



Washington State

Bridge Strike Analysis

Final Report

Prepared for:

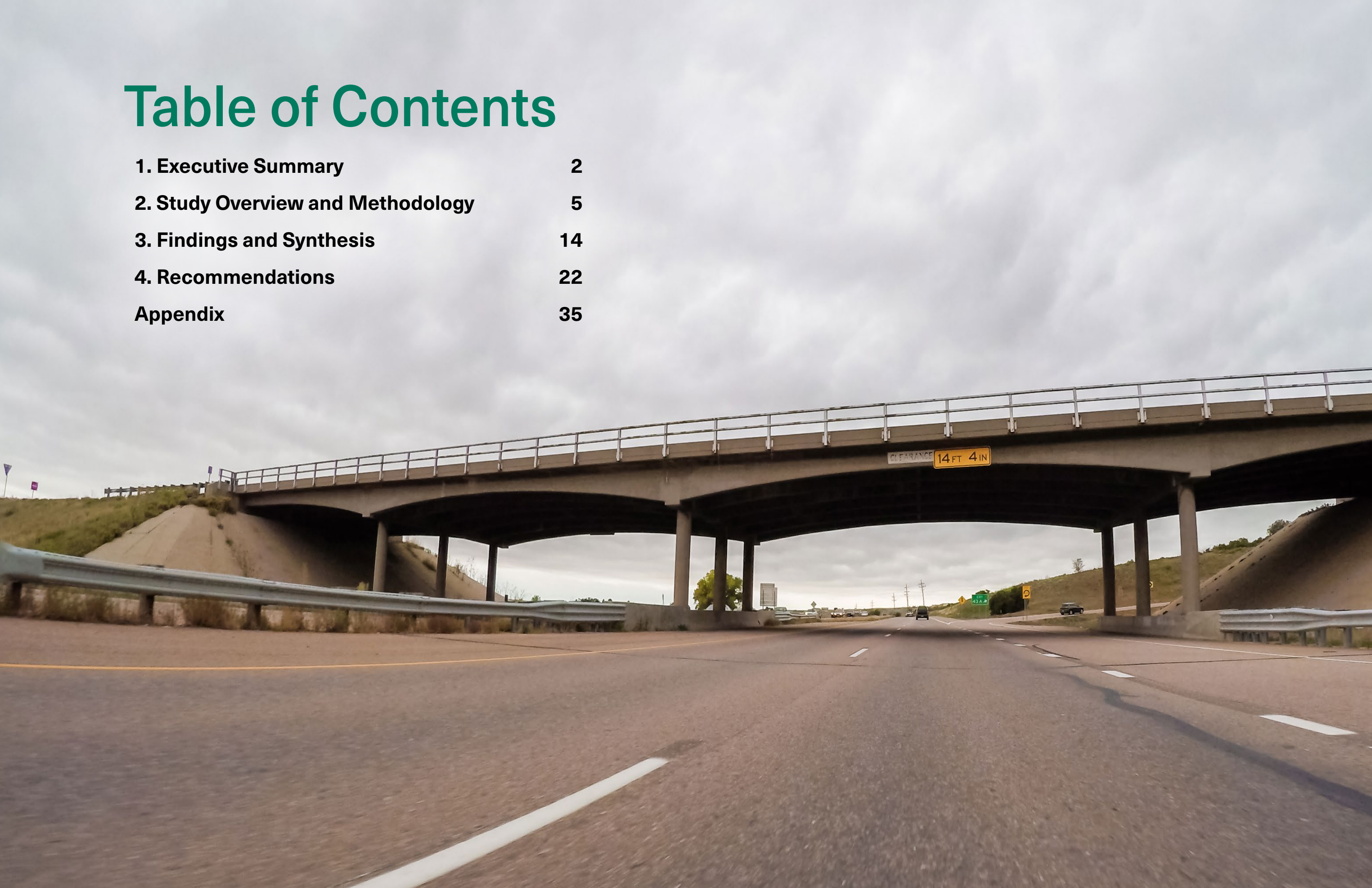
Washington State Department of Transportation

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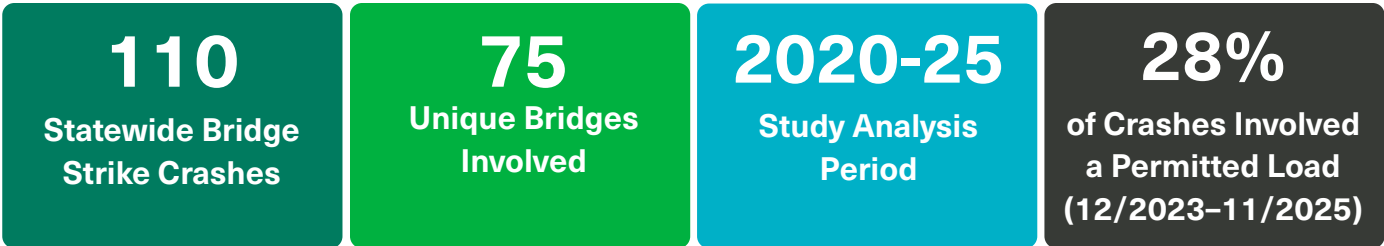


Washington Legislature Proviso Reporting Requirements

The Washington State Legislature directed the Washington State Department of Transportation (WSDOT) within existing resources to analyze bridge strikes around the state during the preceding three years, review best practices used by other jurisdictions and provide recommendations for reducing bridge strikes. The recommendations should address potential physical infrastructure improvements, such as the location, type and height of posted warning signs. Recommendations should also consider driver information and training campaigns, with scalable cost options for each recommendation¹. This Bridge Strike Analysis and Recommendations Report fulfills the Legislature’s reporting requirements by documenting recent bridge strikes, evaluating applicable best practices, prioritizing affected bridges and presenting practical, cost-tiered recommendations for reducing future strikes.

Study Analysis and Findings

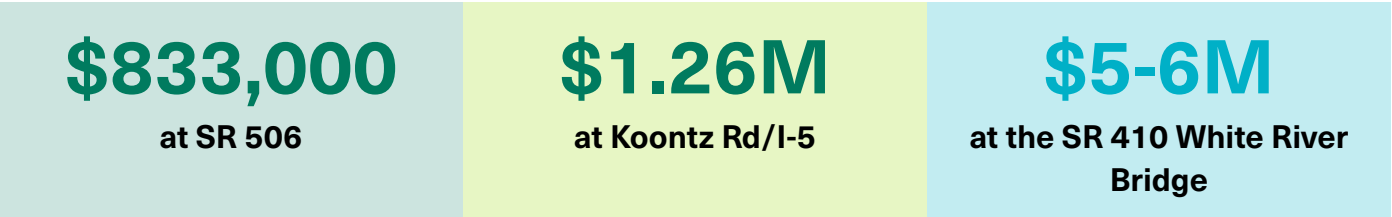
The study integrated crash records, bridge inventory and inspection information, traffic data, oversize and overweight permit records, law enforcement information, repair and maintenance records, partner input, and practices used by transportation agencies elsewhere in the United States. Bridge strikes represented a small proportion of all crashes on state routes, but their consequences were often substantially greater than their frequency suggests. Individual strikes required emergency inspections, lane or roadway closures, traffic control, repairs, and disruptions to freight, rail, transit, and general traffic.



During the available permit data period, 28 percent of crashes involved loads with identified permits; the remaining crashes did not necessarily involve vehicles required to have permits. Review of the permitted-load crash narratives identified multiple contributing circumstances

involving vehicle or load-height verification, load and equipment securement, route adherence, warning response, and other roadway users. This indicates that permit issuance alone does not prevent bridge strikes.

Recent events demonstrate the potential financial consequences. Estimated repair costs included approximately:



Bridge strikes are recurring events at a select number of locations along Tier 1 (T-1) and Tier 2 (T-2) strategic freight corridors in Washington State

Bridge strikes occurred throughout the state and during every year of the study period. However, the incidents were not distributed evenly:

- **21 of the 75** bridges experienced more than one documented strike.
- **Seven** bridges experienced three or more strikes.
- Schoessler Road over I-90 experienced **six** documented strikes, the highest frequency in the study.
- Bridge-strike activity was concentrated along major freight and commercial-vehicle corridors, including **I-5 and I-90**.

 **No single cause or countermeasure explains or addresses every strike**

The study did not identify any single characteristic, driver groups, vehicle types, bridge properties, or roadway conditions responsible for bridge strikes. Rather, strikes commonly resulted from a combination of human-factor decisions, protocols, and existing safeguards.

¹ The 2026 Supplemental Transportation Budget, ESSB 6005, Section 218 (11).

Study Analysis and Findings

Recurring factors for bridge strike crashes included:

A warning was missed or came too late to stop or divert safely.	Dump bodies, booms, lifts, buckets, or other equipment remained elevated.	Cargo shifted or was improperly secured.
A route or navigation application did not account for the vehicle's height.	A permitted vehicle deviated from its approved route.	The maximum height of the vehicle, equipment, or load was not verified.

Most strikes occurred in clear weather, during daylight, and on dry pavement. This indicates that bridge strikes are primarily an operational protocol, routing, vehicle-configuration, and warning-response issue, not principally an adverse-weather issue. **Since the causes vary by event and location, WSDOT should not rely on one statewide technology or install the same treatment at every affected bridge.** The findings instead support a layered strategy combining targeted Education, Enforcement, and location-specific Engineering measures, including a combination of signing or clearance update, an active warning, a physical warning device, in-cab information, or a structural or operational improvement.

The study provides a transparent method for deciding where to begin

The study developed a Bridge Prioritization Index (BPI) for the 75 bridges with at least one documented strike. The BPI combines:

35% Strike history	25% Roadway exposure	25% Bridge vulnerability	15% Potential consequence
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BPI scores ranged from 11.7 to 80.8. The results were:

# of bridges	BPI category	Recommended planning response
3	Highest Priority	Advance to early field verification, diagnostic review, and development of location-specific alternatives.
29	Elevated Priority	Apply foundational actions and systematically review upper-ranked, repeat-strike, low-clearance, and consequence-sensitive locations.
43	Routine Monitoring	Maintain clearance information and signing consistent with applicable standards and agency practices, address identified issues as appropriate, and monitor available event information.

The three locations receiving the highest overall BPI scores are:

- Bridge 5/420 – Light Rail at Lakeview over I-5: BPI 80.8.
- Bridge 5/419 – 47th Avenue SW over I-5: BPI 77.9.
- Bridge 3/105 – Railroad Bridge over SR 3: BPI 71.7.

A high BPI score does not necessarily indicate that a bridge is highly susceptible to structural damage. The index considers strike history, crash consequences, roadway exposure, geometry, and structural consequence. Accordingly, a structurally robust bridge may remain a high-priority location when repeated strikes have caused serious vehicle, occupant, traffic, or operational consequences.

The BPI was developed by the project team as a planning tool, not a structural condition or safety rating. It is intended to identify which WSDOT bridges along major freight corridors should be priority focus areas for bridge strike prevention measures; it does not automatically determine what should be constructed. Field verification and engineering judgment remain necessary before a treatment or funding level is selected. The best-practices review found that transportation agencies commonly use layered approaches incorporating targeted outreach, enforcement, reliable clearance and routing information, active warnings, and site-specific physical measures rather than relying on a single countermeasure. Drawing on these findings, the recommendations are organized around **Education, Enforcement, and Engineering** and grouped into three planning-level cost tiers:

Cost tier	Planning-level range	Intended application
Cost Tier 1 – Low-Cost and Foundational	\$0–\$25,000	The Eastern Transportation Coalition's (TETC) campaign materials; law enforcement questionnaire and officer job aid; clearance and signing audits, including review of sign location, type, mounting height, visibility, condition, and displayed clearance information; static or relocated warning signs; route and turnaround signs; limited rumble strips; vegetation or visibility corrections; clearance-data modifications; permit prompts; in-cab height placards.
Cost Tier 2 – Moderate-Cost Warning, Detection, and Technology	\$25,000–\$250,000	Targeted enforcement details; enhanced education with paid distribution and formal evaluation; flashing signs and beacons; changeable or blank-out signs; fixed event-verification cameras; sensor-based overheight detection; active warning systems; passive hanging chains or clanker assemblies; geofenced in-cab notification pilots; commercial-navigation or telematics partnerships.
Cost Tier 3 – High-Cost and Capital	More than \$250,000	Enhanced overheight vehicle detection systems with sensors, video surveillance, and TMC clearance monitoring; complete clanker installations with dynamic warning systems; protective portals or crash beams; pull-off or turnaround construction; multi-location connected-vehicle corridor deployment; structural protection, bridge raising, roadway lowering, or bridge replacement.

For more information regarding the Cost Tiers, please refer to Section 4.2. These ranges are estimates for planning values. A highest priority bridge does not automatically require a Cost Tier 3 project. The approach to bridge strike countermeasures should involve a location-specific approach that addresses recurring strike mechanisms and provides drivers with a clear, educated, and safe navigation of the bridge clearance area. Higher-cost measures should be considered where strikes persist, existing warnings may not be adequately addressing the recurring strike mechanism, or another strike could cause exceptional structural, safety, mobility, freight, rail, or economic consequences.

Recommended Next Steps

The study recommends that WSDOT take the following actions through its existing bridge, traffic, maintenance, operations, permitting, communications, and safety functions:

- **Field-verify the first group of priority locations:**
Begin with the three highest priority bridges and selected elevated priority and consequence-sensitive bridges. Confirm the controlling clearance, existing signs, sight distance, strike mechanism, ownership, and safe exit, pull-off, turnaround, or diversion options.
- **Evaluate and implement applicable Cost Tier 1 measures.**
Field-verify the controlling clearance and evaluate the location, type, mounting height, visibility, condition, and displayed clearance information of existing warning signs in accordance with applicable WSDOT standards. Address confirmed signing or clearance-information needs through field review.
- **Develop Cost Tier 2 concepts for selected locations.**
Prepare location-specific concepts and planning-level cost estimates for active warnings, physical warning devices, overheight detection, cameras, in-cab notification, or other moderate-cost treatments at repeat-strike locations.
- **Evaluate Cost Tier 3 measures selectively.**
Advance capital alternatives only where recurrence, structural vulnerability, network consequence, or the need to construct a safe stop-and-divert response justifies the investment.
- **Coordinate improvements with existing projects.**
Incorporate bridge-strike mitigation into planned repair, preservation, paving, ITS, traffic, freight, or corridor projects where doing so can reduce cost and accelerate delivery.
- **Improve clearance, routing, and event data.**
Maintain authoritative direction-, approach-, and lane-specific clearance information and improve linkage among crash, bridge, inspection, maintenance, permitting, enforcement, and repair-cost records.
- **Implement targeted education for truck drivers and leverage existing campaign strategies.**
Adapt TETC's "Check Your Height, Know It's Right" materials for Washington. Emphasize verifying vehicle height, lowering equipment, securing loads, using truck-appropriate routing, following permitted routes, and stopping when warned.
- **Implement a bridge-strike event questionnaire for Washington State Patrol (WSP) incident reporting.**
Adapt the TETC/NYSDOT questionnaire to capture information not consistently available in existing records, including vehicle-height knowledge, navigation use, permit compliance, equipment position, warning recognition, and the reason the driver proceeded.
- **Use evidence-based enforcement and accountability.**
Focus enforcement on documented patterns involving permit deviations, raised equipment, load securement, or repeated warning noncompliance. Preserve information needed to support investigation and cost recovery.

- **Collect post-implementation data and assess countermeasure performance.**
Compare pre- and post-treatment strike history, warning activations, driver response, system reliability, inspection and closure effects, and other available measures. Because bridge strikes are relatively infrequent, WSDOT should evaluate treatments over a sufficient period and account for changes in traffic, construction, clearance, and reporting practices.

Practical Direction

The analysis does not support requiring the same technology at all 75 bridges or immediately constructing high-cost projects at every highest or elevated priority location. The sites vary substantially in strike mechanism, bridge type, warning conditions, ownership, approach geometry, and availability of a safe diversion route.

A practical approach would support:

- Field verification and diagnostic evaluation of priority locations.
- Verification and timely improvement of controlling clearance information and warning-sign location, type, mounting height, visibility, condition, and displayed clearance information, consistent with applicable WSDOT standards.
- Development and implementation of selected Cost Tier 2 treatments.
- Preliminary engineering for capital improvements at consequence-sensitive locations.
- Improvement of clearance, routing, questionnaire, and bridge-strike data.
- Post-implementation monitoring and reporting.

The detailed BPI results and initial cost-tier assignments for all 75 bridges are included in the report appendix. These assignments provide a starting point for engineering review and future investment decisions; they are not final project commitments.



2.1 Project Overview

The Washington State Legislature directed the Washington State Department of Transportation (WSDOT) to conduct a statewide evaluation of bridge strike incidents and develop recommendations to reduce future occurrences. In response to this legislative direction, WSDOT initiated this study to better understand bridge strike incidents occurring on the state transportation system, identify recurring patterns observed in available data, review practices implemented by other transportation agencies, and develop practical strategies to support future decision-making.

The study was designed to support WSDOT's reenvisioned agency values, including Safety Always and Think Beyond Today. Ongoing efforts to improve infrastructure resiliency ensure this work helps with future investments in bridge strike mitigation. To accomplish these objectives, the project combined partner engagement, multiple transportation datasets, engineering review, statistical analyses, and a review of national practices. Rather than relying on a single source of information, findings from each project task were integrated to develop a broad understanding of bridge strike issues across Washington State and to inform the development of potential mitigation strategies.



2.2 Bridge Strike Overview

Bridge strikes occur when a vehicle collides with a bridge or other overhead structure because the vehicle exceeds the available vertical clearance or its load extends beyond allowable limits. Although relatively infrequent compared to other crash types, bridge strikes can result in significant operational and infrastructure impacts, including structural damage, roadway closures, traffic delays, costly inspections and repairs, and increased exposure of maintenance personnel and first responders to roadway hazards.

The circumstances leading to bridge strikes are often complex and involve interactions among infrastructure characteristics, vehicle dimensions, cargo securement, routing decisions, driver awareness, permitting practices, and roadway operations. Consequently, transportation agencies generally recognize that no single countermeasure can eliminate bridge strike incidents. Instead, successful mitigation typically requires a combination of infrastructure improvements, operational practices, driver education, and regulatory measures.

Transportation agencies throughout North America have implemented a variety of strategies to reduce bridge strike incidents. These efforts generally fall within the Education, Enforcement, and Engineering (3E) framework commonly used in transportation safety programs.



Education strategies focus on increasing awareness among commercial vehicle operators, motor carriers, and other roadway users through driver training programs, public outreach campaigns, routing guidance, informational materials, and industry partnerships that encourage proper route planning and vehicle height awareness.

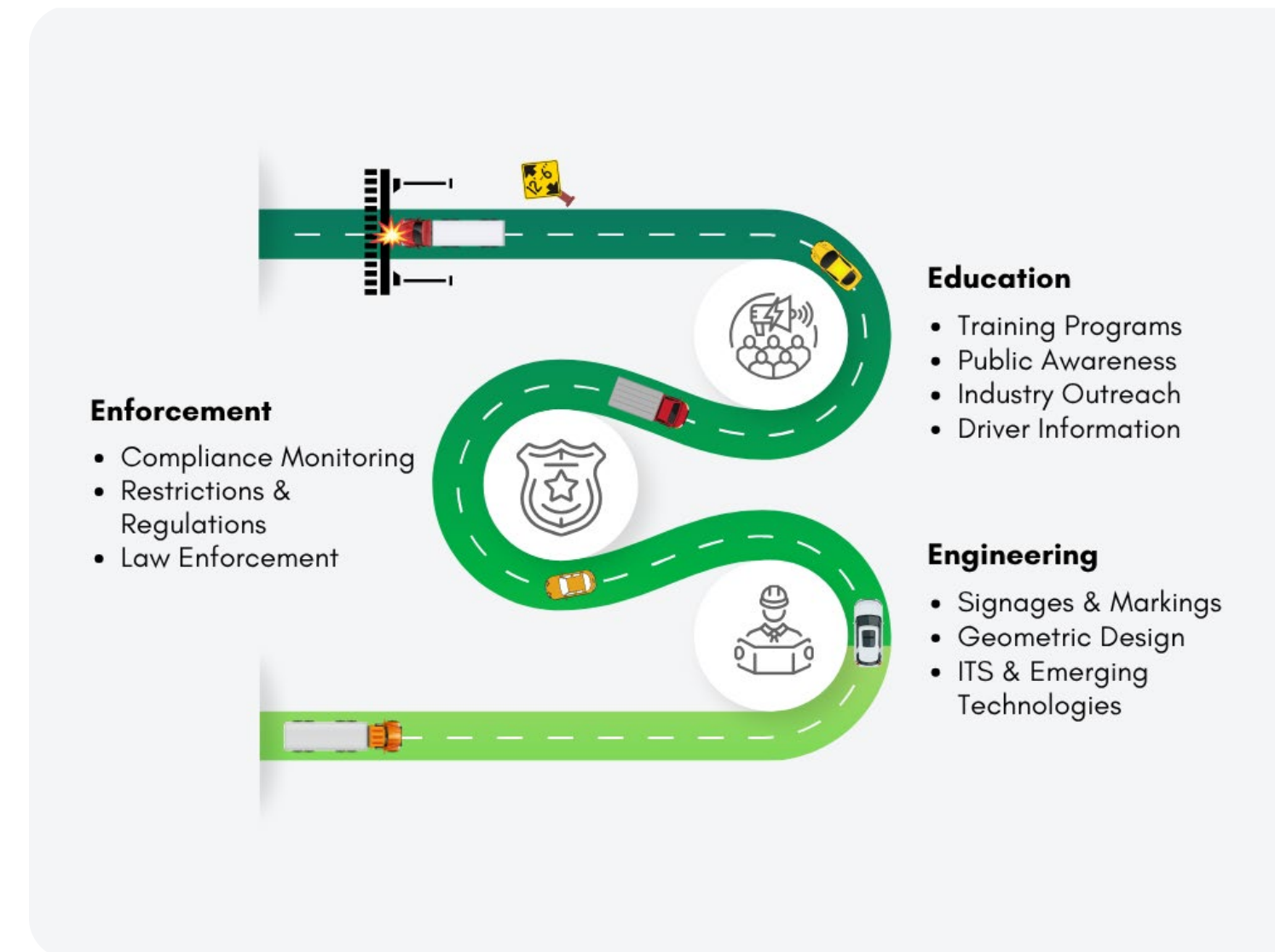


Enforcement strategies emphasize compliance with vehicle size regulations, oversize/overweight permitting requirements, cargo securement standards, commercial vehicle inspections, routing restrictions, and targeted enforcement activities intended to reduce unsafe operating practices.



