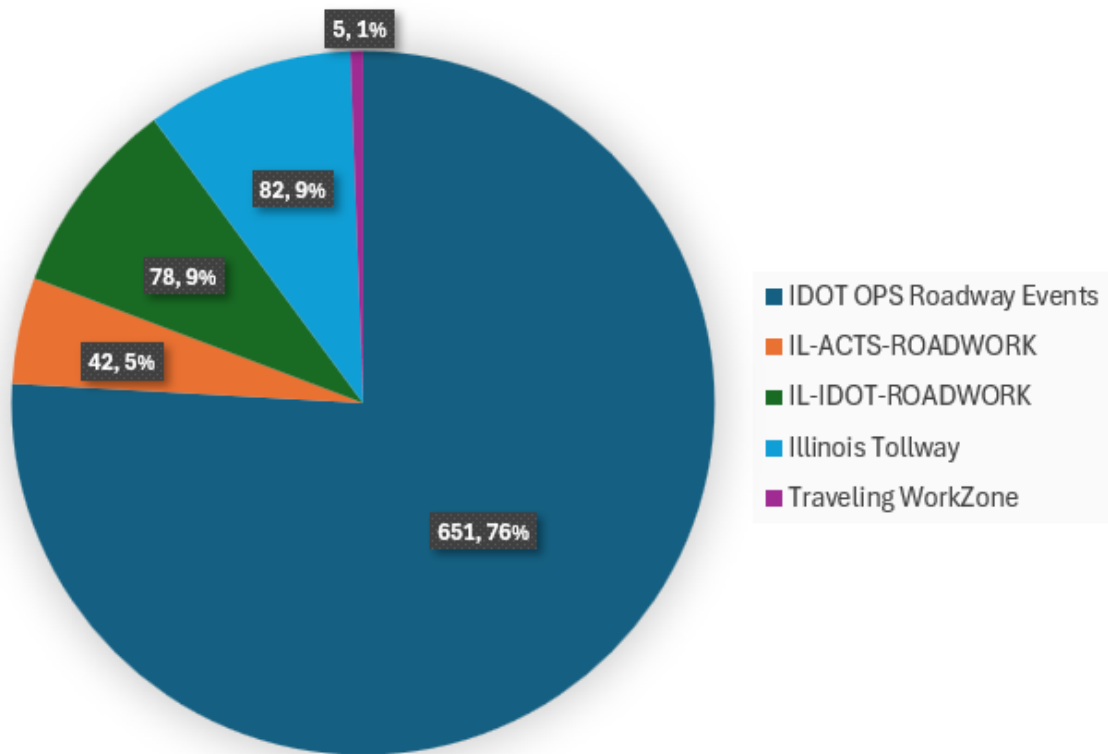


Figure 25. Snapshot of the IDOT WZDH data sources illustrating the overall contribution.

Work Zone Data Hub (WZDH) Technical Memorandum - Appendix

1. Data Model JSON schema – available in the ROSA P archive upon completion of the project.
2. Source to common model transformation documentation - available in the ROSA P archive upon completion of the project.
3. Record export table data dictionary - available in the ROSA P archive upon completion of the project.