Engineering strategies include improvements to roadway and bridge infrastructure, warning signage, pavement markings, overheight vehicle detection systems, intelligent transportation system (ITS) technologies, physical bridge protection devices, and roadway design modifications that reduce conflicts between vehicles and low-clearance structures.

Recognizing that bridge strike incidents involve both infrastructure and human factors, this study adopts the **Education, Enforcement, and Engineering framework** as the foundation for organizing the review of existing practices and the development of potential mitigation strategies presented later in this report.



Education, Enforcement, and Engineering (3E) framework

2.3 Study Framework

To address the study objectives, a structured, multi-step framework was developed that integrated **partner engagement, multiple transportation datasets, engineering review, and analytical methods** to support the development of mitigation strategies. The framework was designed to progressively build knowledge throughout the project, with findings from each phase informing subsequent tasks. This approach allowed qualitative insights obtained from partners to complement quantitative analyses and ensured that recommendations were informed by multiple sources of information rather than a single analytical method.

This study consisted of five major phases. The process began with partner engagement to understand current practices, operational challenges, and agency perspectives regarding bridge strike incidents in Washington State. Multiple datasets were subsequently compiled, reviewed, integrated, and prepared to support the study objectives. Following data preparation, descriptive analyses were conducted to summarize bridge strike characteristics, while bridge type assessments and spatial analyses were performed to evaluate infrastructure characteristics and identify locations with recurring bridge strike activity. Building upon these analyses, a bridge prioritization framework was developed to systematically prioritize bridges with recurring strike incidents and identify locations warranting further consideration. Finally, the findings from the partner engagement, data analyses, bridge prioritization framework, and a review of practices implemented by other transportation agencies were synthesized to develop potential mitigation strategies organized within the Education, Enforcement, and Engineering (3E) framework.

Although the study framework is presented as a sequence of five phases, the overall process was iterative. Information obtained through partner engagement informed the data collection and analytical activities, while findings from the analyses guided subsequent partner discussions and the review of national practices. This iterative approach helped ensure that the proposed mitigation strategies considered both the observed characteristics of bridge strike incidents in Washington State and the operational perspectives of agencies and industry partners.



2.4 Partner Engagement

Partner engagement was conducted as the first step of the study to obtain operational perspectives on bridge strike incidents, understand existing practices, and identify challenges associated with bridge strike prevention and response. Since bridge strikes involve multiple transportation disciplines, including commercial vehicle operations, bridge engineering, maintenance, traffic operations, permitting, enforcement, and freight movement, the study sought input from partners representing these different functional areas.

Individual meetings were conducted with representatives from WSDOT divisions, industry organizations, and national transportation partners. Discussions focused on current bridge strike experiences, reporting procedures, permit processes, enforcement practices, operational challenges, driver behavior, infrastructure considerations, and existing mitigation strategies. Partners were also asked to identify opportunities for improving bridge strike prevention through education, enforcement, engineering, technology, and interagency coordination.

Rather than serving as a validation of quantitative analyses, partner input provided valuable operational context that helped guide subsequent phases of the study. The discussions informed the selection of datasets, supported interpretation of crash narratives and bridge damage information, and identified practical considerations that may not be evident from statewide datasets alone. Partner perspectives were also used throughout the development of the recommendation framework to ensure that proposed strategies reflected operational feasibility and implementation considerations.

Six partner meetings were conducted with representatives from WSDOT technical and operational offices, commercial vehicle and driver organizations, a pilot-car training provider, and a regional transportation coalition. The discussions addressed bridge inspection and structural consequences, available data and reporting practices, overheight warning systems, oversize/overweight permitting, pilot-car operations, load measurement and securement, route planning, driver training, industry concerns, and multi-state education and outreach practices.

Partner input provided operational context for the information obtained from crash records, bridge inspection and damage reports, and permit records. The meetings helped identify relevant data sources, explain existing WSDOT procedures, clarify industry and driver practices, and document implementation considerations associated with warning systems, permitting, education, enforcement, and outreach. These perspectives were considered alongside the quantitative and qualitative analyses conducted during later phases of the study.

Partner Engagement Meetings

Partner	Organization	Primary Areas of Discussion
Bridge and Data Divisions	WSDOT	Bridge damage assessment, inspection practices, structural impacts, bridge inventory, and agency perspectives on bridge strike issues
Transportation Operations Division	WSDOT	Existing overheight detection technologies and engineering countermeasures
Permit Dept. & Pilot Car Training Provider (ESC)	WSDOT	Oversize/overweight permitting processes, pilot car operations, and driver training practices
Washington Trucking Associations (WTA)	Industry Association	Industry perspectives on bridge strike causes, operational challenges, and potential mitigation strategies
Owner-Operator Independent Drivers Association (OOIDA)	Industry Association	Commercial driver perspectives on training, technology, routing, and safety practices
The Eastern Transportation Coalition (TETC)	National/Regional Transportation Coalition	Multi-state bridge strike initiatives, public outreach campaigns, and best practices from other agencies

2.5 Data Collection and Preparation

Bridge strike incidents are influenced by a combination of infrastructure characteristics, roadway conditions, vehicle attributes, operational practices, and human factors. Consequently, no single dataset provides sufficient information to fully characterize these events. To support the study objectives, multiple datasets were collected and integrated to capture different aspects of bridge strike incidents, including crash characteristics, bridge inventory information, bridge conditions, permitting records, and partner perspectives.

The primary datasets used throughout the study included:

- Washington State Crash Database
- Police Crash Reports
- WSDOT Bridge Inventory
- Bridge Inspection Reports
- Bridge Damage Reports
- Oversize/Overweight Permit Records (eSNOOPI Pro)

Each dataset contributed unique information that supported different components of the study, ranging from identifying bridge strike locations and understanding crash circumstances to evaluating bridge characteristics and reviewing existing mitigation practices.

2.5.1 Crash Data

The WSDOT Collision Portal served as the primary source for identifying bridge strike crashes included in this study. Crash records covering approximately six years (01/01/2020 to 11/30/2025) were obtained and filtered using the “First Object Struck” variable to identify crashes involving the underside of a bridge. A six-year analysis period was used instead of three years to increase the sample size of bridge strike events, providing a more robust dataset and improving the reliability of the analysis given the relatively low frequency of crashes.

Following the initial screening, the Vehicle Type and Commercial Vehicle Class variables were reviewed to verify that the crashes involved vehicles relevant to the study. Police crash reports were

subsequently examined to confirm bridge strike events and verify records with incomplete or ambiguous vehicle classifications. During this verification process, six crashes were excluded because they did not involve impacts with low-clearance bridge structures. The resulting dataset was used for subsequent analyses.

2.5.2 Police Crash Reports

Police crash reports were reviewed for all bridge strike crashes included in the study to verify collision circumstances and supplement information available in the crash database. The narrative descriptions and collision diagrams provided additional details regarding vehicle operations, cargo characteristics, driver actions, routing decisions, and crash circumstances that were not captured within the coded crash records. These qualitative findings supported the interpretation of the analytical results presented later in the report.

2.5.3 Oversize/Overweight Permit Data

Oversize and overweight permit information was obtained from eSNOOPI Pro (Electronic System Network for Oversize and Overweight Permit Information), WSDOT’s web-based permit management system used to issue and manage oversize/overweight vehicle permits. Vehicle Identification Numbers (VINs) obtained from the crash database were queried within eSNOOPI Pro to determine whether vehicles involved in bridge strike crashes were operating under an active permit at the time of the incident. Permit information was then used to distinguish permitted and non-permitted movements and to support the evaluation of bridge strike characteristics.

2.5.4 Bridge Inventory, Inspection, and Damage Data

Three bridge-related datasets were obtained from WSDOT to support the evaluation of infrastructure characteristics associated with bridge strike incidents. These datasets included bridge inventory information, bridge inspection records, and documented bridge damage reports.

Bridge inventory data provided structural and roadway characteristics for bridges included in the study, such as bridge type, year built, roadway functional classification, vertical clearance, span configuration, and other physical attributes. These variables were used to examine bridge characteristics associated with bridge strike occurrences.

Bridge inspection reports and bridge damage records were reviewed to identify documented impacts resulting from bridge strike incidents. These records provided information regarding the location and nature of observed damage, inspection findings, and maintenance activities following strike events. The information was also used to compare documented bridge damage with crash records and improve understanding of the infrastructure impacts associated with bridge strikes.

Where applicable, bridge inventory information was linked with crash locations to support subsequent descriptive and statistical analyses.

2.5.5 Data Preparation

Before analysis, each dataset underwent a preparation process to improve consistency and ensure that only records relevant to the study objectives were included. This process included reviewing data completeness, removing duplicate records, filtering non-relevant events, standardizing variable formats, and preparing datasets for subsequent spatial, descriptive, and statistical analyses. Where appropriate, information from multiple datasets was linked using common identifiers or geographic locations to support integrated analyses.

These preparation activities resulted in a consolidated analytical database that supported the descriptive analyses, spatial evaluations, and statistical modeling conducted as part of this study.

2.6 Data Review and Analysis

Following data preparation, analytical methods were applied to examine bridge strike incidents from different perspectives. The analysis included spatial review of bridge strike locations, descriptive summaries of crash and bridge characteristics, detailed review of crash narratives and supporting records, a bridge type and structural consequence assessment, and the development of a bridge prioritization framework to identify structures with the greatest potential need for future mitigation measures. Each method served a different purpose: descriptive and spatial analyses documented observed patterns, record reviews provided operational context, the bridge type assessment examined differences in potential structural consequences, and statistical models explored relationships within the available data.

Each analytical component served a distinct purpose. Descriptive analyses characterized the overall bridge strike dataset and identified recurring trends, while spatial analyses highlighted locations experiencing repeated incidents. Crash narrative reviews provided additional context regarding the operational circumstances surrounding bridge strikes that could not be captured through coded crash variables alone. The bridge type assessment evaluated how structural configuration may influence the consequences of bridge strikes, and the bridge prioritization framework combined multiple infrastructure and operational characteristics to support the identification of bridges that may warrant further evaluation for mitigation measures. Collectively, these analyses established the technical basis for the findings presented in Section 3 and informed the development of the mitigation strategies described in Section 4.

2.6.1 Spatial and Location Analysis

A spatial analysis was conducted to examine the geographic distribution of bridge strike crashes across Washington State and to identify locations with recurring bridge strike incidents. Crash locations were mapped using their recorded geographic coordinates and reviewed in conjunction with the state highway network.

To support this review, bridge strike crashes were aggregated by location, and the frequency of crashes at each bridge was summarized. A spatial density map was then developed to visualize the distribution of bridge strike incidents and identify locations with relatively higher concentrations of crashes. Bridges experiencing multiple bridge strike crashes during the study period were identified as priority locations for further review.

The spatial analysis was intended to provide geographic context for the statewide distribution of bridge strike incidents and to support subsequent evaluation of bridge characteristics and development of mitigation strategies.

2.6.2 Descriptive Analysis

Descriptive analysis was conducted to summarize the characteristics of the verified bridge strike crashes and the bridges associated with those events. Frequencies and distributions were developed for variables related to crash timing and location, crash severity, driver and vehicle characteristics, and roadway and environmental conditions.

The descriptive analysis was used to identify recurring characteristics within the study dataset and guide the subsequent review of crash locations, narratives, bridge records, and statistical results. Given the limited number of verified bridge strike crashes, the observed distributions were interpreted as patterns within the study period rather than evidence of causal relationships.



2.6 Data Analysis Methodology

2.6.3 Bridge Type Structural Consequence Assessment

A separate bridge engineering assessment was conducted to examine how the consequences of an overheight vehicle strike may vary among bridge structural systems. The assessment focused on overhead structures associated with WSDOT Tier 1 and Tier 2 freight corridors and used the bridge inventory Span Type classification to identify and group the principal structural systems represented in those corridors. Two crossing conditions were considered: a Tier 1 or Tier 2 roadway passing beneath another bridge and other structures, such as pedestrian or railroad bridges, crossing above a Tier 1 or Tier 2 corridor.

The assessment used a screening-level, consequence-based framework that considered five components:

- **Structural vulnerability:** Sensitivity of the bridge system to impact damage
- **Structural redundancy:** Ability to redistribute load following damage
- **Repair complexity:** Anticipated effort required to restore capacity
- **Operational impact:** Traffic and freight disruption associated with damage
- **Strike exposure:** Likelihood of impact based on clearance and corridor characteristics

Each component was assigned a planning-level score from 1 to 5, with the combined score used to classify structures into **low, moderate, high, or critical** structural-consequence categories. The total structural-consequence score was calculated as the sum of the five component scores, resulting in a range of 5 to 25. The framework was intended to differentiate structures where a strike could result in greater structural damage, repair difficulty, safety concerns, or freight disruption; it was not intended to estimate the probability that a strike would occur.

Structural Consequence Scoring Matrix

Total Score	Structural Consequence Category	Description
20-25	Critical	High consequence; potential for severe structural damage and major network disruption
15-19	High	Considerable damage and operational impacts likely
10-14	Moderate	Repairable damage with generally localized operational impacts
<10	Low	Limited structural and operational consequences

Bridge types were grouped according to their expected response to vehicle impacts, typical damage mechanisms, and consequences of localized member damage. The assessment included **prestressed concrete girders, steel girders and steel box girders, concrete box girders, conventional reinforced concrete systems, steel trusses, steel tied arches, and bridges carrying railroad traffic over state routes**. The engineering memorandum identified prestressed concrete girder systems, certain steel girder systems, through trusses, and tied arches as structural types warranting greater attention where reduced clearance, high freight exposure, limited redundancy, or previous strike history is also present. Concrete box girders and bridges carrying heavy railroad traffic were assigned a Low structural-consequence category because significant damage to these superstructures from overheight vehicle strikes is uncommon.

The bridge type assessment was incorporated into the broader prioritization framework through the Structural Consequence variable. This allowed the prioritization process to consider not only historical strike frequency and exposure-related characteristics, but also the potential severity of structural and operational consequences if a future strike occurred. This assessment is a comparative screening tool and does not replace site-specific structural evaluation, load-rating analysis, field inspection, or engineering judgment.

Structural Consequence Component Scoring

Total Score	1 (Low)	3 (Moderate)	5 (High)
Structural Vulnerability	Cosmetic/local damage expected	Local Structural Damage possible	Primary load path highly vulnerable
Redundancy	Multiple alternate load paths	Limited redundancy	Fracture-critical/nonredundant
Repair Complexity	Minor patching, local repair	Partial member repair	Span replacement or major strengthening
Operation Impact	Local short-duration closure	Regional traffic impacts	Major freight corridor disruption
Strike Exposure	High clearance/low truck volume	Moderate exposure	Low clearance/high freight exposure

2.6 Data Analysis Methodology

2.6.4 Bridge Prioritization Framework

Bridge Prioritization Index (BPI) was developed to systematically identify bridges where bridge strike mitigation efforts are likely to provide the greatest benefit. Because funding and agency resources are limited, the framework provides a transparent and repeatable method for evaluating bridges based on both observed bridge strike history and characteristics that influence the likelihood and consequences of future bridge strikes.

The framework was applied to the 75 bridges included in this study that experienced at least one documented bridge strike between January 2020 and November 2025. Rather than relying solely on strike frequency, the BPI evaluates multiple dimensions of bridge strikes, including crash history, roadway exposure, structural vulnerability, and the potential consequences of future bridge strikes.

The objective of the BPI is to support engineering decision-making by identifying candidate locations for additional evaluation and mitigation. The prioritization is intended as a planning tool and should not be interpreted as a measure of structural adequacy or bridge safety.

Framework Development

The prioritization framework was developed using four guiding principles:

- Emphasize locations with recurring bridge strike history
- Account for roadway characteristics that increase exposure to overheight vehicles
- Consider bridge characteristics associated with greater susceptibility to damage
- Recognize the operational and structural consequences associated with future bridge strikes

Evaluation variables were selected based on the crash data analysis, bridge inventory data, partner input, and engineering judgment. Selection was limited to variables that could be

consistently obtained for all bridges included in the study. To improve transparency and repeatability, each variable was assigned a standardized score using thresholds based on observed data distributions, existing engineering guidance, or documented bridge characteristics.

Bridge Prioritization Dimensions

The Bridge Prioritization Index consists of four dimensions:

Dimension	Weight
Strike History	35%
Exposure	25%
Vulnerability	25%
Consequence	15%

Greater weight was assigned to strike history because documented bridge strike occurrences provide direct evidence of recurring operational issues. The remaining dimensions provide additional context regarding exposure, structural susceptibility, and the potential impacts associated with future bridge strikes.

Evaluation Variables

Strike History (35%)

The strike history dimension evaluates both the frequency and recency of documented bridge strikes.

Variable	Scoring Method	Basis for Inclusion
Number of Bridge Strikes	1 strike = 0 points; 2 strikes = 1 point; 3–4 strikes = 2 points; 5 or more strikes = 3 points	Repeated bridge strikes indicate recurring operational conditions that have not been resolved.
Years Since Most Recent Strike	0–1 years = 3 points; 2 years = 2 points; 3 years = 1 point; 4 or more years = 0 points	Recent bridge strikes are more likely to reflect current roadway conditions than older incidents.

Considering both frequency and recency allows the framework

to distinguish between isolated historical events and locations experiencing ongoing bridge strike activity.

Exposure (25%)

Exposure represents the volume of traffic traveling beneath each bridge and the corresponding opportunity for bridge strike occurrences.

Variable	Scoring Method	Basis for Inclusion
Under-Road AADT	Quartile-based scoring using the study bridge dataset	Zero heavy vehicles = 0 points; positive values grouped into three data-derived categories (tertiles)
Heavy Vehicle AADT	Zero heavy vehicles = 0 points; positive values grouped into three data-derived categories (tertiles)	Commercial vehicles account for the majority of documented bridge strikes. Higher truck volumes therefore increase exposure to overheight vehicles.

Quartiles and tertiles were selected because they reflect the distribution of the study dataset rather than arbitrary thresholds, allowing bridges to be evaluated relative to one another.

Vulnerability (25%)

The vulnerability dimension evaluates bridge characteristics that influence the likelihood or severity of structural impacts.

Variable	Scoring Method	Basis for Inclusion
Vertical Clearance	<15.0 ft = 3 points; 15.0–<16.0 ft = 2 points; 16.0–<16.5 ft = 1 point; ≥16.5 ft = 0 points	Lower clearances provide less tolerance for overheight vehicles. The 16 ft 6 in threshold is consistent with current roadway design guidance referenced in the Bridge Office memorandum.
Geometry Modifier	Add 1 point when bridge skew is ≥30 degrees or the bridge is curved	Skewed and curved bridges may reduce driver sight distance and available clearance, increasing operational complexity. Because geometry is considered a secondary influence, it is included only as a limited modifier.

2.6 Data Analysis Methodology

Evaluation Variables

Consequence (15%)

The consequence dimension evaluates the potential impacts associated with future bridge strikes.

Variable	Scoring Method	Basis for Inclusion
Highest Recorded Crash Severity	No apparent injury/Unknown = 0; Possible = 1; Minor = 2; Serious/Fatal = 3	Represents the most severe recorded crash outcome at the bridge.
Network Importance	Functional classification establishes the base score; National Highway System (NHS) or National Highway Freight Network (NHFN) designation may increase the score, up to a maximum of 3 points	Bridges located on critical transportation corridors may experience greater operational impacts if inspections or closures are required.
Structural Consequence	Low=0; Moderate=1; High=2; Critical=3; Unclassified=1	Structural consequence categories were developed from the Bridge engineering assessment and reflect the anticipated complexity of inspection, repair, or replacement following a bridge strike. Mixed span bridges were assigned the highest applicable consequence category. Bridges carrying heavy railroad traffic were assigned a Low category based on their design for substantially greater rail loads and the finding that significant superstructure damage from overheight vehicle strikes is uncommon.

Composite Scoring

Each evaluation variable was assigned a standardized score. Scores within each dimension were combined and normalized according to the dimension weights to produce a Bridge Prioritization Index ranging from 0 to 100, with higher values indicating greater relative priority for diagnostic evaluation and potential mitigation. The weighting approach intentionally emphasizes observed bridge strike history while ensuring that roadway exposure, structural vulnerability, and potential consequences are also considered during prioritization.

Priority Categories

Following calculation of the Bridge Prioritization Index, bridges were grouped into three priority categories.

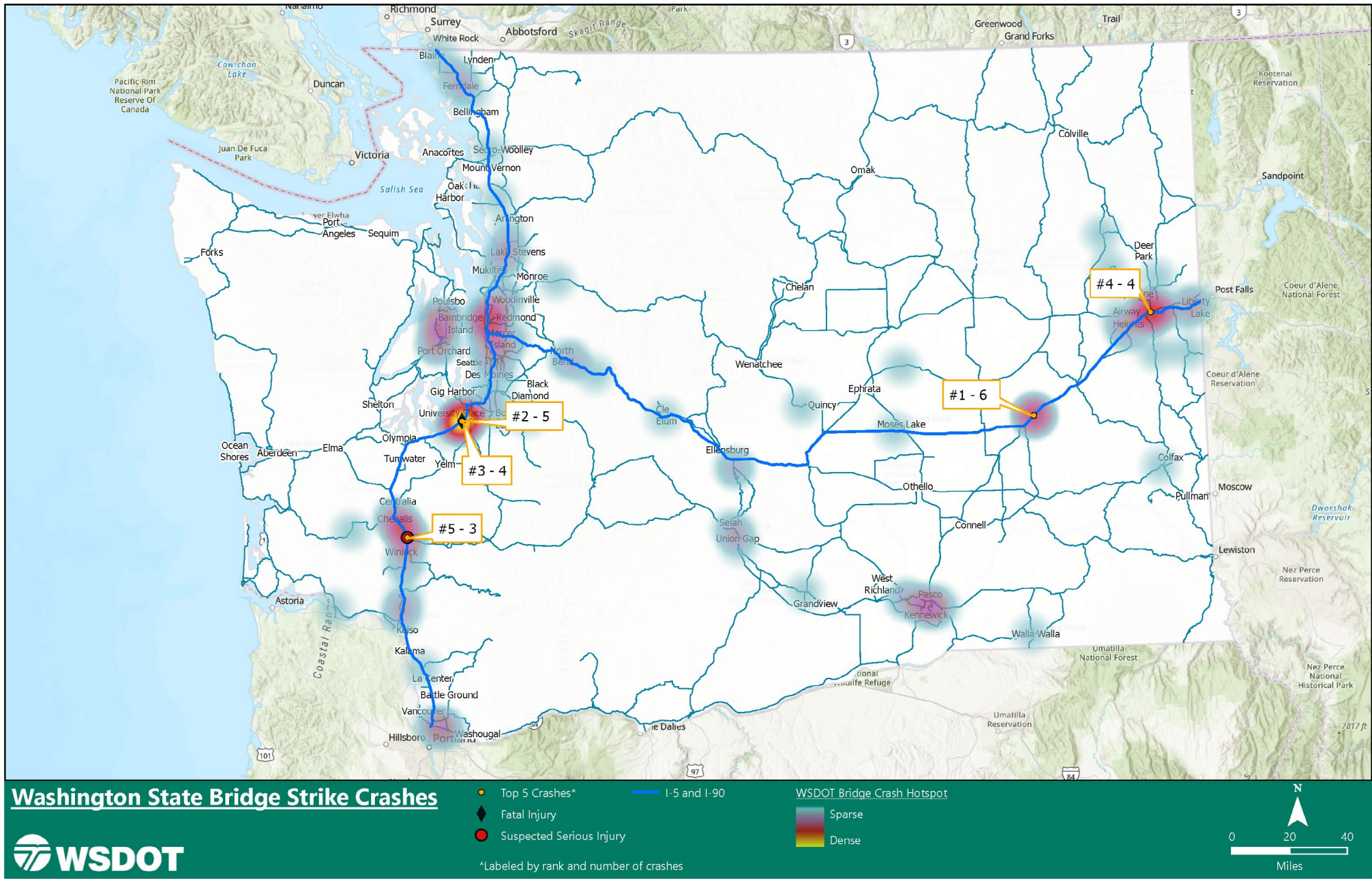
Priority Category	BPI Score
Highest Priority	≥70
Elevated Priority	40–69.9
Routine Monitoring	<40

These thresholds were selected to distinguish bridges exhibiting multiple priority-related characteristics while maintaining a practical number of candidate locations for future engineering evaluation. The categories are intended to support planning and prioritization and should not be interpreted as indicators of structural condition or safety.



3.1 Spatial Distribution of Bridge Strike Crashes

The locations of bridge strike crashes were analyzed to identify places where crashes happened repeatedly. Crash locations were mapped across Washington, and a spatial analysis was used to find areas with bridge strike clusters. Most bridge strike crashes occurred along Washington’s major freight routes, especially interstates 5 and 90, as well as several state highways in urban and industrial areas. Although most bridges were struck only once during the study period, some locations had repeated crashes. This suggests that factors such as bridge design, road layout or traffic conditions may increase the likelihood of bridge strikes at those sites. Seven of the 75 bridges experienced three or more documented strikes during the study period. The highest number occurred at Interstate 90 and Schoessler Road, where six crashes were recorded. Other locations with repeated bridge strikes included Interstate 5 at the train overpass (five crashes), Interstate 5 at 47th Avenue SW (four crashes), State Route 2 at the North Division Street railroad overpass (four crashes), and SR 12 at Koontz Road (three crashes). While bridge strikes occurred throughout the state, repeated crashes were concentrated at only a few locations. This suggests that targeted improvements at these higher-priority locations may be more effective than applying the same countermeasures to all bridges.



Top 5 Locations based on Frequency

#	# of Bridge Strike Crashes	Locations
1	6	I-90 @ Schoessler Rd
2	5	I-5 @ Train Overpass (MP 126.41)
3	4	I-5 @ 47th Ave SW
4	4	SR2 (N Division St @ Train overpass (Sprague Ave))
5	3	SR12 @ Koontz Rd

Spatial Distribution of Washington State Bridge Strike Crashes

3.2 Crash Characteristics

A total of 110 bridge strike crashes involving commercial vehicles were identified on Washington State routes between January 2020 and November 2025. During the same period, more than 268,000 reportable crashes occurred on the state highway system, indicating that bridge strikes represent a relatively small proportion of all crashes. Despite their low frequency, these incidents have the potential to result in significant infrastructure damage, traffic disruption, and costly repairs.

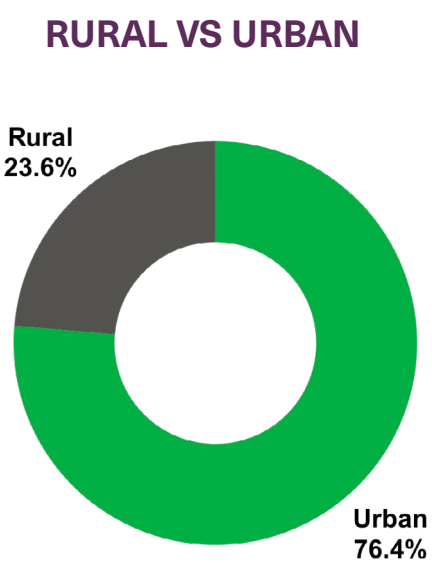
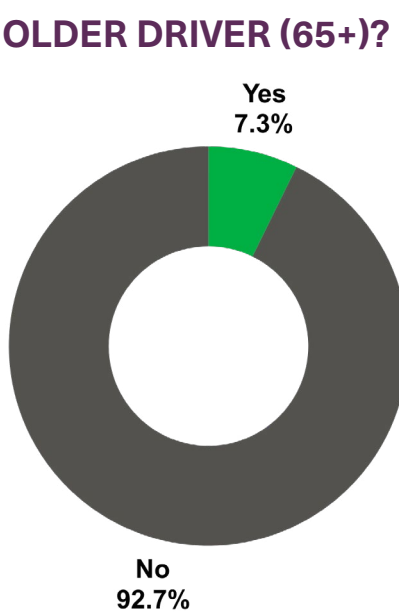
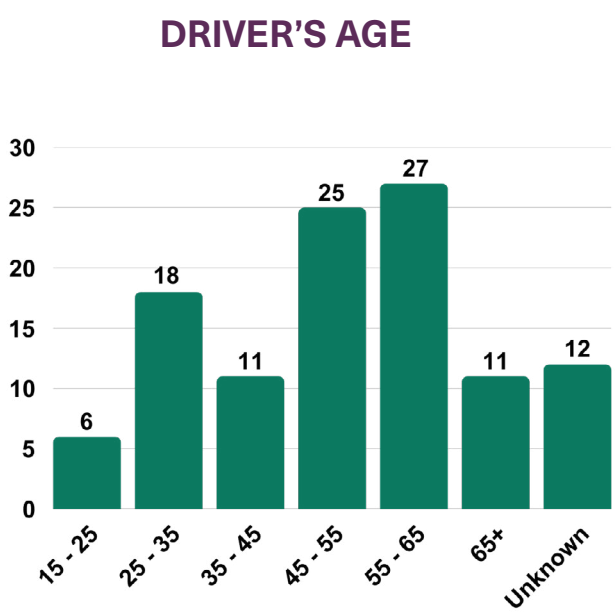
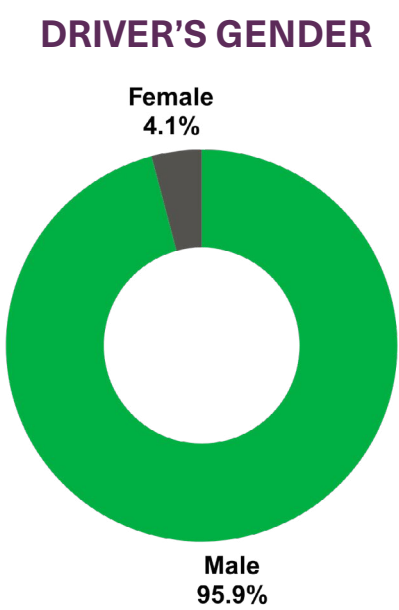
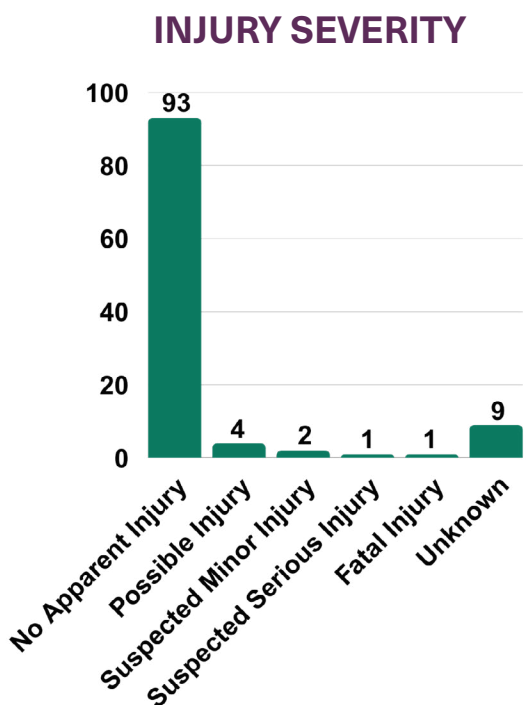
The annual number of bridge strike crashes ranged from 10 to 26 incidents per year, with the highest number occurring in 2021. Although bridge strike frequencies varied from year to year, incidents were observed consistently throughout the study period, indicating that bridge strikes remain an ongoing operational issue rather than isolated events. Only one fatal bridge strike crash occurred during the study period (2024). Most bridge strike crashes resulted in property damage or minor injuries; however, many incidents required bridge inspections, lane closures, or temporary traffic control measures that are not reflected by crash severity alone.

Descriptive analyses were performed to better understand the characteristics of bridge strike crashes, including driver demographics, vehicle types, crash conditions, roadway characteristics, and environmental factors. The objective was to identify recurring patterns that could provide additional context for the development of mitigation strategies.

As mentioned earlier, most bridge strike crashes resulted in property damage only, with 93 of the 110 crashes involving no apparent injury. Four crashes resulted in possible injuries, two resulted in suspected minor injuries, one resulted in a suspected serious injury, and one crash resulted in a fatality. The majority of bridge strike crashes involved male drivers (95.9%), reflecting the demographic composition of the commercial trucking industry. Drivers between 45 and 65 years of age represented the largest proportion of bridge strike crashes, accounting for nearly half of all incidents. Older drivers (aged 65 years or older) were involved in approximately 7 percent of bridge strike crashes. Approximately 76 percent of crashes occurred in urban areas, while the remaining incidents occurred in rural locations.

Summary of Crashes

Year	Total State Route Crashes	Bridge Strike Crashes	Fatal Crashes
2020	38,724	19	0
2021	48,174	26	0
2022	47,403	21	0
2023	48,172	10	0
2024	48,711	20	1
2025 (through Nov)	37,102	14	0
Total	268,286	110	1

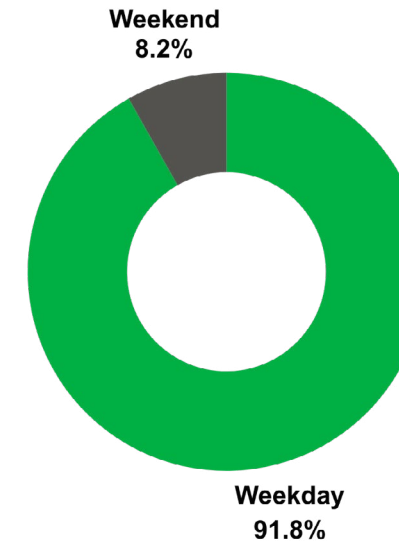


3.2 Crash Characteristics

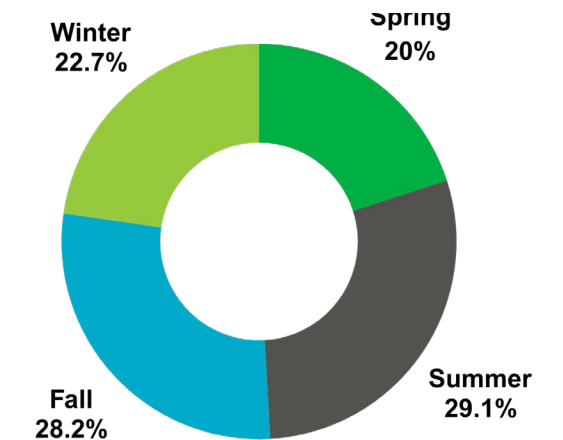
Most bridge strike crashes occurred on weekdays (92%), suggesting they are likely linked more often to regular commercial freight traffic than to weekend or recreational travel. Bridge strikes occurred throughout the year, with slightly more crashes in the summer (29.1%) and fall (28.2%). The differences between seasons were small, indicating that bridge strikes are not generally tied to a specific time of year.

Most bridge strike crashes occurred during daylight (86%), in clear weather (71%), and on dry roads (86%). About 13% of the crashes were hit-and-run incidents. Truck tractors with semi-trailers were involved in most bridge strike crashes, followed by flatbed trucks, vans and truck-trailer combinations. Larger commercial vehicles accounted for most of the crashes in the study, which is expected because vehicle height and cargo configuration are major factors in bridge strike incidents.

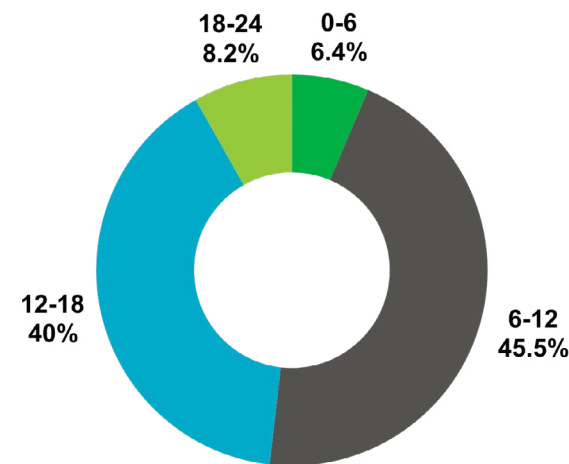
DAY OF WEEK



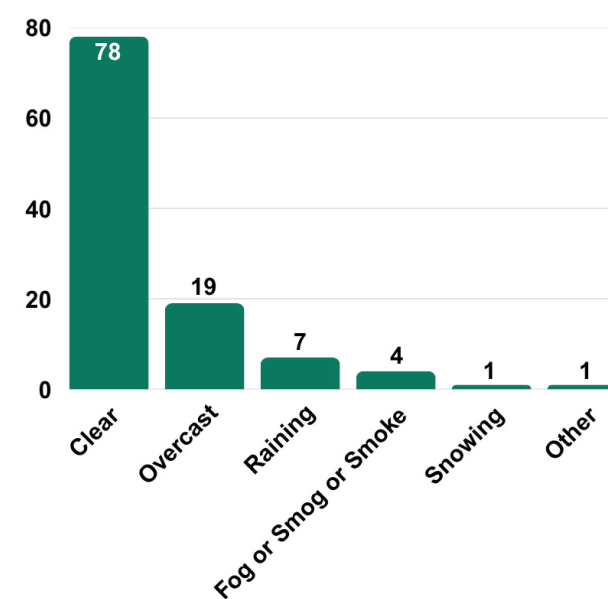
SEASON



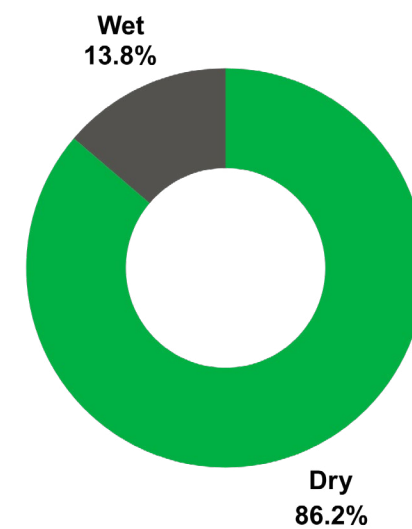
TIME OF DAY



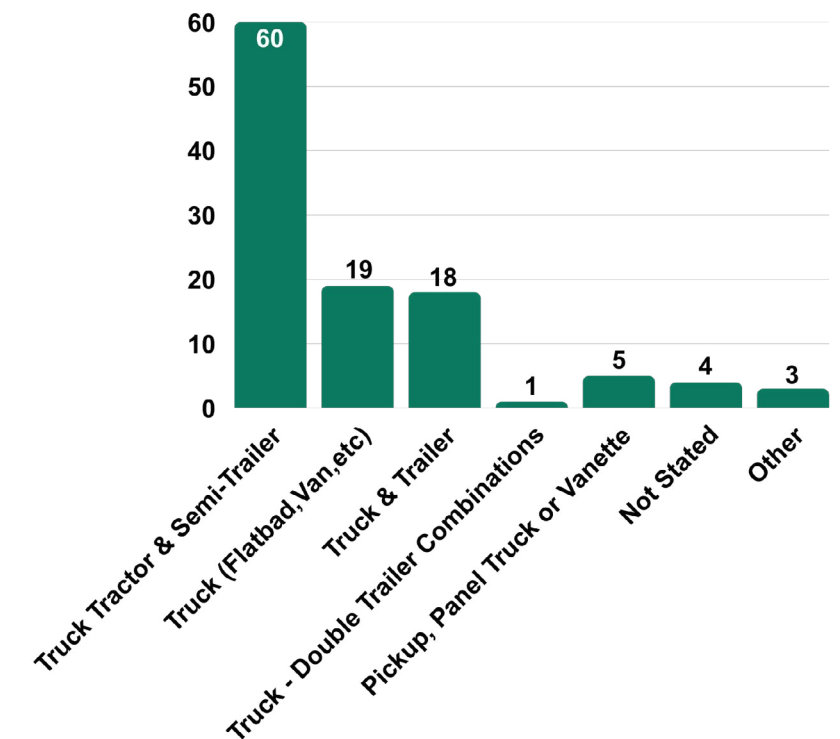
WEATHER CONDITION



ROAD SURFACE CONDITION



VEHICLE TYPE



3.3 Crash Narrative Review

To supplement the quantitative analyses, police crash reports were reviewed for all bridge strike crashes included in the study. Unlike the coded crash database, the narrative descriptions and collision diagrams provide detailed information regarding driver actions, vehicle operations, cargo characteristics, roadway circumstances, and events immediately preceding each bridge strike.

The narratives were reviewed to identify recurring operational themes rather than to evaluate individual crashes. Similar circumstances were grouped into common categories to better understand the conditions under which bridge strikes occurred. These observations provide additional context for the descriptive analyses presented earlier and help identify practical considerations for bridge strike mitigation.

1	Vehicle Height Not Verified Prior to	Several crash reports indicated that drivers did not accurately verify the overall height of their vehicle or load prior to travel. In some cases, changes to the cargo configuration or equipment position increased the vehicle height beyond what the driver anticipated. "...driver stated he believed the load would clear the bridge based on previous trips."
2	Route Planning and Driver Decisions	Several narratives described drivers entering routes with low-clearance bridges without confirming that the selected route could accommodate the vehicle height. Other reports indicated that drivers recognized the low-clearance warning only after passing a safe location to stop or turn around. "...driver observed the warning sign but was unable to stop before reaching the bridge."
3	Oversize Load Operations	Bridge strikes involving oversize loads often involved operational issues such as changes to equipment configuration, improperly lowered booms, load shifts during transport, or deviations from permitted routes. These observations highlight the importance of verifying vehicle height throughout the trip rather than only during permit preparation.

Collectively, these findings suggest that a high percentage of bridge strike crashes in the state in the past six years resulted from a combination of operational decision-making and driver awareness rather than from a single infrastructure deficiency. These observations were considered during the development of the mitigation strategies presented in the next section.

3.4 Partner Perspectives

Partner meetings were conducted with representatives from WSDOT divisions, industry organizations, and national transportation partners to better understand operational challenges associated with bridge strike incidents and to identify current practices used for prevention and response. While perspectives varied across organizations, several common themes emerged consistently throughout the discussions.

Bridge Strikes Extend Beyond Infrastructure Damage

Partners consistently emphasized that the impacts of bridge strikes extend well beyond physical damage to bridge components. Even when structural damage is minor, bridge strikes frequently require emergency inspections, temporary lane closures, traffic control, and coordination among multiple agencies before the bridge can safely reopen.

Multiple Factors Contribute to Bridge Strikes

Participants noted that bridge strikes result from a combination of operational and human factors rather than a single cause. Frequently discussed issues included inadequate route planning, failure to verify vehicle height after loading, reliance on non-commercial navigation applications, and operational errors involving oversized loads. Several partners also noted that bridge strikes are not limited to permitted oversize vehicles. Delivery trucks, rental trucks, and other commercial vehicles were identified as recurring contributors in addition to oversized loads.

Importance of Education and Interagency Coordination

Partners consistently emphasized that reducing bridge strikes will require coordination across multiple organizations, including transportation agencies, commercial vehicle enforcement, permitting offices, freight carriers, and industry associations. Many participants highlighted education and driver awareness as opportunities to reduce bridge strike occurrences, particularly through improved outreach regarding vehicle height verification, route planning, and commercial navigation tools. National partners also described public awareness campaigns and collaborative outreach efforts that have been implemented by several states to improve driver awareness of low-clearance structures. **"Always trust the roadway signs first. GPS doesn't know your vehicle height."**

In Summary, although partners represented different agencies and responsibilities, there was broad agreement that bridge strike mitigation requires a combination of engineering improvements, operational practices, education, enforcement, and continued collaboration among transportation partners. These perspectives provided important context for interpreting the study findings and informed the development of the mitigation strategies presented in the next Section.

3.5 Bridge Type Assessment

3.5.1 Bridge Type Structural Consequence Characterization

To supplement the quantitative analyses, a bridge type assessment was conducted using police crash reports for all documented bridge strikes, along with the WSDOT bridge inventory. The assessment focused on overhead structures located along Tier 1 and Tier 2 freight corridors to better understand the characteristics and patterns associated with bridge strike events. The following bridge types were identified as most common in the corridors (Top 10). This summary is solely focused on bridge type and not refined based on lower vertical clearance.

Bridge Type	Frequency
Pre-Stressed Concrete Girder (PCG)	31%
Pre-Stressed Concrete Bulb-T Girder (PCBTG)	11%
Steel Truss (STrus)	11%
Concrete Box Girder (Cbox)	10%
Steel Girder (weld or rivet) (SG)	8%
Post-Tensioned Concrete Box Girder (PTCBox)	8%
Steel Box Girder (Sbox)	3%
Concrete Slab (CS)	3%
Concrete T-Beam (CTB)	2%
Steel Tied Arch (STA)	2%

The following summarizes the typical performance of the identified bridge types under typical overheight vehicle strikes. For planning-level screening, bridge types were grouped based on similar structural response to overheight vehicle impacts, expected damage mechanisms, and the consequence of localized member damage.

Prestressed Concrete Girder Bridges (PCG, PCBTG)

Typical Structural Consequence: High

Prestressed concrete girders are particularly vulnerable due to reliance on prestressing strands, which are nonredundant and sensitive to damage. Even minor impacts can result in strand exposure or rupture, leading to immediate capacity concerns. Prestressed girder systems may also require extensive post-impact investigation due to uncertainty regarding internal strand damage, strand debonding, or localized loss of prestress force that may not be externally visible. These systems are common throughout WSDOT’s urban freeway network and therefore may present elevated operational consequences where freight detours are limited.

- **Key Damage Considerations:** Strand damage, hidden internal distress, girder replacement
- **Typical Outcome:** Strand splice & patching, load restrictions or span replacement
- **Implication:** High priority for mitigation where clearance is constrained

Steel Girder Bridges (SG, Sbox)

Typical Structural Consequence: Moderate to High

Steel girder and steel box girder bridges typically have exposed bottom flanges, particularly at fascia girders, making them susceptible to direct impact. The potential consequence varies depending on whether the structure is fracture critical. Redundant multi-girder systems may tolerate localized damage with limited capacity loss, whereas fracture-critical members may require immediate closure and detailed fracture assessment.

- **Key Damage Considerations:** Flange bending, cracking, bracing damage
- **Typical Outcome:** Lane closures and complex repairs (e.g., heat straightening, structural reinforcing)
- **Implication:** Targeted mitigation warranted on freight routes

Concrete Box Girders (Cbox, PTCBox)

Typical Structural Consequence: Low

Post-tensioned box girders have prestressing, but because the

geometry is closed/deep and tendons are generally protected, behavior under strike is more like standard box girders than open prestressed girders. Severe impacts may still result in localized tendon-zone damage requiring detailed investigation. It is uncommon for collisions at concrete box girder vehicle bridge superstructures to result in significant damage to the bridge.

- **Key Damage Considerations:** Surface spalling and localized cracking
- **Typical Outcome:** Minimal structural impact; short-term repairs
- **Implication:** Standard clearance signage sufficient

Conventional Reinforced Concrete (CS, CTB)

Typical Structural Consequence: Low to Moderate

These bridges typically feature continuous soffits and more redundant behavior, reducing susceptibility to severe structural damage from localized impacts tendon-zone damage requiring detailed investigation.

- **Key Damage Considerations:** Surface spalling and localized cracking
- **Typical Outcome:** Minimal structural impact; short-term repairs
- **Implication:** Standard clearance signage sufficient

Steel Truss (STrus)

Typical Structural Consequence: Critical

Through truss structures frequently combine reduced portal clearances with highly nonredundant load paths, increasing both strike probability and consequence severity. Even localized portal-frame damage may compromise lateral stability or require immediate operational restrictions. These structures have a well-documented history of strike events.

- **Key Damage Considerations:** Portal and/or sway frame damage, lateral instability
- **Typical Outcome:** Immediate closure and extensive repair
- **Implication:** Highest priority for active warning and protection systems

3.5 Bridge Type Assessment

3.5.1 Bridge Type Structural Consequence Characterization

Railroad Bridge (RR)

Typical Structural Consequence Low

Bridges carrying heavy rail over a state route are designed to be much stronger than typical vehicle bridges because they must support the heavy loads of trains. These structure types are much more robust and resistant to overheight vehicle strikes. It is uncommon for collisions at railroad bridge superstructures to result in significant damage to the bridge.

- **Key Damage Considerations:** Surface spalling and localized cracking
- **Typical Outcome:** Minimal structural impact
- **Implication:** Standard clearance signage sufficient

3.5.2 Key Strike and Consequence Modifiers

Within each bridge type, the following factors may increase the likelihood of a strike or the severity of its consequences:

- Low vertical clearance (<16'-6")
- Location on Tier 1 strategic freight corridors
- Proximity to port terminals/intermodal facilities
- Skewed crossings or restricted sight distance
- Sag vertical curves reducing perceived clearance
- Horizontal curvature approaching undercrossings
- Complex lane/channelization conditions
- Nonredundant (fracture-critical) structural systems
- Documented history of previous strikes
- Lighting limitations

These factors should be used to refine prioritization within each bridge category. The framework is intentionally scalable and may be refined as additional inventory, clearance, freight exposure, or strike-history data become available.

3.5.3 Limitations

This methodology is intended as a comparative screening tool and does not calculate the probability of a future strike or predict actual strike frequency. The framework is based on generalized bridge-type behavior and planning-level operational assumptions and is not intended to replace detailed structural evaluation, load rating analysis, or site-specific engineering judgment. Final decisions regarding mitigation or structural response should be based on detailed engineering analysis and field investigation.



3.6 Bridge Prioritization Framework Results

The Bridge Prioritization Index (BPI) was applied to the 75 bridges in the study population that experienced at least one documented bridge strike during the study period. As described in the preceding methodology section, the BPI combines four dimensions:

- Strike history: 35 percent.
- Roadway exposure: 25 percent.
- Bridge vulnerability: 25 percent.
- Potential consequence: 15 percent.

The BPI has a theoretical range from 0 to 100, with higher scores indicating a greater relative need for engineering review and potential mitigation. Scores among the 75 study bridges ranged from 11.7 to 80.8.

The BPI identifies where WSDOT should look first. It does not, by itself, select a countermeasure, establish that a bridge is structurally deficient or unsafe, or determine that a capital project is required. Countermeasure selection requires field verification, review of the strike mechanism, and engineering judgment, as discussed in Section 4.2.

3.6.1 Priority Distribution

The BPI classified three bridges as Highest Priority, 29 as Elevated Priority, and 43 as Routine Monitoring. This distribution provides an initial group for detailed engineering evaluation while retaining a broader group for systematic review and monitoring.

Priority category	BPI	Bridge	Evidence driving priority	Initial treatment direction
Highest Priority	70 or greater	3	4.0%	Advance to detailed field verification and site-specific diagnostic review.
Elevated Priority	40–69.9	29	38.7%	Apply baseline actions and systematically review the highest-ranking, repeat-strike, and consequence-sensitive locations.
Routine Monitoring	Below 40	43	57.3%	Maintain clearance information and signing consistent with applicable standards and agency practices, address identified issues as appropriate, monitor available event information, and update the BPI.

A high BPI score does not necessarily indicate that a bridge is highly susceptible to structural damage. The index considers strike history, crash consequences, roadway exposure, geometry, and structural consequence. Accordingly, a structurally robust bridge may remain a high-priority location when repeated strikes have caused serious vehicle, occupant, traffic, or operational consequences.

Most bridges were assigned to Routine Monitoring because they had an isolated or older strike and did not simultaneously exhibit high exposure, constrained clearance, recurring history, or high-consequence characteristics. A Routine Monitoring designation does not mean that a bridge is free from the potential for future strikes or consequences. Every bridge in the study population experienced at least one documented strike, and a new severe or repeat event may justify an earlier review.

3.6.2 Highest-Priority Locations

Three bridges received BPI scores of 70 or greater. These locations combine recurring or recent strike history with roadway exposure, clearance, and bridge or network consequences. Their ranking indicates the need for early field verification and site-specific diagnostic review; it does not mean that all three locations should receive the same countermeasure.

Rank	Bridge	BPI	Evidence driving priority
1	5/420 – Light Rail at Lakeview over I-5	80.8	Five documented strikes; most recent event within one year; approximately 15 feet 2 inches of recorded clearance; steel-girder structure; high traffic and heavy-vehicle exposure; and no advance clearance signing recorded in the study inventory.
2	5/419 – 47th Avenue SW over I-5	77.9	Four documented strikes; most recent event in 2025; approximately 14 feet 9 inches of recorded clearance; high roadway exposure; the highest recorded crash outcome was fatal; and no advance clearance signing recorded in the study inventory.
3	3/105 – Railroad over SR 3	71.7	Three documented strikes; most recent event in 2025; approximately 15 feet 2 inches of recorded clearance; high roadway and heavy-vehicle exposure; recurring construction-equipment context; and no advance clearance signing recorded in the study inventory.

3.6 Bridge Prioritization Framework Results

3.6.3 Elevated-Priority Locations Requiring Early Review

An Elevated Priority result should not be interpreted as a recommendation to defer action. Within this category, several bridges rise to the top because of repeat history, recent strikes, low clearance, structural consequence, network importance, incomplete signing, or a known high-cost outcome. The following locations should be included in the first systematic review of the Elevated Priority category. The complete ranking of all 75 study bridges is provided in the **appendix**.

Bridge	BPI	Evidence driving priority
904/10 – SR 904 over I-90	61.7	Two recent strikes; prestressed-concrete girder; substantial roadway and heavy-vehicle exposure; and advance clearance signing was not identified in the records available for this study.
90/327 – Schoessler Road over I-90	61.3	Six documented strikes—the highest frequency in the study—and a recent event; approximately 14 feet 5 inches of recorded clearance. Available truck-volume information should be verified because the recorded value may understate actual exposure.
82/10N – I-82 over SR 821	60.9	Two recent strikes; approximately 14 feet 10 inches of recorded clearance; prestressed-concrete girder; approximately 30-degree skew; and recurring construction-equipment or raised-equipment context.
397/15 – Railroad over SR 397	57.9	Two recent strikes; approximately 14 feet 10 inches of recorded clearance; railroad bridge carrying heavy rail; and advance and bridge-mounted signs recorded on both approaches, indicating that static signing alone may not be sufficient. Although assigned a Low structural-consequence category, its repeat-strike history, constrained clearance, and owner-coordination needs support early review.
5/418 – Bridgeport Way over I-5	57.9	Two recent strikes; approximately 15 feet of recorded clearance; high traffic exposure; heavy-equipment or overheight-load context; and no advance clearance signing recorded in the study inventory. Although the concrete box-girder structure is assigned a Low structural-consequence category, the recent strikes, constrained clearance, and roadway exposure support early review.
410/101 – SR 410 White River Bridge	57.1	Through-truss elements and low portal clearance create critical structural consequences. The 2025 strike required an extended closure and an estimated \$5–\$6 million repair project.
5/220 – 13th Street over I-5	55.0	Two documented strikes; most recent approximately one year ago; approximately 15 feet 1 inch of recorded clearance; high structural consequence; and interstate mobility and freight exposure. The recent event history supports a Tier 1 baseline and location-specific Tier 2 evaluation.
5/837N-W – N-W Ramp	55.0	One documented strike in the most recent study year; approximately 16 feet 3 inches of recorded clearance; high structural consequence; ramp geometry; limited recovery distance; and the need to provide warning before the last safe decision point.

The elevated-priority bridges do not necessarily require capital projects. Their placement identifies the need for early diagnostic review so WSDOT can determine whether the appropriate response is a data or signing correction, an active or in-cab warning, a physical treatment, targeted

enforcement, or a higher-cost structural or operational improvement.

3.6.4 Use of Driver and Operational Factors

Driver age, sex, impairment, weather, and other incident-level characteristics were intentionally excluded from the BPI. These variables describe the circumstances of individual events rather than stable attributes of a bridge and generally do not provide a defensible basis for prioritizing infrastructure locations. Including them could also double-count strike history or direct investments toward demographic characteristics that WSDOT cannot address through a site treatment. These factors remain important after locations are prioritized. WSDOT should use crash narratives, law enforcement records, questionnaire responses, vehicle type, permit status, navigation use, route familiarity, equipment position, load configuration, warning recognition, and the reason a driver proceeded to diagnose each selected location and tailor the Education, Enforcement, and Engineering response. The recommended post-prioritization diagnostic process is presented in Section 4.2.1

3.6.5 Interpretation and Limitations

The BPI is a planning and screening tool. It should be updated at least annually and after any severe or repeat event. Before programming a project, WSDOT should verify:

- Controlling clearance by lane and direction.
- Existing signs, visibility, and message consistency.
- Heavy-vehicle exposure.
- Approach speed and stopping sight distance.
- Structure ownership and maintenance responsibility.
- Availability of electrical power and communications.
- Availability of a safe exit, turnaround, pull-off, or alternate route.
- Recent paving, maintenance, rehabilitation, or construction that may have changed the available clearance.

Values reported as zero, particularly heavy-vehicle exposure on major freight routes, should be checked to distinguish a true zero from a spatial-join, reporting, or data-availability limitation.

WSDOT should retain an engineering-judgment override. A bridge with an Elevated Priority or Routine Monitoring result may warrant earlier action where a strike could damage a critical or nonredundant member, affect rail or transit operations, close a critical freight or emergency route, produce a long detour, or create consequences that are not fully represented in the available data. Any override should document:

- The reason for the override.
- The technical office responsible for the decision.
- The information supporting the decision.
- The proposed next action.
- The conditions under which the decision will be reevaluated.

4.1 Best Practices

4.1.1 Education and Outreach

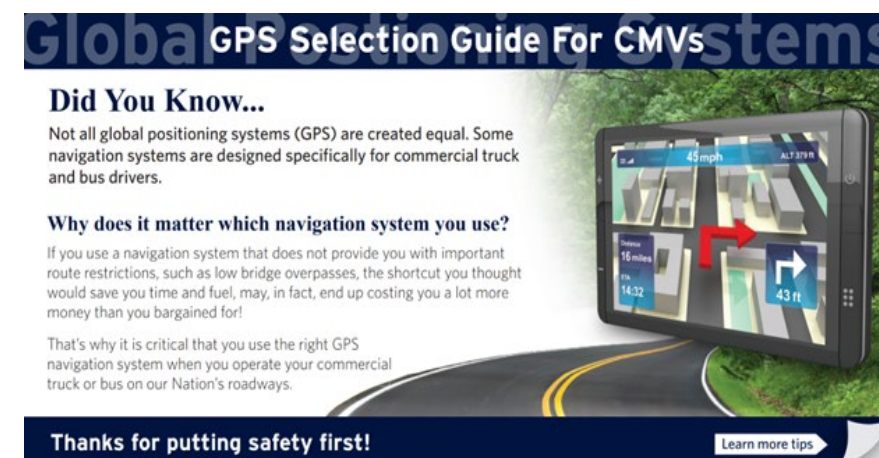
Driver Education

Driver education is an important component of bridge-strike prevention. Training can reinforce the need to know the actual height of the vehicle and load, use commercial-vehicle routing information, comply with oversize-permit requirements, follow approved routes, and obey posted clearance and restriction signs. Education may be provided through commercial-driver training, carrier safety programs, permit communications, refresher training, and targeted outreach along priority corridors and near recurring bridge-strike locations. A NYSDOT bridge-vehicle impact study identified the improper use of GPS devices as a contributing factor in bridge strikes on New York parkways. Based on more than 40 documented parkway bridge impacts, the study reported that over 90 percent of the involved drivers were using GPS while traveling on unauthorized routes. The study recommended truck-specific navigation systems capable of avoiding parkways and low-clearance structures. These findings support educating drivers about the limitations of consumer navigation applications and the importance of verifying routes against official restrictions. In 2013, FMCSA introduced the GPS Selection Guide for Commercial Motor Vehicles, a visor card intended to help truck and bus drivers select and properly use navigation systems designed for commercial vehicles. The guidance advises drivers to enter relevant vehicle information, including height, length, width, weight, and hazardous-material restrictions, and to continue obeying posted roadway signs. FMCSA also encouraged commercial-driver training programs to include instruction on selecting and using electronic navigation systems¹⁻².

Outreach Campaign

Outreach campaigns target both carriers and the general public to raise awareness about the dangers of overheight vehicles. State DOTs like WSDOT and TxDOT have implemented campaigns through social media, roadside signage, and industry partnerships. These efforts often coincide with enforcement blitzes and technology rollouts, such as geofencing alerts and mobile detection units. Campaigns stress the financial and safety consequences of strikes, reinforcing accountability and encouraging proactive route checks. Collaborative initiatives with trucking associations amplify these messages across multiple jurisdictions. The West Virginia Department of Transportation (WVDOT) launched a public awareness campaign titled “Check Your Height, Know It’s Right” from July 22–26, 2025. The initiative aims to prevent collisions with low-clearance bridges, which can damage vehicles and infrastructure, cause major traffic delays, and endanger public safety. The campaign emphasizes that drivers are responsible for knowing their vehicle height and complying with posted clearance signs, warning against relying solely on navigation apps. Outreach includes social media graphics and safety reminders targeting CDL holders, rental truck drivers, and RV operators. WVDOT notes that many moving trucks range from 11 to 13’6” in height, exceeding clearances on older bridges. This effort is part of a regional initiative supported by The Eastern Transportation Coalition, a partnership of 20 states and Washington, D.C., focused on improving transportation safety and efficiency³.

Part of the Visor Card to Educate Drivers



“Check Your Height, Know It’s Right” Public Awareness Campaign



¹ FMCSA GPS Selection Guide: https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/GPS_Visor_Card_508CLN.pdf

² FMCSA bridge-strike actions: <https://www.fmcsa.dot.gov/faq/what-actions-will-fmcsa-take-address-problem-bridge-strikes>

³ TETC: <https://tetcoalition.org/>

4.1 Best Practices

4.1.2 Enforcement

States use targeted roadside enforcement, automated monitoring, permit verification, and increased penalties to improve compliance with vehicle-height and routing requirements.

- New York – Targeted Enforcement and Driver-Record Penalties: New York conducts targeted commercial-vehicle enforcement at locations with recurring bridge strikes. Enforcement officers check vehicle height, equipment condition, permit compliance, and adherence to posted restrictions. Beginning February 16, 2026, New York also assigns eight driver-record points for an overheight-vehicle or bridge-strike violation, strengthening consequences for noncompliance¹⁻².
- Delaware – Automated Vehicle-Height Enforcement: Delaware enacted legislation authorizing state and local agencies to use vehicle-height monitoring systems to enforce motor-vehicle size restrictions. The systems may use sensors and recorded images to document violations and support civil penalties. The law establishes requirements for site selection, system operation, documentation, law-enforcement review, notices of violation, and admissibility of recorded evidence³.
- Delaware – Technology-Assisted Commercial-Vehicle Screening: Delaware State Police and DelDOT use virtual weigh-station technology, including weigh-in-motion equipment, license-plate recognition, vehicle-identification readers, and overheight sensors, to screen commercial vehicles and support more efficient size-and-weight enforcement⁴.
- Texas – Route-Inspection Certification for Exceptionally High Loads: Texas requires a route inspection for loads exceeding 18 feet 11 inches in height. The applicant must certify that the route has been physically inspected for vertical-clearance and other constraints before permit issuance. This requirement creates an additional compliance and accountability measure for movements presenting the most significant clearance constraints⁵.

These practices demonstrate an evidence-based enforcement approach that concentrates resources on recurring-strike locations and clearance-constrained movements, verifies compliance before and during travel, and uses documented violations to support penalties.

4.1.3 Engineering

Engineering measures provide location-specific treatments where bridge conditions, strike history, structural consequences, or the diagnostic review indicate that infrastructure intervention is warranted. They include accurate clearance information, properly located warning signs,

physical warning devices, active overheight detection, vehicle-routing systems, and structural or roadway modifications. National guidance emphasizes that the appropriate treatment should be based on the specific strike mechanism, roadway geometry, bridge vulnerability, warning visibility, and the availability of a safe location for an overheight vehicle to stop or divert. No single engineering treatment is appropriate for every bridge. Static signs may be sufficient where clearance information is accurate and drivers have adequate decision distance. At repeat-strike or consequence-sensitive locations, agencies may need to add active detection, physical warnings, operational controls, or structural improvements.

Passive Warning and Signing Measures

Passive measures include advance and structure-mounted clearance signs, overhead signs, pavement markings, enhanced delineation, flashing beacons, lighting, and vegetation management. Agencies should verify that displayed clearance information is consistent with controlling clearance information, warnings are visible and located sufficiently in advance of the bridge and, where feasible, before the last safe decision point, and drivers have sufficient distance and a usable location to stop or divert.



¹ <https://www.governor.ny.gov/news/governor-hochul-announces-new-yorks-participation-coordinated-public-awareness-and-enforcement>

² New York DMV point-value requirements: <https://dmv.ny.gov/news/dmv-reminds-new-yorkers-of-updated-point-values-for-driving-violations>

³ <https://legis.delaware.gov/BillDetail?LegislationId=47558>

⁴ <https://dsp.delaware.gov/wp-content/uploads/sites/118/2026/04/Annual-Report-2025.pdf>

⁵ <https://www.txdmv.gov/motor-carriers/oversize-overweight-permits/texas-size-weight-limits/route-inspections>

4.1 Best Practices

4.1.3 Engineering

Passive Warning and Signing Measures

Warning-sign reviews should document sign location, type, mounting height, lateral placement, visibility, condition, and displayed clearance information. WSDOT installs signs in accordance with applicable agency standards and standard plans. WSDOT Standard Plan G-20.10-03 establishes ground-mounted sign-placement requirements, including a minimum vertical distance of seven feet from the bottom of the sign to the ground for signs located within the Design Clear Zone. The applicable requirements should be confirmed based on the sign assembly and site conditions. The displayed clearance value should also be compared with the controlling lane- and direction-specific clearance information.

TxDOT requires clearances to be remeasured following construction or maintenance that could affect available height. Results are coordinated with permitting and bridge-inspection personnel, and signs are updated when needed¹. WSDOT similarly maintains bridge-clearance information used by the public and its permitting system.

Physical and Sacrificial Warning Devices

Physical warning devices, including hanging chains, flexible bars, suspended markers, and clankers, provide audible or physical warning before an overheight vehicle reaches a bridge. They are most appropriate on lower-speed approaches with adequate stopping or turnaround space. DelDOT installed clanker systems using suspended orange marine bumpers after conventional signs and flashing warnings did not sufficiently reduce strikes. DelDOT reported that locations previously experiencing approximately two to nine strikes annually had no strikes in 2023 and one in 2024 following installation². PennDOT has used similar systems at selected railroad bridges and designed them to minimize falling components and roadway debris³. INDOT evaluated flexible warning bars but cautioned against rigid devices because of potential vehicle damage, debris, and liability⁴. The available PennDOT and INDOT sources document implementation and design considerations but do not provide before-and-after strike data demonstrating effectiveness.

Active Overheight Detection and Warning Systems

Active systems use infrared beams, lasers, radar, cameras, or other sensors to identify an overheight vehicle and activate flashing beacons, blank-out signs, dynamic message signs, audible alarms, or traffic signals. WSDOT operates a dual-beam infrared system on northbound SR 529 in Everett that activates warning lights and an audible bell. The system operates continuously and receives weekly observational checks but does not transmit alerts, retain activation records, or have dedicated camera coverage. Future systems could improve upon this practice through activation logging, camera verification, and remote health monitoring.

New York provides several documented applications of active overheight detection. At Glenridge Road, NYSDOT installed infrared detection connected to electronic message signs and flashing beacons. The available NYSDOT project announcement does not provide a post-installation evaluation of bridge-strike frequency. At Onondaga Lake Parkway, NYSDOT reported in 2017 that an overheight detection system installed in 2011 reduced bridge strikes from several per year to an average of approximately one per year. However, bridge strikes later recurred, including at least six during the first part of 2023. NYSDOT subsequently added sensors, blank-out signs, pavement markings, lane reductions, and an overheight-activated traffic signal. These examples illustrate the use of layered countermeasures rather than reliance on detection alone^{5 & 6}.

Example of Overheight Vehicle Detection System in Glenville, New York



¹ TxDOT vertical-clearance guidance: https://www.txdot.gov/manuals/trf/smk/warning_signs/vertical_clearance-i1000022.html

² TETC/DelDOT Interview Material

³ TETC/PennDOT Interview Material

⁴ INDOT Limited Vertical Clearance Bridge Warning System Study: https://www.in.gov/indot/files/FinalReport_LimitedVerticalClearanceBridgeWarningSystemStudy_11-29-2022.pdf

⁵ NYSDOT Glenridge Road system: <https://www.dot.ny.gov/news/press-releases/2023/2023-03-07>

⁶ NYSDOT Onondaga Lake Parkway improvements: <https://www.dot.ny.gov/news/press-releases/2023/2023-06-231>

4.1 Best Practices

4.1.3 Engineering

Structural Clearance Modifications

WSDOT has used and evaluated structural retrofits that raise truss portal and sway frames to increase vertical clearance. Following the 2013 Skagit River Bridge collapse, WSDOT assessed 63 steel truss bridges with minimum clearances below 16 feet 6 inches and identified raising portal and sway frames to at least 16 feet 6 inches as the primary retrofit strategy. The study also documented WSDOT bridges where portal or sway frames had previously been raised and developed bridge-specific retrofit recommendations and planning-level cost estimates for the remaining low-clearance structures. Because this treatment directly removes or reduces the overhead conflict, WSDOT could consider it for other low-clearance truss bridges where strike history, structural vulnerability, freight exposure, and site-specific engineering feasibility justify the investment¹.

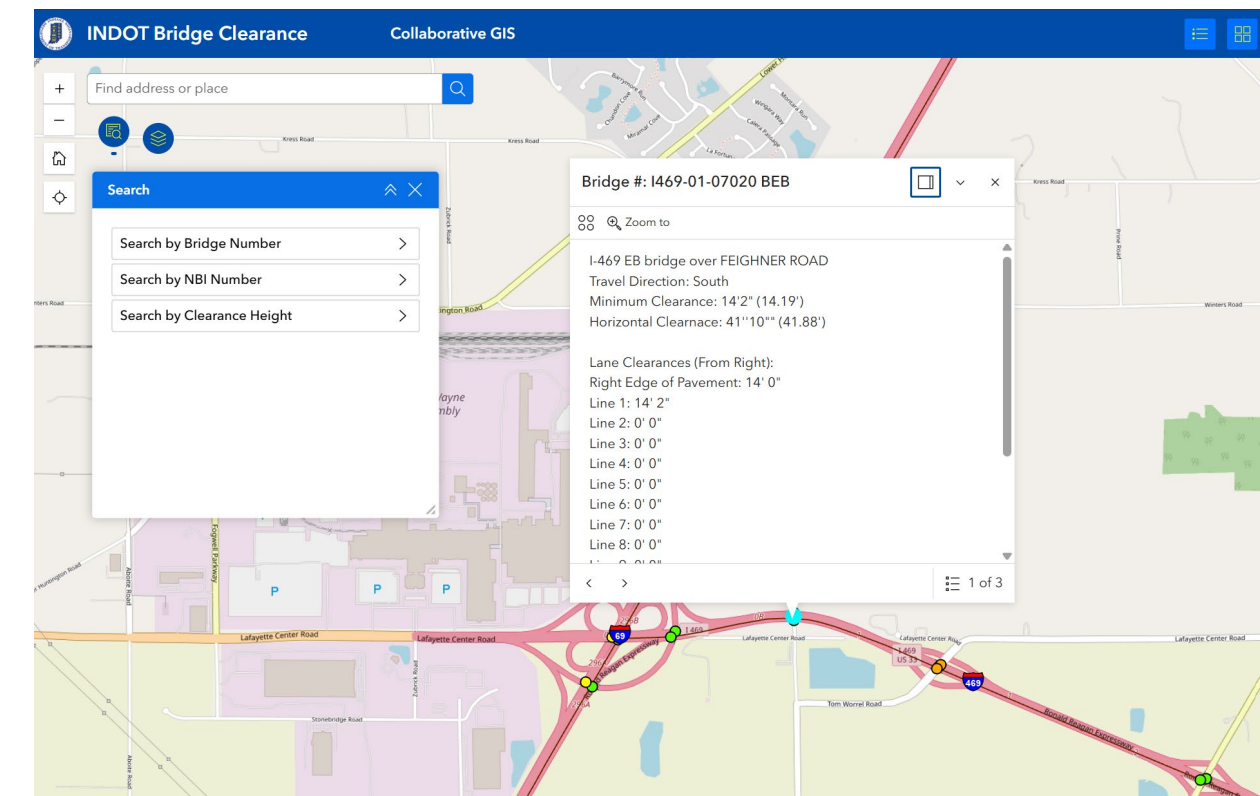
Clearance, Routing, and Permitting Systems

In addition to physical infrastructure and detection technologies, many state DOTs rely on data sharing and real-time information systems to reduce the likelihood of bridge strikes. These systems support bridge strike prevention by providing drivers, freight operators, and transportation agencies with timely information about bridge clearances, roadway restrictions, and potential hazards along a route. By improving access to accurate infrastructure data and operational information, transportation agencies can help drivers avoid low-clearance bridges before reaching them.

WSDOT processes oversize and overweight permits through the Electronic System Network for Oversize and Overweight Permit Information Pro (eSNOOPI Pro). For standard oversize and overweight movements, eSNOOPI Pro automatically evaluates the requested vehicle dimensions and route against restrictions contained in the system. Movements exceeding established thresholds receive additional review. For loads over 200,000 pounds, WSDOT requires an application at least 30 days before movement; loads exceeding 16 feet in width or height require a written application at least seven calendar days in advance. As described by Permit Office project partners, WSDOT technical offices review the proposed superload route and assemble an approval package. Once the route is approved and a superload approval number is assigned, the carrier applies for the permit, and Commercial Vehicle Services issues it in eSNOOPI Pro using the approved route. This process provides additional coordination for loads presenting greater infrastructure or operational concerns. WSDOT also provides a public Bridge Vertical Clearance Trip Planner and other commercial-vehicle maps and restriction information. Permit Office partners indicated that bridge-clearance information used by the permitting system is updated frequently, generally through nightly data updates. WSDOT also publishes temporary commercial-vehicle restrictions and adjusts system routing when necessary. For example, during work on the I-90 Vantage Bridge, the bridge was assigned a lower routing priority so eSNOOPI Pro would automatically direct restricted vehicles to an alternate route²⁻⁵.

INDOT publishes a bridge-clearance map covering interstates, U.S. highways, and state routes. Users can view the direction of travel and minimum clearance for the applicable lanes and access a more detailed structure-information sheet. INDOT cautions that the map does not replace required approvals or account for local roads⁶. Texas uses the Texas Permitting and Routing Optimization System for oversize and overweight movements. Texas also requires the motor carrier to physically inspect and certify a proposed route for loads exceeding specified dimensions, including loads higher than 18 feet 11 inches⁷⁻⁸. PennDOT similarly uses its Automated Permit Routing and Analysis System to evaluate and route permitted oversize and overweight vehicles. PennDOT research also identified inaccurate or incomplete commercial-navigation information as a contributing factor in bridge strikes and recommended improved communication of roadway restrictions to navigation providers⁹.

INDOT Bridge Clearance Map



¹ WSDOT Bridge and Structures Office, Low Vertical Clearance Truss Bridges: Risk Assessment and Retrofit Mitigation Study, November 2017.

² WSDOT self-issued permits and eSNOOPI Pro: <https://wsdot.wa.gov/travel/commercial-vehicles/commercial-vehicle-permits/self-issue-permit>

³ WSDOT commercial-vehicle maps and tools: <https://wsdot.wa.gov/travel/commercial-vehicles/maps-tools-commercial-vehicles>

⁴ WSDOT route and vehicle restrictions: <https://wsdot.wa.gov/travel/commercial-vehicles/route-commercial-vehicle-restrictions>

⁵ Vantage Bridge routing example: https://wsdot.wa.gov/sites/default/files/2026-02/CommercialVehicle-Vantage-Bridge-truck-restriction-info_0.pdf

⁶ INDOT bridge-clearance map guidance: <https://www.in.gov/indot/travel-conditions/restrictionsclosings>

⁷ Texas permitting and routing system: <https://www.txdmv.gov/motor-carriers/oversize-overweight-permits>

⁸ Texas route-inspection requirements: <https://www.txdmv.gov/motor-carriers/oversize-overweight-permits/texas-size-weight-limits/route-inspections>

⁹ PennDOT commercial-vehicle navigation research: <https://www.pa.gov/content/dam/copapwp-pagov/en/penndot/documents/research-planning-innovation/research-projects/best%20practices%20and%20potential%20solutions%20for%20commercial%20vehicle%20navigation.pdf>

4.1 Best Practices

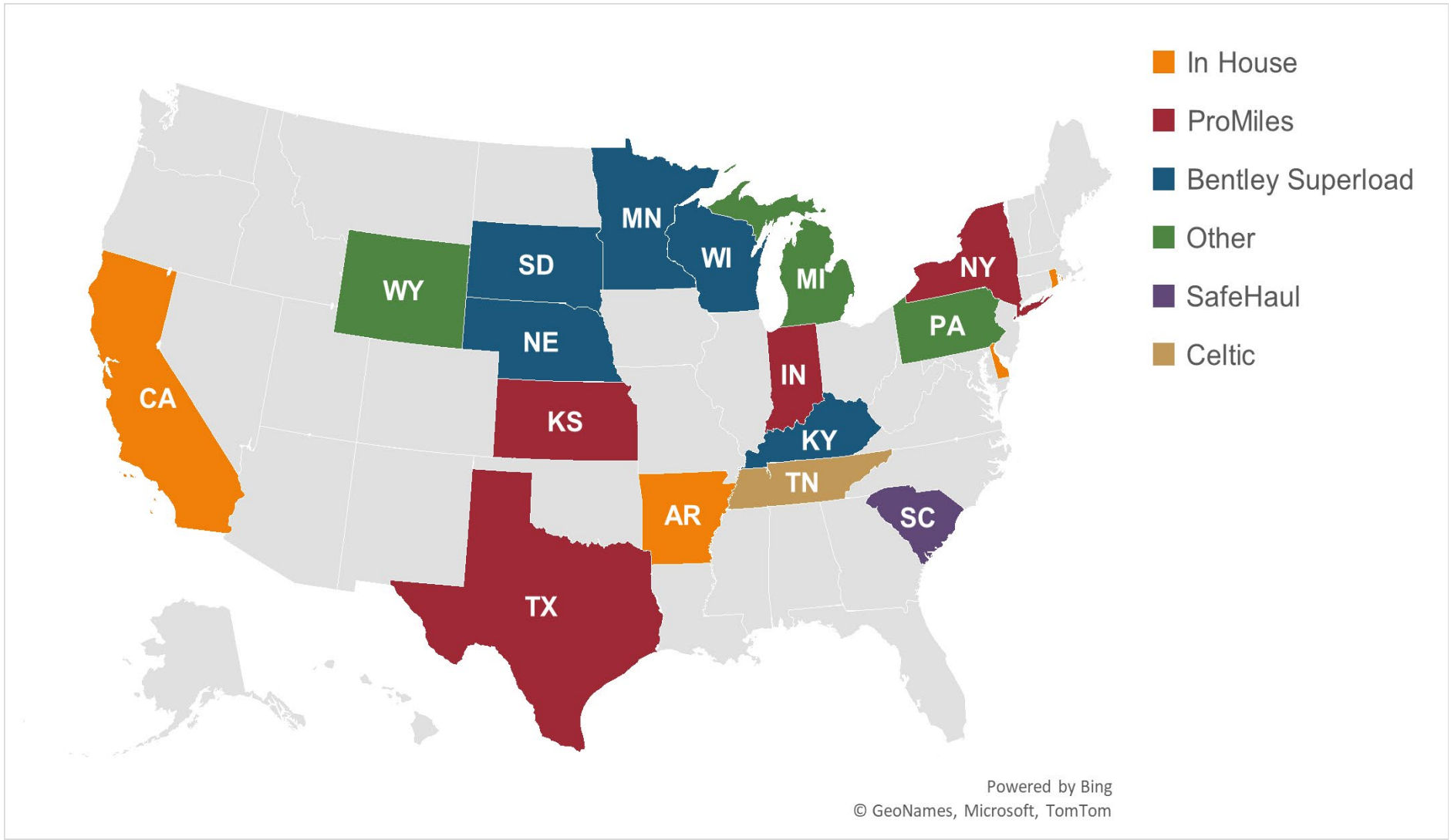
4.1.3 Engineering

Use of Navigation Applications

State DOTs use several approaches to provide routing and clearance information intended to reduce the likelihood of bridge strikes. The following figure summarizes the systems reported by responding agencies in the state survey conducted for NCHRP Research Report 1132. Four responding states, Arkansas, California, Delaware, and Rhode Island, reported using internally developed electronic mapping systems. Most of the responding agencies shown in the figure used commercial routing platforms, including Bentley SUPERLOAD, ProMiles, SafeHaul, or other applications, often configured using state-specific roadway restrictions and clearance data.

For example, Tennessee reported using a state-specific application developed by Celtic Systems that combines a commercial GIS roadway network with clearance data supplied by the state DOT. Texas uses the Texas Permitting and Routing Optimization System (TxPROS), developed by ProMiles, to evaluate and route permitted oversized and overweight movements. Wyoming reported that routes were reviewed manually at the time of the survey. These practices illustrate the range from internally developed mapping tools and customized commercial platforms to manual route review¹.

Systems Reported by Responding Agencies



¹ NCHRP Research Report 1132: <https://nap.nationalacademies.org/catalog/28813/bridge-and-tunnel-strikes-a-guide-for-prevention-and-mitigation>

4.2 Recommendation Strategies

4.2.1 Post-Prioritization Diagnostic Review

After the BPI identifies a location for review, WSDOT should conduct a post-prioritization diagnostic assessment using crash narratives, law-enforcement records, the proposed driver questionnaire, permit information, field observations, and warning-system activation data.

The assessment should identify the driver, vehicle, routing, and operational factors associated with strikes at that location. These factors should not change the BPI score. Instead, they should determine the appropriate combination of Education, Enforcement, and Engineering treatments.

Relevant factors include:

- Suspected alcohol or drug impairment.
- Distraction or fatigue.
- Route familiarity.
- Commercial-driving and vehicle-specific experience.
- Vehicle ownership or rental status.
- License type.
- Navigation method.
- Permit status and approved-route compliance.
- Knowledge of vehicle and load height.
- Raised equipment.
- Unsecured or shifted loads.
- Warning recognition and comprehension.
- The reason the driver continued.

Driver age may be examined in aggregate to identify communication, legibility, or warning-usability needs. Age should not independently determine a location’s priority or enforcement treatment.

The following table provides the use of driver and operational findings.

Post-Prioritization Diagnostic Review Summary

Post-prioritization finding	Recommended response
Alcohol or drug impairment	Use established crash and enforcement records to identify relevant locations and time periods. Coordinate with existing WSP impaired-driving enforcement rather than adding impairment to the BPI or relying on questionnaire self-report.
Distraction, fatigue, or delayed warning recognition	Review warning placement, repetition, contrast, lighting, clutter, comprehension time, and stopping distance. Reinforce a direct “stop when warned” message.
Inexperienced, occasional, or rental-truck driver	Coordinate education with rental companies, universities, moving and storage businesses, delivery operators, RV providers, and other points where drivers obtain unfamiliar large vehicles.
Driver did not know the vehicle height	Add height-verification prompts during rental, loading, permitting, dispatch, and pre-trip inspection. Promote an in-cab maximum-height placard.
Consumer navigation or route unfamiliarity	Promote truck-appropriate navigation, share authoritative clearance data with navigation providers, and place warnings before the last safe decision point.
Permit or approved-route deviation	Strengthen permit acknowledgment, route-compliance review, carrier notification, and targeted enforcement.
Raised equipment or unsecured or shifted load	Target construction, towing, refuse, utility, agricultural, logging, and equipment-hauling operators with equipment-stow and load-securement messages. Consider vehicle-mounted equipment-position warnings.
Warning was seen but ignored	Escalate beyond static signing to an active, physical, in-cab, or enforcement-based treatment. Record warning activations and driver response.
Warning was missed or misunderstood	Review sign wording, visibility, contrast, placement, and whether the message clearly identifies the affected vehicle and required action.
Aggregate age or experience pattern	Improve sign legibility, message simplicity, advance-notice time, and outreach channels. Do not use age alone for enforcement or infrastructure prioritization.
Multiple contributing factors	Use a layered package combining Education, Enforcement, and Engineering rather than relying on a single countermeasure.

4.2 Recommendation Strategies

4.2.2 Implement Targeted Education and Outreach

WSDOT can use existing national and regional materials rather than establishing a separate statewide bridge-strike program or developing an entirely new campaign.

The TETC's Bridge Strike Media and Strategy Toolkit provides customizable brochures, rack cards, social-media graphics, videos, news-release materials, and the "Check Your Height, Know It's Right" message. WSDOT can adapt these materials to Washington routes, warning systems, permit requirements, and observed strike mechanisms.

Washington outreach should emphasize a short sequence of actions that drivers can readily understand and remember:

1. Know and verify the maximum height of the vehicle, equipment, and cargo.
2. Fully lower and secure dump bodies, booms, lifts, buckets, and other equipment.
3. Use a navigation system appropriate for the vehicle and load.
4. Follow the permitted route and all roadway restrictions.
5. Stop or divert when an overheight warning activates.

Partner input supported education as a necessary component of a layered bridge-strike strategy. Outreach should be targeted using aggregate information about the vehicles, drivers, and operating circumstances associated with Washington strikes. Potential audiences include:

- Commercial motor-vehicle operators.
- Construction and heavy-equipment operators.
- Rental and moving-truck users.
- Refuse, utility, towing, and service fleets.
- Agricultural and logging operators.
- Recreational-vehicle and trailer users.
- Occasional drivers of unfamiliar large vehicles.
- Dispatchers, permit coordinators, and pilot or escort vehicle operators.

If aggregate age, experience, language, or route-familiarity patterns are identified, WSDOT should use them to improve communication channels, message legibility, comprehension, and timing. These characteristics should not be presented as independent causes of bridge strikes.

Recommended Outreach Actions

WSDOT should implement education through existing communication channels and partner networks. Recommended actions include:

- Customize TETC materials using Washington terminology, routes, signs, and driver resources.
- Incorporate maximum-height verification and equipment-stow reminders into oversize and overweight permit communications.
- Coordinate distribution through commercial-driver associations, construction organizations, freight operators, rental companies, moving and storage businesses, truck stops, rest areas, weigh stations, ports, and training providers.
- Provide materials to rental companies and other businesses that place inexperienced drivers in unfamiliar large vehicles.
- Coordinate focused outreach with construction and hauling seasons, college move-in and move-out periods, major detours, and temporary clearance restrictions.
- Use geotargeted or corridor-specific messaging near repeat-strike locations where feasible.
- Provide an in-cab height placard or checklist that allows drivers to record the maximum height of the vehicle and load.
- Reinforce that roadway signs and permit restrictions control, even when a consumer navigation application indicates that the route is available.
- Emphasize that drivers should not proceed to "test" the clearance after a warning activates.

WSDOT should monitor outreach reach and partner participation, but evaluation should extend beyond the number of materials distributed. Useful measures include questionnaire findings, sign comprehension, warning-system activations, driver turnarounds, permit-route compliance, and changes in strike frequency at treated locations.

4.2.3 Implement a Law Enforcement Bridge Strike Questionnaire

WSDOT and WSP should adapt the TETC/NYSDOT Restricted Facility Driver Questionnaire for use following bridge strikes and qualifying overheight events. The questionnaire would fill information gaps that coded crash and inspection records cannot reliably address.

The questionnaire should help determine:

- Whether the driver knew the maximum height of the vehicle and load.
- Whether the maximum height was displayed inside the vehicle.
- Whether equipment was fully lowered and secured.
- Whether the vehicle was owned, leased, or rented.
- Whether an oversize or overweight permit was required and obtained.
- Whether the vehicle was operating on its approved route.
- Which navigation system or routing source was used.
- Where and why the driver entered the restricted route.
- Whether the driver saw and understood the warning signs.
- Whether an active warning was triggered.
- Why the driver continued toward the bridge.

The questionnaire should be concise enough for practical roadside use. Where feasible, an electronic form should prepopulate the date, time, route, direction, bridge ID, and responding agency.

4.2 Recommendation Strategies

4.2.3 Implement a Law Enforcement Bridge Strike Questionnaire

Recommended implementation actions include:

- Retain the core TETC questionnaire fields concerning posted clearance, vehicle and cargo height, in-cab height information, vehicle ownership, equipment, license class, experience, navigation method, route entry, warning comprehension, and reason for proceeding.
- Add trip purpose, route familiarity, permit status, rental status, and experience with the specific vehicle type where these fields can be collected consistently.
- Obtain suspected impairment, citations, toxicology results, and other sensitive enforcement information through existing law enforcement records rather than relying on driver self-report.
- Develop a one-page officer job aid and brief roll-call training.
- Initially use the questionnaire in WSP districts containing Highest Priority, repeat-strike, or consequence-sensitive bridges.
- Transmit completed forms to a designated WSDOT data steward.
- Match questionnaire information to crash, WSP event, permit, inspection, maintenance, and repair records using bridge ID, location, and event time.
- Establish appropriate access, retention, and privacy requirements for personally identifiable and enforcement information.
- Track questionnaire completion and missing-data rates to avoid drawing misleading conclusions from incomplete responses.

Questionnaire data should not be used to modify the BPI based on individual driver characteristics. Instead, aggregated results should support the post-prioritization diagnostic review described in Section 4.2.1 and help WSDOT select appropriate engineering, education, and enforcement measures.

4.2.4 Improve Clearance, Routing, and Bridge-Strike Data

Reliable clearance, routing, traffic, and event information is foundational to bridge-strike prevention. WSDOT should maintain an authoritative direction-, approach-, and lane-specific clearance dataset with defined ownership, update procedures, and quality-control documentation. The clearance information should be coordinated, as applicable, across:

- Bridge inventory and inspection records.
- Oversize and overweight permitting and routing systems.
- WSDOT traveler-information platforms.
- Permanent and temporary restriction notices.
- Construction and maintenance records.
- Geographic information system layers.
- Machine-readable information supplied to commercial navigation providers.

Recommended actions include:

- Verify the controlling clearance by lane and direction at priority locations.
- Reconcile discrepancies among field measurements, bridge records, permit-routing information, and posted signs.
- Reverify clearance following paving, rehabilitation, structural work, maintenance activity, or a field report of a discrepancy.
- Record temporary restrictions and construction-related clearance changes through consistent WSDOT channels.
- Establish a process for communicating authoritative restrictions to commercial-vehicle navigation providers.
- Distinguish true zero truck volumes from missing, unavailable, or incorrectly joined data.
- Improve linkage among crash, WSP, inspection, maintenance, permit, and repair-cost records using a consistent bridge identifier.
- Document the first advance warning, last safe decision point, controlling clearance, available alternate route, and usable pull-off or turnaround at reviewed locations.
- Inventory existing static signs, active warnings, cameras, power, communications, and other relevant infrastructure.

- Maintain records of warning activations, confirmed overheight vehicles, driver responses, false alarms, system downtime, and maintenance activity for active systems.

At locations where appropriate static signs are already present and strikes continue, WSDOT should evaluate a different layer of protection rather than installing additional duplicative signs. The next treatment may include an active, physical, operational, in-cab, enforcement, or structural measure, depending on the diagnosed strike mechanism and site conditions. These data improvements should also support periodic BPI updates and reassessment following severe or repeat events.

4.2.5 Targeted Enforcement and Accountability

WSP and WSDOT should use bridge-strike records, questionnaire findings, permit information, and warning-system activation data to focus enforcement on documented patterns of noncompliance. Enforcement should be location- and evidence-based rather than dependent on broad, continuous patrol activity. Potential enforcement applications include:

- Time-limited enforcement and education details following a repeat strike or the installation of a new treatment.
- Vehicle-height, equipment-position, load-securement, permit, and approved-route checks where legally authorized.
- Targeted activity during time periods associated with recurring overheight movements.
- Coordination with carriers or industries connected to repeated permit or equipment-position violations.
- Preservation of photographs, video, vehicle information, and other evidence needed for investigation and cost recovery.
- Coordination with WSDOT's existing processes for recovering inspection, repair, traffic-control, and related costs from responsible parties.

Where crash and enforcement records identify alcohol or drug impairment, WSP may incorporate relevant locations and time periods into its existing impaired-driving enforcement activities. Impairment should remain outside the BPI because it is not a stable location characteristic. Driver age should not be used as an enforcement criterion. Any aggregate age or experience pattern should instead inform education, warning design, legibility, message comprehension, and delivery channels.

4.2 Recommendation Strategies

4.2.6 Cost-Tiered Countermeasure Framework

The study supports a layered strategy organized around Education, Enforcement, and Engineering. No single treatment will address every bridge strike because the study identified multiple contributing mechanisms: unverified height, raised equipment, shifted or improperly secured cargo, route deviations, use of noncommercial navigation, delayed recognition of warnings, and nonpermitted vehicles operating on restricted routes. The recommended strategy therefore combines statewide actions with cost-tiered site treatments.

Partner interviews and the national best practices indicate that there is no single countermeasure that will prevent all bridge strikes. Bridge strikes result from different combinations of infrastructure, vehicle, routing, operational, and driver factors. A low-clearance bridge repeatedly struck by rental trucks requires a different response from a high-clearance bridge struck by raised construction equipment or a permitted vehicle operating off its approved route. WSDOT should therefore use a layered strategy combining Education, Enforcement, and Engineering.

The following cost tiers are intended to provide scalable planning options during the assessment of bridge strike countermeasures. The ranges presented are rough-order-of-magnitude (ROM) industry planning values. Costs should be refined after field verification, concept development, and confirmation of the intended project delivery method.

The ROM ranges apply to the complete treatment package, not only the purchase price of individual equipment. The cost of a roadside technology may include detection equipment, signs, poles, foundations, power, communications, traffic control, software integration, testing, and construction management. Costs may also be affected by the number of approaches, roadway width and speed, available stopping distance, utility conflicts, railroad coordination, right of way, environmental requirements, and the availability of a safe pull-off, turnaround, or diversion route.

Tier 1 Low-Cost and Foundational \$ ROM planning range \$0-\$25,000 per countermeasure location Appropriate measures TETC campaign materials; law enforcement questionnaire and officer job aid; clearance and signing audits, including review of sign location, type, mounting height, visibility, condition, and displayed clearance information; static or relocated warning signs; route and turnaround signs; limited rumble strips; vegetation or visibility corrections; clearance-data modifications; permit prompts; in-cab height placards.	Tier 2 Moderate-Cost Warning, Detection, and Technology \$\$ ROM planning range \$25,000-\$250,000 per location countermeasure or pilot Appropriate measures Targeted enforcement details; enhanced education with paid distribution and formal evaluation; flashing signs and beacons; changeable or blank-out signs; fixed event-verification cameras; sensor-based overheight detection; active warning systems; passive hanging chains or clanker assemblies; geofenced in-cab notification pilots; commercial-navigation or telematics partnerships.	Tier 3 High-Cost and Capital \$\$\$ ROM planning range More than \$250,000 per location countermeasure; major structural work may cost several million dollars Appropriate measures Enhanced overheight vehicle detection systems with sensors, video surveillance, and TMC clearance monitoring; complete clanker installations with dynamic warning systems; protective portals or crash beams; pull-off or turnaround construction; multi-location connected-vehicle corridor deployment; structural protection, bridge raising, roadway lowering, or bridge replacement.
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4.2 Recommendation Strategies

4.2.6 Cost-Tiered Countermeasure Framework

Tier 1 – Low-Cost and Foundational \$

Project partner meetings support including education and data collection in this tier. TETC’s campaign materials are already developed with public funding and can be customized by WSDOT. TETC indicated that states using existing communications staff, social-media channels, videos, or podcasts generally experienced minimal incremental cost. However, WSDOT should still identify staff responsibilities and provide funding for translation, printing, partner distribution, and evaluation where necessary.

The proposed law enforcement questionnaire also belongs in Tier 1. It would improve information about vehicle height, equipment position, permit status, navigation use, route familiarity, rental or ownership status, understanding of the warnings, and why the driver proceeded. This information is necessary to determine whether future investment should emphasize engineering, education, or enforcement.

In addition, Tier 1 measures should establish a consistent baseline at all selected locations. They are appropriate for correcting missing or inconsistent information, improving warning visibility, addressing driver knowledge, and collecting better data before higher-cost investments are made.

Tier 1 action should include a route-level review extending upstream from the bridge to the last safe decision point. The review should verify:

- The controlling clearance by lane and direction.
- Consistency among bridge inventory, permitting, roadway-sign, and traveler-information records.
- The displayed clearance value on each applicable warning sign.
- The location, type, mounting height, lateral placement, visibility, and condition of existing warning signs.
- Consistency with applicable WSDOT standards and standard plans.

- Whether warnings begin sufficiently in advance of the bridge and before the last safe decision point.
- Whether the driver is clearly instructed to stop, exit, turn, pull over, or take another appropriate action.
- Whether an alternate route, turnaround, pull-off, or other safe-response location is available.
- Whether the strike pattern involves vehicle height, raised equipment, load shift, route deviation, or failure to respond to warnings.

Tier 1 should also include low-cost vehicle-based measures, such as in-cab height placards.

Tier 2 – Moderate-Cost Warning, Detection, and Technology Measures \$\$

Tier 2 measures should be considered where basic signing is already present but strikes continue, or where the diagnostic review indicates that drivers need a more conspicuous, individualized, physical, or in-cab warning.

WSDOT’s partner interviews provide an important Washington-specific cost basis. WSDOT staff estimated that a basic overheight detection system could cost approximately \$30,000 per location if installed using state forces. The same type of system could cost approximately \$150,000–\$200,000 when delivered through a capital project because of design, bidding, traffic control, poles, foundations, electrical work, inspection, and other project-delivery requirements.

The partner interviews also identified important limitations. WSDOT currently has very few operating active overheight warning systems. The existing SR 529 system uses infrared detection to activate warning lights and an audible bell, but it is not integrated with a TMC or broader operational response. Staff reported that its routine maintenance burden is relatively low, primarily approximately one hour per week for checks.

Therefore, Tier 2 detection should be deployed selectively. A detector should not be installed unless the resulting warning provides the driver with:

1. A clear indication that the warning applies to that vehicle.
2. A direct instruction, such as stop, exit, turn, or pull over.
3. Sufficient distance to respond safely.
4. A physically usable location to stop or divert.
5. A defined operational response if the vehicle cannot turn around independently.

Partners emphasized that successfully detecting and stopping an overheight vehicle creates a second question: Where does the vehicle go? Some locations may require a pull-off area, turnaround, or law enforcement response. These supporting improvements may move an otherwise moderate-cost warning system into Tier 3.

Tier 2 should also include emerging-technology pilots. Potential applications include:

- Geofenced notifications delivered through commercial navigation or fleet platforms.
- Low-clearance alerts delivered through services such as Drivewyze or similar providers.
- Machine-readable bridge-clearance and restriction data provided to commercial-navigation companies.
- Smartphone-based alerts where messages can be delivered without creating driver distraction.
- Event-verification cameras that measure whether drivers slow, stop, turn, or continue.

Partners noted that nearly every driver has a smartphone, but commercial fleets do not use one common in-cab system. A geofenced notification will only reach drivers using the participating platform. For that reason, in-cab warnings should be piloted as an additional layer and should not replace roadside warning devices.

4.2 Recommendation Strategies

4.2.6 Cost-Tiered Countermeasure Framework

Tier 3 – High-Cost and Capital Measures

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Tier 3 measures should be reserved for locations with recurring strikes, high structural or network consequences, inadequate alternate routes, or continued noncompliance after lower-cost measures have been implemented.

Depending on site conditions, an integrated Tier 3 detection system may include:

- Redundant overheight sensors.
- Directional detection.
- A direct driver-specific message.
- Cameras and event recording.
- TMC and law enforcement notification.
- Remote equipment-health monitoring.
- Backup power.
- Integration with a traffic signal or stop-control system.
- A constructed pull-off, turnaround, or diversion path.
- Defined response procedures for WSDOT, WSP, and the structure owner.

Complete clanker systems also belong in Tier 3 when they require new mast arms, foundations, signs, flashers, cameras, and electrical work. TETC's DeIDOT summary reported that installations generally cost approximately \$250,000, while the Casho Mill Road project cost approximately \$350,000–\$400,000 because it included additional warning and ADA improvements. DeIDOT also estimated approximately \$25,000 to replace a completely damaged hanging clanker assembly, including chains and attachments, but excluding the primary support structure.

Partners cautioned that physical telltales and active systems should only be used where a driver has somewhere safe to stop or turn. A clanker may successfully prevent a strike but leave an overheight vehicle stopped in a travel lane or attempting to reverse through traffic. The treatment package must therefore address both warning and recovery.

Protective portals, crash beams, structural strengthening, bridge raising, roadway lowering, and replacement should be evaluated only where the expected structural, mobility, freight, rail, or safety consequences justify the investment. The Bridge Office emphasized that some structures, particularly through-truss bridges or structures with vulnerable overhead members, may have consequences far beyond the number of recorded crashes. Route vulnerability and the absence of a reasonable detour should also inform these decisions.

Integrating Newer Technologies Within the Cost Tiers

Newer technology should be treated as a higher-cost measure and considered primarily for priority locations where lower-cost treatments have not adequately addressed the recurring strike mechanism. Before broader deployment, WSDOT should conduct a limited pilot to evaluate detection accuracy, alert timing, driver response, system reliability, communications requirements, cybersecurity and privacy considerations, maintenance responsibilities, and the availability of a safe response path. These technologies should supplement, not replace, accurate clearance data, commercial-vehicle routing resources, roadside signs, physical warnings, and enforcement. Expansion should occur only when the pilot demonstrates measurable safety and operational benefits.

WSDOT should first ensure that its bridge-clearance information is accurate, direction- and lane-specific, and updated when paving, rehabilitation, construction, or structural work changes the available clearance. Partners emphasized that agencies cannot credibly tell drivers to trust roadway and digital information unless the underlying information is current and consistent.

As part of a pilot, WSDOT could work with commercial-navigation, fleet-technology, and subscription providers to distribute permanent and temporary clearance restrictions. A small pilot should be conducted at selected high-priority locations to determine:

- Which vehicles receive the notification.
- Whether drivers understand that the alert applies to them.
- Whether the warning is delivered early enough.
- Whether drivers slow, stop, or divert.
- Whether alerts produce false or irrelevant warnings.
- Whether the system can distinguish direction of travel.
- Whether the driver has a safe response path.
- Whether WSDOT or WSP needs to be notified.
- Whether the benefits justify expansion.

Connected and in-cab technologies should supplement, not replace, roadside signs, physical warnings, and enforcement. Their effectiveness depends on accurate data, compatible equipment, reliable communications, fleet participation, cybersecurity, privacy protections, and clear responsibility for maintaining the information.

Application of the Cost Framework

WSDOT should begin with the least-cost treatment that credibly addresses the diagnosed problem, but cost alone should not determine the treatment. For example:

- Missing or inconsistent information may be addressed through Tier 1.
- Repeated missed warnings may justify Tier 2 active or in-cab warnings.
- Warnings that are seen but ignored may require physical notification or enforcement.
- A detected vehicle with no safe escape path may require Tier 3 construction.
- A structurally vulnerable bridge with severe detour consequences may justify a higher-cost treatment even with relatively few recorded strikes.

4.2 Recommendation Strategies

4.2.7 Applying Cost Tiers to Prioritized Locations

The BPI identifies the order in which locations should be reviewed; it does not automatically prescribe a countermeasure or level of investment. After a location is selected for review, the strike mechanism should be diagnosed. Afterwards, select a cost-effective treatment package that provides a credible additional layer of protection.

This report uses two distinct classification systems:

- **BPI priority categories:** Highest Priority, Elevated Priority, and Routine Monitoring.
- **Countermeasure cost tiers:** Cost Tier 1, Cost Tier 2, and Cost Tier 3.

To avoid confusion, the word “tier” is reserved for the countermeasure cost categories in the recommendations section. The cost tiers established in Section 4.2.1 are:

- **Cost Tier 1 – Low-Cost and Foundational:** \$0–\$25,000 per location or discrete program action.
- **Cost Tier 2 – Moderate-Cost Warning, Detection, and Technology:** \$25,000–\$250,000 per location or pilot.
- **Cost Tier 3 – High-Cost and Capital:** Above \$250,000 per location, with major structural work potentially costing several million dollars.

A Highest Priority bridge does not automatically require a Cost Tier 3 countermeasure. Conversely, a Routine Monitoring bridge may warrant earlier or higher-cost action if engineering judgment identifies severe structural, safety, mobility, freight, rail, or emergency-response consequences. Before assigning a cost tier, WSDOT should:

- Confirm the bridge, direction, affected lane, and controlling clearance.
- Reconcile crash, inspection, maintenance, WSP, permit, and cost-recovery records.
- Review the structural and network consequences of another strike.
- Diagnose the driver, vehicle, routing, and operational factors.
- Inventory existing signs, detection, cameras, power, communications, and other treatments.
- Identify the last safe decision point and available exit, turnaround, pull-off, or alternate route.
- Select the lowest-cost treatment package that addresses the identified mechanism.
- Define performance measures and conditions for escalation.

Cost Tiers and Recommended Actions for Priority Categories

Priority category	Cost tier	Recommended action
Highest Priority	Implement applicable Cost Tier 1 corrections immediately. Assess Cost Tier 2 measures for site implementation. Evaluate Cost Tier 3 where structural or network consequences are severe or where a complete stop-and-divert response requires capital construction.	Escalate where strikes continue after lower-cost measures, static warnings are already complete, drivers repeatedly disregard warnings, or another strike could create major structural, rail, freight, mobility, or safety consequences.
Elevated Priority	Apply the Cost Tier 1. Review upper-ranked, repeat-strike, low-clearance, and consequence-sensitive locations for Cost Tier 2 treatments.	Consider Cost Tier 3 for persistent recurrence, exceptional consequences, lack of a safe response path, or a documented engineering-judgment override.
Routine Monitoring	Maintain signing and clearance information. Address identified issues through routine maintenance and monitor for new events.	Initiate a new diagnostic review after a severe event, a second recent event, a material clearance change, or identification of a structural or network concern not fully represented in the BPI.

4.2 Recommendation Strategies

4.2.7 Applying Cost Tiers to Prioritized Locations

Initial Location and Cost-Tier Assignment

The following assignments identify the initial level of evaluation recommended for the Highest Priority bridges and selected Elevated Priority bridges. They are not final design decisions. Final treatment selection should follow field verification, diagnostic review, structure-owner coordination, and confirmation that the driver has a safe response path. The full cost-tier assignment table for all 75 bridges is provided in **Appendix**. These assignments should be revisited after field verification and after any new severe or repeat strike. WSDOT should document any decision to advance or defer a location, including the diagnostic evidence, responsible office, selected cost tier, expected outcome, and performance measures. The objective is not to install one technology at every ranked bridge. It is to apply a consistent process that identifies the location, diagnoses why strikes occur, selects the most cost-effective package, and escalates the treatment when recurrence or consequence justifies additional investment.

Bridge	BPI category	Initial cost-tier evaluation	Next step
5/420 – Light Rail at Lakeview over I-5	Highest Priority	Cost Tier 1 plus Cost Tier 2; evaluate Cost Tier 3 feasibility.	Verify controlling clearance, signing, strike mechanism, ownership, and diversion feasibility. Evaluate a coordinated corridor treatment with Bridge 5/419.
5/419 – 47th Avenue SW over I-5	Highest Priority	Cost Tier 1 plus Cost Tier 2; evaluate Cost Tier 3 only if a capital operational response is required.	Review raised-equipment and fatal-event circumstances. Determine whether active roadside or in-cab warnings can be coordinated with Bridge 5/420.
3/105 – Railroad Bridge over SR 3	Highest Priority	Cost Tier 1 plus Cost Tier 2; evaluate Cost Tier 3 feasibility.	Coordinate with the railroad or structure owner. Verify clearance, approach speed, warning location, power and communications, and available diversion geometry. Evaluate Tier 3 only if a complete physical warning or constructed safe-response path is required.
904/10 – SR 904 over I-90	Elevated Priority	Cost Tier 1 initially; evaluate Cost Tier 2 after field review.	Verify signing conditions, controlling clearance, heavy-vehicle exposure, and strike mechanism before selecting an active treatment.
90/327 – Schoessler Road over I-90	Elevated Priority	Cost Tier 1; Cost Tier 2 active or physical warning evaluation; Cost Tier 3 if safe-response construction is required.	Verify truck exposure, signing, recurrence pattern, and the availability of a pull-off or turnaround.
82/10N – I-82 over SR 821	Elevated Priority	Cost Tier 1 plus Cost Tier 2 evaluation.	Focus the diagnostic review on construction equipment, raised components, approach geometry, and warning recognition.
397/15 – Railroad Bridge over SR 397	Elevated Priority	Cost Tier 2 evaluation because repeat strikes occurred despite static signing recorded on both approaches.	Coordinate with the railroad owner and determine whether an active, physical, or in-cab warning provides a credible additional layer. The Low structural-consequence classification does not remove the need to address recurrence and constrained clearance.
5/418 – Bridgeport Way over I-5	Elevated Priority	Cost Tier 1 plus Cost Tier 2 evaluation.	Confirm advance-signing needs and determine whether the recurring heavy-equipment context supports active or in-cab warning.
410/101 – SR 410 White River Bridge	Elevated Priority with engineering-judgment override	Continue implementation and evaluation of the current overheight-detection effort. Evaluate additional Cost Tier 2 or Cost Tier 3 measures only if post-implementation monitoring or the diagnostic review identifies an unmet operational, structural, or safe-response need.	Confirm that the current system provides adequate warning and a safe stop or diversion response. Establish performance measures for system activation, driver response, reliability, maintenance, and operational notification before considering additional treatments.
5/220 – 13th Street over I-5	Elevated Priority	Cost Tier 1 plus Cost Tier 2 evaluation.	Apply the foundational baseline and complete a diagnostic review. Verify lane- and direction-specific clearance, correct signs and commercial-navigation data, and evaluate directional detection or an in-cab warning pilot if static information is insufficient.
5/837N-W – N-W Ramp	Elevated Priority	Cost Tier 1 plus Cost Tier 2 evaluation.	Apply the foundational baseline and complete a diagnostic review. Verify lane- and direction-specific clearance, place warnings before the ramp's last safe decision point, and evaluate directional detection or an in-cab warning pilot if static information is insufficient.

Appendix



Bridge Characteristics

#	Bridge Number	Bridge Name	Span Type	Structural Consequence	Strike Count	Years Since Last Strike	AADT Under	Heavy Vehicle AADT	Vertical Clearance ft	Bridge Skew Degree	Highest Severity	NHS Designation	NHFN Designation
1	5/420	LIGHT RAIL (ST) @ LAKEVIEW OVER I-5	SG	High	5	1	149000	16241	15.17		No Apparent Injury	Y	1
2	5/419	47TH AVE SW OVER I-5	CBox	Low	4	0	149000	16241	14.75	0	Dead at Scene	N	N
3	3/105	RAILROAD OVER SR 3	CG	Low	3	0	85000	4590	15.17		No Apparent Injury	Y	N
4	904/10	SR 904 OVER I-90	PCG	High	2	0	39000	5304	16.00	45	No Apparent Injury	N	N
5	90/327	SCHOESSLER RD OVER I-90	CBOX	Low	6	0	21000	0	14.42	0	No Apparent Injury	Y	N
6	82/10N	I-82 OVER SR 821	PCG	High	2	1	1200	154.8	14.83	30	No Apparent Injury	Y	1
7	397/15	RAILROAD OVER SR 397	SG	Low	2	0	18000	972	14.83		No Apparent Injury	Y	
8	5/418	BRIDGEPORT WAY OVER I-5	CBox	Low	2	1	135000	0	15.00	39	No Apparent Injury	Y	N
9	410/101	WHITE RIVER	STrus CTB	Critical	1	0	22000	1386	14.25	0	No Apparent Injury	Y	N
10	5/220	13TH ST OVER I-5	PCG	High	2	1	62000	0	15.08	0	No Apparent Injury	N	N
11	5/837N-W	N-W RAMP	PCG	High	1	0	21000	5040	16.25	38	No Apparent Injury	Y	1
12	5/574	NE 50TH ST OVER I-5	CBox	Low	2	1	39000	0	14.75	0	No Apparent Injury	Y	N
13	5/212	KOONTZ RD OVER I-5	PCG	High	3	1	52000	0	16.00	0	Suspected Serious Injury	N	N
14	5/217W	I-5 OVER RUSH RD	CTB	Moderate	2	2	3600	1022.4	14.42	0	No Apparent Injury	Y	1
15	90/133	BULLFROG RD OVER I-90	PCG	High	1	0	34000	7344	16.00	4	No Apparent Injury	Y	N
16	14/12	LIESER RD OVER SR 14	PCG	High	3	2	55000	0	15.92	16	No Apparent Injury	Y	N
17	90/587W-W	I-90 WB RAMP	CBOX	Low	1	3	80000	0	14.75	0	Possible Injury	Y	1
18	5/569	ROANOKE ST OVER I-5	CBox	Low	2	1	222000	0	15.25	0	No Apparent Injury	N	N
19	28/101	RR OVER SR 28 TRINIDAD	SG	Low	1	2	11000	1419	14.50		Possible Injury	Y	N
20	BRG-096	SR 513 UNDER UW STADIUM PED		Unclassified	1	1	43000	0	12.50		No Apparent Injury	Y	N
21	BOT-09	102ND AVE OVER SR 522	SB CTB	High	2	0	36000	0	15.67	0	No Apparent Injury	N	
22	2/26	SULTAN RIVER	STrus CTB	Critical	1	1	24000	0	14.58	0	No Apparent Injury	Y	N
23	82/123	E YAKIMA AVE OVER I-82	CBOX	Low	1	0	36000	0	15.75	30	No Apparent Injury	Y	N
24	90/89N	I-90 OVER 468TH AVE SE	PCG	High	2	2	3600	931.5	15.50	23	No Apparent Injury	Y	1
25	2/641S	BNRR OVER US 2/DIVISION	SG	Low	4	3	24000	0	13.42		Possible Injury	Y	N

Bridge Ranking

#	Bridge Number	Strike Count Score	Recency Score	Strike History Score	AADT Score	Heavy Vehicle Score	Exposure Score 100	Clearance Score	Geometry Modifier	Vulnerability Score 100	Severity Score	Network Importance Score	Structural Consequence Score	Consequence Score 100	Bridge Prioritization Index	Priority Tier
1	5/420	3	3	100	3	3	100	2	0	50	0	3	2	55.6	80.8	High
2	5/419	2	3	83.3	3	3	100	3	0	75	3	0	0	33.3	77.9	High
3	3/105	2	3	83.3	3	3	100	2	0	50	0	3	0	33.3	71.7	High
4	904/10	1	3	66.7	2	3	83.3	1	1	50	0	1	2	33.3	61.7	Medium
5	90/327	3	3	100	1	0	16.7	3	0	75	0	2	0	22.2	61.3	Medium
6	82/10N	1	3	66.7	0	1	16.7	3	1	100	0	3	2	55.6	60.9	Medium
7	397/15	1	3	66.7	1	2	50	3	0	75	0	2	0	22.2	57.9	Medium
8	5/418	1	3	66.7	3	0	50	2	1	75	0	2	0	22.2	57.9	Medium
9	410/101	0	3	50	1	2	50	3	0	75	0	2	3	55.6	57.1	Medium
10	5/220	1	3	66.7	3	0	50	2	0	50	0	2	2	44.4	55	Medium
11	5/837N-W	0	3	50	1	3	66.7	1	1	50	0	3	2	55.6	55	Medium
12	5/574	1	3	66.7	2	0	33.3	3	0	75	0	2	0	22.2	53.8	Medium
13	5/212	2	3	83.3	2	0	33.3	1	0	25	3	0	2	55.6	52.1	Medium
14	5/217W	1	2	50	0	2	33.3	3	0	75	0	3	1	44.4	51.2	Medium
15	90/133	0	3	50	2	3	83.3	1	0	25	0	2	2	44.4	51.2	Medium
16	14/12	2	2	66.7	2	0	33.3	2	0	50	0	2	2	44.4	50.8	Medium
17	90/587W-W	0	1	16.7	3	0	50	3	1	100	1	3	0	44.4	50	Medium
18	5/569	1	3	66.7	3	0	50	2	0	50	0	1	0	11.1	50	Medium
19	28/101	0	2	33.3	1	2	50	3	0	75	1	3	0	44.4	49.6	Medium
20	BRG-096	0	3	50	2	0	33.3	3	0	75	0	2	1	33.3	49.6	Medium
21	BOT-09	1	3	66.7	2	0	33.3	2	0	50	0	1	2	33.3	49.2	Medium
22	2/26	0	3	50	1	0	16.7	3	0	75	0	2	3	55.6	48.8	Medium
23	82/123	0	3	50	2	0	33.3	2	1	75	0	2	0	22.2	47.9	Medium
24	90/89N	1	2	50	0	2	33.3	2	0	50	0	3	2	55.6	46.7	Medium
25	2/641S	2	1	50	1	0	16.7	3	0	75	1	2	0	33.3	45.4	Medium

Bridge Characteristics

#	Bridge Number	Bridge Name	Span Type	Structural Consequence	Strike Count	Years Since Last Strike	AADT Under	Heavy Vehicle AADT	Vertical Clearance ft	Bridge Skew Degree	Highest Severity	NHS Designation	NHFN Designation
26	90/567P	PEDESTRIAN BR OVER I-90	CS	Moderate	2	4	124000	0	14.75		No Apparent Injury	Y	1
27	90/95S	I-90 OVER USFS RD 9030	PCG	High	1	0	140	26.985	15.08	1	No Apparent Injury	Y	1
28	303/42	SR 303 OVER SR 3	PCG	High	1	1	26000	0	15.75	20	No Apparent Injury	Y	N
29	27/111	RAILROAD OVER SR 27	SG	Low	1	0	4800	360	14.33		No Apparent Injury	N	N
30	90/585	BARKER RD OVER I-90	CS	Moderate	1	3	76000	0	14.75	0	No Apparent Injury	Y	N
31	90/219P	I-90 UNDER WESTLAKE PED	PCG	High	1	5	28000	6496	15.92		No Apparent Injury	Y	1
32	5/822E	I-5 OVER SR 539/MERIDIAN	CBOX	Low	1	5	29000	783	14.58	12	No Apparent Injury	Y	1
33	99/511	DES MOINES MEM OVER SR 99	CVS	Moderate	1	2	26000	0	14.58	12	No Apparent Injury	Y	N
34	395/102	SYLVESTER ST OVER US 395	PCG	High	1	0	51000	0	16.42	16	No Apparent Injury	N	N
35	409/10	JULIA BUTLER HANSEN BR	STrus PCG SG CTB	Critical	1	0	2400	0	16.33	0	No Apparent Injury	N	N
36	167/119	S 277TH ST OVER SR 167	PCG	High	1	1	117000	0	16.67	0	No Apparent Injury	Y	N
37	5/829E	I-5 OVER PORTAL WAY	PCG	High	1	4	11510	230.2	14.25	23	No Apparent Injury	Y	1
38	5/717	COOK RD OVER I-5	CS	Moderate	1	1	46000	0	16.25	23	No Apparent Injury	N	N
39	2/608	RAILROAD OVER US 2	SB	Low	1	3	11000	0	14.67		Possible Injury	Y	N
40	90/593S	I-90 OVER SPOKANE BRIDGE RD	POBX	Low	1	3	1100	44.825	14.42	0	No Apparent Injury	Y	1
41	90/54W	150TH AVE OVER I-90	SG	High	1	5	97000	0	16.25	8	No Apparent Injury	Y	1
42	303/25	CENTRAL VLY OVER SR 303	PCG	High	2	4	30000	0	15.00	0	No Apparent Injury	Y	N
43	5/640W	I-5 OVER EVERETT AVE	PCG	High	1	3	6500	0	15.67	40	No Apparent Injury	Y	1
44	5/411NCD	NBCD OVER 41ST DIVISION DR	PCG	High	1	3	7400	0	14.83	0	No Apparent Injury	Y	1
45	12/639S	US 12 OVER MYRA RD	PCG	High	1	1	4200	456.75	19.83	18	No Apparent Injury	Y	N
46	5/588SCD	SBCD OVER NORTHGATE WAY	PCG	High	1	3	48000	0	16.00	0	Suspected Minor Injury	Y	1
47	82/130S-W	S-W RAMP OVER I-82	PCG	High	1	3	29000	0	17.75	45	Suspected Minor Injury	Y	1
48	99/400	SR 99 OVER I-5	PCG	High	1	3	183000	0	16.42	3	No Apparent Injury	Y	N
49	5/674W	I-5 OVER 300TH ST NW	PCG	High	1	5	1980	136.62	14.58	9	Unknown	Y	1
50	5/133E	I-5 OVER HUNTINGTON AVE	PCG	High	1	4	4430	376.55	15.50	33	No Apparent Injury	Y	1

Bridge Ranking

#	Bridge Number	Strike Count Score	Recency Score	Strike History Score	AADT Score	Heavy Vehicle Score	Exposure Score 100	Clearance Score	Geometry Modifier	Vulnerability Score 100	Severity Score	Network Importance Score	Structural Consequence Score	Consequence Score 100	Bridge Prioritization Index	Priority Tier
26	90/567P	1	0	16.7	3	0	50	3	0	75	0	3	1	44.4	43.8	Medium
27	90/95S	0	3	50	0	1	16.7	2	0	50	0	3	2	55.6	42.5	Medium
28	303/42	0	3	50	1	0	16.7	2	0	50	0	3	2	55.6	42.5	Medium
29	27/111	0	3	50	0	1	16.7	3	0	75	0	1	0	11.1	42.1	Medium
30	90/585	0	1	16.7	3	0	50	3	0	75	0	2	1	33.3	42.1	Medium
31	90/219P	0	0	0	2	3	83.3	2	0	50	0	3	2	55.6	41.7	Medium
32	5/822E	0	0	0	2	2	66.7	3	0	75	0	3	0	33.3	40.4	Medium
33	99/511	0	2	33.3	1	0	16.7	3	0	75	0	2	1	33.3	39.6	Low
34	395/102	0	3	50	2	0	33.3	1	0	25	0	1	2	33.3	37.1	Low
35	409/10	0	3	50	0	0	0	1	1	50	0	1	3	44.4	36.7	Low
36	167/119	0	3	50	3	0	50	0	0	0	0	2	2	44.4	36.7	Low
37	5/829E	0	0	0	1	1	33.3	3	0	75	0	3	2	55.6	35.4	Low
38	5/717	0	3	50	2	0	33.3	1	0	25	0	1	1	22.2	35.4	Low
39	2/608	0	1	16.7	1	0	16.7	3	0	75	1	2	0	33.3	33.8	Low
40	90/593S	0	1	16.7	0	1	16.7	3	0	75	0	3	0	33.3	33.8	Low
41	90/54W	0	0	0	3	0	50	1	1	50	0	3	2	55.6	33.3	Low
42	303/25	1	0	16.7	2	0	33.3	2	0	50	0	2	2	44.4	33.3	Low
43	5/640W	0	1	16.7	0	0	0	2	1	75	0	3	2	55.6	32.9	Low
44	5/411NCD	0	1	16.7	0	0	0	3	0	75	0	3	2	55.6	32.9	Low
45	12/639S	0	3	50	0	2	33.3	0	0	0	0	2	2	44.4	32.5	Low
46	5/588SCD	0	1	16.7	2	0	33.3	1	0	25	2	3	2	77.8	32.1	Low
47	82/130S-W	0	1	16.7	2	0	33.3	0	1	25	2	3	2	77.8	32.1	Low
48	99/400	0	1	16.7	3	0	50	1	0	25	0	2	2	44.4	31.3	Low
49	5/674W	0	0	0	0	1	16.7	3	0	75	0	3	2	55.6	31.3	Low
50	5/133E	0	0	0	0	1	16.7	2	1	75	0	3	2	55.6	31.3	Low

Bridge Characteristics

#	Bridge Number	Bridge Name	Span Type	Structural Consequence	Strike Count	Years Since Last Strike	AADT Under	Heavy Vehicle AADT	Vertical Clearance ft	Bridge Skew Degree	Highest Severity	NHS Designation	NHFN Designation
51	506/108	SR 506 OVER I-5	PCG	High	2	3	40000	0	16.42	0	No Apparent Injury	N	N
52	518/12	24TH AVE S OVER SR 518	PCG	High	1	4	69000	0	16.25	30	No Apparent Injury	N	N
53	5/655	TULALIP RR OVER I-5	SG	Low	1	3	104000	0	16.08		No Apparent Injury	Y	1
54	405/14	LIND AVE OVER I-405	PCG	High	1	3	167000	0	16.33	5	No Apparent Injury	N	N
55	5/829W	I-5 OVER PORTAL WAY	PCG	High	1	4	11510	230.2	15.25	23	No Apparent Injury	Y	1
56	124/1	DEPUTY MICHAEL ESTES OVERPASS	PCG	High	1	1	27000	0	16.50	27	No Apparent Injury	Y	N
57	12/502	KAHLOTUS RD OVER US 12	PCG	High	1	5	28000	5068	17.25	13	No Apparent Injury	Y	N
58	2/655	RAILROAD OVER US 2	SG	Low	1	1	20000	0	16.92		No Apparent Injury	Y	N
59	290/7	RAILROAD OVER SR 290	SG	Low	1	5	8300	0	14.33	0	No Apparent Injury	Y	N
60	6/107	SR 6 UNDER ST PARKS TRAIL	SG	High	1	4	2300	282.9	14.83		No Apparent Injury	N	
61	5/129	PLEASANT HILL RD OVER I-5	PCG	High	1	5	28000	5684	17.08	11	Unknown	N	N
62	90/538E-S	PED/BIKE TRAIL OVER RAMP	SG	High	1	5	3100	0	14.33		No Apparent Injury	Y	
63	6/124	SR 6 OVER I-5	PCG	High	1	5	66000	0	16.33	13	No Apparent Injury	Y	N
64	5/102W	I-5 OVER SR 503	PCG	High	1	4	20000	0	15.83	15	Unknown	Y	1
65	28/122	RAILROAD OVER SR 28	SG	Low	1	3	630	108.99	15.25		No Apparent Injury	N	N
66	195/112E	RAILROAD OVER US 195	SG	Low	1	4	7300	0	14.58		No Apparent Injury	Y	N
67	182/14	SR 240 OVER I-182	PTCBox	Low	2	4	83000	0	16.75	0	No Apparent Injury	Y	N
68	3/128E	SR 3 OVER NEWBERRY HILL	PCG	High	1	4	7300	0	16.42	37	No Apparent Injury	Y	N
69	5/5	EVERGREEN BLVD OVER I-5	POBX CBOX	Low	1	3	130000	0	16.75	17	No Apparent Injury	N	N
70	5/646	12TH ST NE OVER I-5	PCG	High	1	4	132000	0	16.58	0	No Apparent Injury	N	N
71	12/344	N 16TH AVE OVER US 12	PCG	High	1	4	29000	0	16.83	0	No Apparent Injury	Y	N
72	411/3	RAILROAD OVER SR 411	TTC	Low	1	4	14000	504	20.17		Unknown	N	N
73	405/26W	I-405 SB OVER NE 44TH ST	PCG	High	1	3	6500	0	17.58	12	No Apparent Injury	Y	1
74	82/170	MABTON-SUNNYSDE OVR I-82	CBox	Low	1	4	25000	0	16.33	0	Unknown	N	N
75	26/283	RAILROAD OVER SR 26	SG	Low	1	4	3100	716.1	16.75		No Apparent Injury	Y	N

Bridge Ranking

#	Bridge Number	Strike Count Score	Recency Score	Strike History Score	AADT Score	Heavy Vehicle Score	Exposure Score 100	Clearance Score	Geometry Modifier	Vulnerability Score 100	Severity Score	Network Importance Score	Structural Consequence Score	Consequence Score 100	Bridge Prioritization Index	Priority Tier
51	506/108	1	1	33.3	2	0	33.3	1	0	25	0	1	2	33.3	31.2	Low
52	518/12	0	0	0	3	0	50	1	1	50	0	1	2	33.3	30	Low
53	5/655	0	1	16.7	3	0	50	1	0	25	0	3	0	33.3	29.6	Low
54	405/14	0	1	16.7	3	0	50	1	0	25	0	1	2	33.3	29.6	Low
55	5/829W	0	0	0	1	1	33.3	2	0	50	0	3	2	55.6	29.2	Low
56	124/1	0	3	50	1	0	16.7	0	0	0	0	2	2	44.4	28.3	Low
57	12/502	0	0	0	2	3	83.3	0	0	0	0	2	2	44.4	27.5	Low
58	2/655	0	3	50	1	0	16.7	0	0	0	0	3	0	33.3	26.7	Low
59	290/7	0	0	0	1	0	16.7	3	0	75	0	2	0	22.2	26.3	Low
60	6/107	0	0	0	0	1	16.7	3	0	75	0	0	2	22.2	26.3	Low
61	5/129	0	0	0	2	3	83.3	0	0	0	0	1	2	33.3	25.8	Low
62	90/538E-S	0	0	0	0	0	0	3	0	75	0	2	2	44.4	25.4	Low
63	6/124	0	0	0	3	0	50	1	0	25	0	2	2	44.4	25.4	Low
64	5/102W	0	0	0	1	0	16.7	2	0	50	0	3	2	55.6	25	Low
65	28/122	0	1	16.7	0	1	16.7	2	0	50	0	1	0	11.1	24.2	Low
66	195/112E	0	0	0	0	0	0	3	0	75	0	3	0	33.3	23.7	Low
67	182/14	1	0	16.7	3	0	50	0	0	0	0	3	0	33.3	23.3	Low
68	3/128E	0	0	0	0	0	0	1	1	50	0	3	2	55.6	20.8	Low
69	5/5	0	1	16.7	3	0	50	0	0	0	0	1	0	11.1	20	Low
70	5/646	0	0	0	3	0	50	0	0	0	0	0	2	22.2	15.8	Low
71	12/344	0	0	0	2	0	33.3	0	0	0	0	2	2	44.4	15	Low
72	411/3	0	0	0	1	2	50	0	0	0	0	1	0	11.1	14.2	Low
73	405/26W	0	1	16.7	0	0	0	0	0	0	0	3	2	55.6	14.2	Low
74	82/170	0	0	0	1	0	16.7	1	0	25	0	1	0	11.1	12.1	Low
75	26/283	0	0	0	0	2	33.3	0	0	0	0	2	0	22.2	11.7	Low

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier Assignment	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
1	5/420	LIGHT RAIL (ST) @ LAKEVIEW OVER I-5	80.8	Highest Priority	Cost Tier 1 + Cost Tier 2; evaluate Cost Tier 3 feasibility	Complete field verification and develop a site-specific active-warning or technology concept.	Escalate for persistent strikes, severe structural/network consequence, or capital stop/diversion needs.	5 documented strikes; most recent approximately 1 year ago; 15 ft 2 in recorded clearance; high structural consequence; transit ownership and potential roadway–transit disruption. The combination of recurrence, recency, exposure/consequence reflected in the 80.8 BPI supports immediate Tier 1 corrections, Tier 2 development, and Tier 3 feasibility review.	Correct and reconcile lane/direction-specific clearance data, advance signs, and truck-navigation data (Tier 1); design corridor overheight detection with driver-specific flashing/CMS warning, event camera, and a confirmed diversion response shared with 5/419 (Tier 2); test integrated TMC/transit notification and constructed stop/diversion feasibility (Tier 3).
2	5/419	47TH AVE SW OVER I-5	77.9	Highest Priority	Cost Tier 1 + Cost Tier 2; evaluate Cost Tier 3 feasibility	Complete field verification and develop a site-specific active-warning or technology concept.	Escalate for persistent strikes, severe structural/network consequence, or capital stop/diversion needs.	4 documented strikes; most recent within the most recent study year; 14 ft 9 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The combination of recurrence, recency, exposure/consequence reflected in the 77.9 BPI supports immediate Tier 1 corrections, Tier 2 development, and Tier 3 feasibility review.	Verify and correct clearance/signing and commercial-navigation information (Tier 1); develop coordinated overheight detection, flashing/CMS warning, and event camera coverage with 5/420 before the last safe exit (Tier 2); evaluate capital stop/diversion improvements only if the corridor lacks a safe response path (Tier 3).
3	3/105	RAILROAD OVER SR 3	71.7	Highest Priority	Cost Tier 1 + Cost Tier 2; evaluate Cost Tier 3 feasibility	Complete field verification and develop a site-specific active-warning or technology concept.	Escalate for persistent strikes, severe structural/network consequence, or capital stop/diversion needs.	3 documented strikes; most recent within the most recent study year; 15 ft 2 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The combination of recurrence, recency, exposure/consequence reflected in the 71.7 BPI supports immediate Tier 1 corrections, Tier 2 development, and Tier 3 feasibility review.	Reconcile clearance, ownership, and approach signing with the railroad (Tier 1); install/evaluate directional overheight detection, flashing warning or CMS, and event camera before the last safe diversion point (Tier 2); consider a complete clanker/protective system or constructed turnaround only with railroad agreement and feasible geometry (Tier 3).
4	904/10	SR 904 OVER I-90	61.7	Elevated Priority	Cost Tier 1; evaluate Cost Tier 2	Confirm signing gaps, clearance, exposure, and strike mechanism.	Advance to Cost Tier 2 if field review confirms static information is inadequate.	2 documented strikes; most recent within the most recent study year; 16 ft 0 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The 61.7 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify the controlling clearance and close documented signing/data gaps (Tier 1); if field review confirms warnings are insufficient, add directional overheight detection with flashing warning and event camera before a usable diversion (Tier 2).
5	90/327	SCHOESSLER RD OVER I-90	61.3	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Verify recurrence pattern, signing, truck exposure, and safe pull-off/turnaround.	Escalate to Cost Tier 3 if a constructed safe-response area is required.	6 documented strikes; most recent within the most recent study year; 14 ft 5 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The 61.3 BPI and repeat-strike history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Upgrade advance clearance and truck-route information and confirm the last safe decision point (Tier 1); because six strikes recur at 14 ft 5 in, evaluate active overheight detection with flashing/CMS warning, event camera, and—only if a safe exit exists—a physical telltale/clanker (Tier 2); construct a pull-off/turnaround if safe recovery cannot otherwise be provided (Tier 3).
6	82/10N	I-82 OVER SR 821	60.9	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Focus on construction equipment, raised components, approach geometry, and warning recognition.	Escalate if recurring events continue after lower-cost actions.	2 documented strikes; most recent approximately 1 year ago; 14 ft 10 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The 60.9 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Add/refresh equipment-stow and vehicle-height messaging for construction/equipment haulers and verify clearance/signs (Tier 1); evaluate active overheight detection with a direct flashing message and event camera focused on raised components (Tier 2).
7	397/15	RAILROAD OVER SR 397	57.9	Elevated Priority	Cost Tier 2 evaluation	Static signing is already recorded; coordinate with the railroad owner on an additional warning layer.	Consider Cost Tier 3 only if physical protection or diversion construction is justified.	2 documented strikes; most recent within the most recent study year; 14 ft 10 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The 57.9 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Coordinate with the railroad to confirm clearance and sign consistency (Tier 1); because strikes occurred despite recorded static signs, add a vehicle-specific layer—directional overheight detection, flashing/CMS warning, event camera, and defined diversion procedure (Tier 2); evaluate physical protection only if structural and site conditions justify it (Tier 3).
7	5/418	BRIDGEPORT WAY OVER I-5	57.9	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Confirm advance signing and whether heavy-equipment events support active or in-cab warning.	Escalate if recurrence persists or a safe operational response requires construction.	2 documented strikes; most recent approximately 1 year ago; 15 ft 0 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The 57.9 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Correct advance signing and digital clearance/route information, including equipment-height reminders (Tier 1); evaluate directional detection, flashing/CMS warning, and event camera before the last safe I-5 diversion point (Tier 2).
9	410/101	WHITE RIVER	57.1	Elevated Priority	Cost Tier 2 + Cost Tier 3 evaluation	Engineering-judgment override: coordinate detection, stop/diversion, operations notification, and structural review.	Proceed to Cost Tier 3 where structural protection or capital operational improvements are warranted.	1 documented strike; most recent within the most recent study year; 14 ft 3 in recorded clearance; critical structural consequence; route continuity and potentially high detour or structural consequences. The 57.1 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation, with a Tier 3 engineering override review.	Continue the planned overheight-detection effort with redundant sensors, driver-specific warning, event recording, equipment-health monitoring, and defined stop/diversion and TMC/WSP notification (Tier 2); concurrently evaluate protective portal/beam, structural modification, or other capital protection because the through-truss portal has critical consequences (Tier 3).
10	5/220	13TH ST OVER I-5	55	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	2 documented strikes; most recent approximately 1 year ago; 15 ft 1 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The 55.0 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier Assignment	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
10	5/837N-W	N-W RAMP	55	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent within the most recent study year; 16 ft 3 in recorded clearance; high structural consequence; ramp geometry, limited recovery distance, and the need to warn before the last safe decision point. The 55.0 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data; place warnings before the ramp's last safe decision point (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
12	5/574	NE 50TH ST OVER I-5	53.8	Elevated Priority	Cost Tier 1; evaluate Cost Tier 2	Verify clearance, signs, sight distance, vehicle context, and diversion options.	Advance to Cost Tier 2 if diagnostic review identifies missed or ineffective warnings.	2 documented strikes; most recent approximately 1 year ago; 14 ft 9 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The 53.8 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Field-verify the 14 ft 9 in controlling clearance, sight distance, and current advance/bridge-mounted signs; correct WSDOT and commercial-navigation data (Tier 1); add active detection and flashing warning only if the diagnostic review confirms that existing information is missed or ineffective (Tier 2).
13	5/212	KOONTZ RD OVER I-5	52.1	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Coordinate with the repair project and assess warning, detection, in-cab notification, or protection.	Evaluate Cost Tier 3 if recurrence continues or structural review identifies greater consequences.	3 documented strikes; most recent approximately 1 year ago; 16 ft 0 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The 52.1 BPI and repeat-strike history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Coordinate Tier 1 clearance/sign/data update with the current repair project; evaluate active overheight detection, flashing/CMS warning, event camera, and in-cab notification (Tier 2); reserve structural protection or modification for continued recurrence or confirmed girder vulnerability (Tier 3).
14	5/217W	I-5 OVER RUSH RD	51.2	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	2 documented strikes; most recent approximately 2 years ago; 14 ft 5 in recorded clearance; moderate structural consequence; interstate mobility and freight exposure. The 51.2 BPI and constrained clearance support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection with flashing warning and event camera due to the constrained clearance (Tier 2).
14	90/133	BULLFROG RD OVER I-90	51.2	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent within the most recent study year; 16 ft 0 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The 51.2 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
16	14/12	LIESER RD OVER SR 14	50.8	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	3 documented strikes; most recent approximately 2 years ago; 15 ft 11 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The 50.8 BPI and repeat-strike history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection with flashing/CMS warning, event camera, and a defined safe diversion; consider a telltale/clanker only where a vehicle can safely stop or turn (Tier 2).
17	90/587W-W	I-90 WB RAMP	50	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 3 years ago; 14 ft 9 in recorded clearance; low structural consequence; ramp geometry, limited recovery distance, and the need to warn before the last safe decision point. The 50.0 BPI and moderate consequence support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data; place warnings before the ramp's last safe decision point (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
17	5/569	ROANOKE ST OVER I-5	50	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	2 documented strikes; most recent approximately 1 year ago; 15 ft 3 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The 50.0 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
19	28/101	RR OVER SR 28 TRINIDAD	49.6	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 2 years ago; 14 ft 6 in recorded clearance; low structural consequence; railroad ownership and roadway-rail coordination needs. The 49.6 BPI and high consequence support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Coordinate with the railroad owner to verify controlling clearance, sign responsibility, and shared incident procedures (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
19	BRG-096	SR 513 UNDER UW STADIUM PED	49.6	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 1 year ago; 12 ft 6 in recorded clearance; unclassified structural consequence; a pedestrian/trail structure requiring early vehicle-height warning before the constrained crossing. The 49.6 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data; confirm the constrained crossing is clearly identified to overheight vehicles (Tier 1); evaluate directional overheight detection with flashing warning and event camera due to the constrained clearance (Tier 2).

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier Assignment	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
21	BOT-09	102ND AVE OVER SR 522	49.2	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	2 documented strikes; most recent within the most recent study year; 15 ft 8 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The 49.2 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
22	2/26	SULTAN RIVER	48.8	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 1 year ago; 14 ft 7 in recorded clearance; critical structural consequence; route continuity and potentially high detour or structural consequences. The 48.8 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation, with a Tier 3 engineering override review.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate active detection, event camera, operations notification, and a documented diversion response (Tier 2); complete Tier 3 structural/protective and safe-response feasibility review.
23	82/123	E YAKIMA AVE OVER I-82	47.9	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent within the most recent study year; 15 ft 9 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The 47.9 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
24	90/89N	I-90 OVER 468TH AVE SE	46.7	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	2 documented strikes; most recent approximately 2 years ago; 15 ft 6 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The 46.7 BPI and high consequence support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
25	2/641S	BNRR OVER US 2/DIVISION	45.4	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	4 documented strikes; most recent approximately 3 years ago; 13 ft 5 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The 45.4 BPI and repeat-strike history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Coordinate with the railroad owner to verify controlling clearance, sign responsibility, and shared incident procedures (Tier 1); evaluate directional overheight detection with flashing/CMS warning, event camera, and a defined safe diversion; consider a telltale/clanker only where a vehicle can safely stop or turn (Tier 2).
26	90/567P	PEDESTRIAN BR OVER I-90	43.8	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	2 documented strikes; most recent approximately 4 years ago; 14 ft 9 in recorded clearance; moderate structural consequence; a pedestrian/trail structure requiring early vehicle-height warning before the constrained crossing. The 43.8 BPI and moderate consequence support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data; confirm the constrained crossing is clearly identified to overheight vehicles (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
27	90/95S	I-90 OVER USFS RD 9030	42.5	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent within the most recent study year; 15 ft 1 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The 42.5 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
27	303/42	SR 303 OVER SR 3	42.5	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 1 year ago; 15 ft 9 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The 42.5 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
29	27/111	RAILROAD OVER SR 27	42.1	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent within the most recent study year; 14 ft 4 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The 42.1 BPI and recent event history support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Coordinate with the railroad owner to verify controlling clearance, sign responsibility, and shared incident procedures (Tier 1); evaluate directional overheight detection with flashing warning and event camera due to the constrained clearance (Tier 2).
29	90/585	BARKER RD OVER I-90	42.1	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 3 years ago; 14 ft 9 in recorded clearance; moderate structural consequence; interstate mobility and freight exposure. The 42.1 BPI and moderate consequence support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier Assignment	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
31	90/219P	I-90 UNDER WESTLAKE PED	41.7	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 5 years ago; 15 ft 11 in recorded clearance; high structural consequence; a pedestrian/trail structure requiring early vehicle-height warning before the constrained crossing. The 41.7 BPI and high consequence support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/bridge signs and commercial-navigation data; confirm the constrained crossing is clearly identified to overheight vehicles (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
32	5/822E	I-5 OVER SR 539/ MERIDIAN	40.4	Elevated Priority	Cost Tier 1 + Cost Tier 2 evaluation	Apply the foundational baseline and complete a diagnostic review before selecting an active treatment.	Consider Cost Tier 3 only for persistent recurrence, exceptional consequences, or an engineering override.	1 documented strike; most recent approximately 5 years ago; 14 ft 7 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The 40.4 BPI and moderate consequence support a Tier 1 baseline plus a location-specific Tier 2 evaluation.	Verify lane/direction-specific clearance; correct advance/ bridge signs and commercial-navigation data (Tier 1); evaluate directional overheight detection or a geofenced/in-cab pilot with flashing warning and event verification where field review shows static information is insufficient (Tier 2).
33	99/511	DES MOINES MEM OVER SR 99	39.6	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; address identified needs through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 2 years ago; 14 ft 7 in recorded clearance; moderate structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
34	395/102	SYLVESTER ST OVER US 395	37.1	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent within the most recent study year; 16 ft 5 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
35	409/10	JULIA BUTLER HANSEN BR	36.7	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent within the most recent study year; 16 ft 4 in recorded clearance; critical structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current; add an annual structure-specific vulnerability review despite the routine BPI category (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
35	167/119	S 277TH ST OVER SR 167	36.7	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 1 year ago; 16 ft 8 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
37	5/829E	I-5 OVER PORTAL WAY	35.4	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 14 ft 3 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Remeasure the low clearance, verify advance and bridge-mounted clearance signs, and correct commercial-navigation data (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/ condition change.
37	5/717	COOK RD OVER I-5	35.4	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 1 year ago; 16 ft 3 in recorded clearance; moderate structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
39	2/608	RAILROAD OVER US 2	33.8	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 14 ft 8 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
39	90/593S	I-90 OVER SPOKANE BRIDGE RD	33.8	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/ repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 14 ft 5 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Remeasure the low clearance, verify advance and bridge-mounted clearance signs, and correct commercial-navigation data (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/ condition change.

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier Assignment	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
41	90/54W	150TH AVE OVER I-90	33.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 5 years ago; 16 ft 3 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
41	303/25	CENTRAL VLY OVER SR 303	33.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	2 documented strikes; most recent approximately 4 years ago; 15 ft 0 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects limited recurrence and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current; review both event narratives and perform short-term field observation to confirm whether the same mechanism is recurring (Tier 1). Advance to Tier 2 active-warning concept development after another event or if the two-event review finds a recurring mechanism.
43	5/640W	I-5 OVER EVERETT AVE	32.9	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 15 ft 8 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
43	5/411NCD	NBCD OVER 41ST DIVISION DR	32.9	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 14 ft 10 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
45	12/639S	US 12 OVER MYRA RD	32.5	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 1 year ago; 19 ft 10 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
46	5/588SCD	SBCD OVER NORTHGATE WAY	32.1	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 16 ft 0 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
46	82/130S-W	S-W RAMP OVER I-82	32.1	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 17 ft 9 in recorded clearance; high structural consequence; ramp geometry, limited recovery distance, and the need to warn before the last safe decision point. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify clearance and route-specific signs before the ramp's last safe decision point and maintain commercial-navigation data (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
48	99/400	SR 99 OVER I-5	31.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 16 ft 5 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
48	5/674W	I-5 OVER 300TH ST NW	31.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 5 years ago; 14 ft 7 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
48	5/133E	I-5 OVER	31.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 15 ft 6 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier Assignment	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
51	506/108	SR 506 OVER I-5	31.2	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	2 documented strikes; most recent approximately 3 years ago; 16 ft 5 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects limited recurrence and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current; review both event narratives and perform short-term field observation to confirm whether the same mechanism is recurring (Tier 1). Advance to Tier 2 active-warning concept development after another event or if the two-event review finds a recurring mechanism.
52	518/12	24TH AVE S OVER SR 518	30	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 16 ft 3 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
53	5/655	TULALIP RR OVER I-5	29.6	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 16 ft 1 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
53	405/14	LIND AVE OVER I-405	29.6	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 16 ft 4 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
55	5/829W	I-5 OVER PORTAL WAY	29.2	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 15 ft 3 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
56	124/1	DEPUTY MICHAEL ESTES OVERPASS	28.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 1 year ago; 16 ft 6 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
57	12/502	KAHLOTUS RD OVER US 12	27.5	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 5 years ago; 17 ft 3 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
58	2/655	RAILROAD OVER US 2	26.7	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 1 year ago; 16 ft 11 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
59	290/7	RAILROAD OVER SR 290	26.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 5 years ago; 14 ft 4 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
59	6/107	SR 6 UNDER ST PARKS TRAIL	26.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 14 ft 10 in recorded clearance; high structural consequence; a pedestrian/trail structure requiring early vehicle-height warning before the constrained crossing. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Remeasure the constrained crossing, maintain conspicuous advance clearance signs, and update digital clearance data (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
61	5/129	PLEASANT HILL RD OVER I-5	25.8	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 5 years ago; 17 ft 1 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
62	90/538E-S	PED/BIKE TRAIL OVER RAMP	25.4	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 5 years ago; 14 ft 4 in recorded clearance; high structural consequence; a pedestrian/trail structure requiring early vehicle-height warning before the constrained crossing. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify clearance and route-specific signs before the ramp's last safe decision point and maintain commercial-navigation data (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
62	6/124	SR 6 OVER I-5	25.4	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 5 years ago; 16 ft 4 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
64	5/102W	I-5 OVER SR 503	25	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 15 ft 10 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
65	28/122	RAILROAD OVER SR 28	24.2	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 15 ft 3 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
66	195/112E	RAILROAD OVER US 195	23.7	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 14 ft 7 in recorded clearance; low structural consequence; railroad ownership and roadway–rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
67	182/14	SR 240 OVER I-182	23.3	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	2 documented strikes; most recent approximately 4 years ago; 16 ft 9 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects limited recurrence and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current; review both event narratives and perform short-term field observation to confirm whether the same mechanism is recurring (Tier 1). Advance to Tier 2 active-warning concept development after another event or if the two-event review finds a recurring mechanism.
68	3/128E	SR 3 OVER NEWBERRY HILL	20.8	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 16 ft 5 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
69	5/5	EVERGREEN BLVD OVER I-5	20	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 16 ft 9 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
70	5/646	12TH ST NE OVER I-5	15.8	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 16 ft 7 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.

Cost-Tier Assignments for 75 Bridge Locations

BPI Rank	Bridge Number	Bridge Name	BPI Score	BPI Category	Initial Cost-Tier	Required Next Step	Escalation Trigger	Evidence Driving Priority and Cost-Tier Assignment	Specific Recommended Countermeasure Package
71	12/344	N 16TH AVE OVER US 12	15	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 16 ft 10 in recorded clearance; high structural consequence; roadway mobility and bridge-damage consequences. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
72	411/3	RAILROAD OVER SR 411	14.2	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 20 ft 2 in recorded clearance; low structural consequence; railroad ownership and roadway-rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
72	405/26W	I-405 SB OVER NE 44TH ST	14.2	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 3 years ago; 17 ft 7 in recorded clearance; high structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
74	82/170	MABTON-SUNNYSDE OVR I-82	12.1	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 16 ft 4 in recorded clearance; low structural consequence; interstate mobility and freight exposure. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Verify lane/direction-specific clearance, maintain required advance and bridge-mounted signs, and keep commercial-navigation data current (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.
75	26/283	RAILROAD OVER SR 26	11.7	Routine Monitoring	Cost Tier 1 as needed; monitor	Maintain clearance data and required signs; correct deficiencies through routine maintenance and rescore annually.	Initiate Cost Tier 2 review after a severe/repeat event, material clearance change, or new consequence concern.	1 documented strike; most recent approximately 4 years ago; 16 ft 9 in recorded clearance; low structural consequence; railroad ownership and roadway-rail coordination needs. The below-40 BPI reflects an isolated event and/or lower combined exposure and recency; therefore Tier 1 maintenance and monitoring are proportionate unless a new severe or repeat event occurs.	Coordinate with the railroad owner to confirm controlling clearance, sign consistency, ownership responsibilities, and incident contacts (Tier 1). Advance to Tier 2 only after a new severe/repeat event, ineffective existing signing, or a material clearance/condition change.