Transportation Asset Management Webinar Series

Webinar 75

Risk Management Plans in TAMPs

Sponsored by FHWA and AASHTO

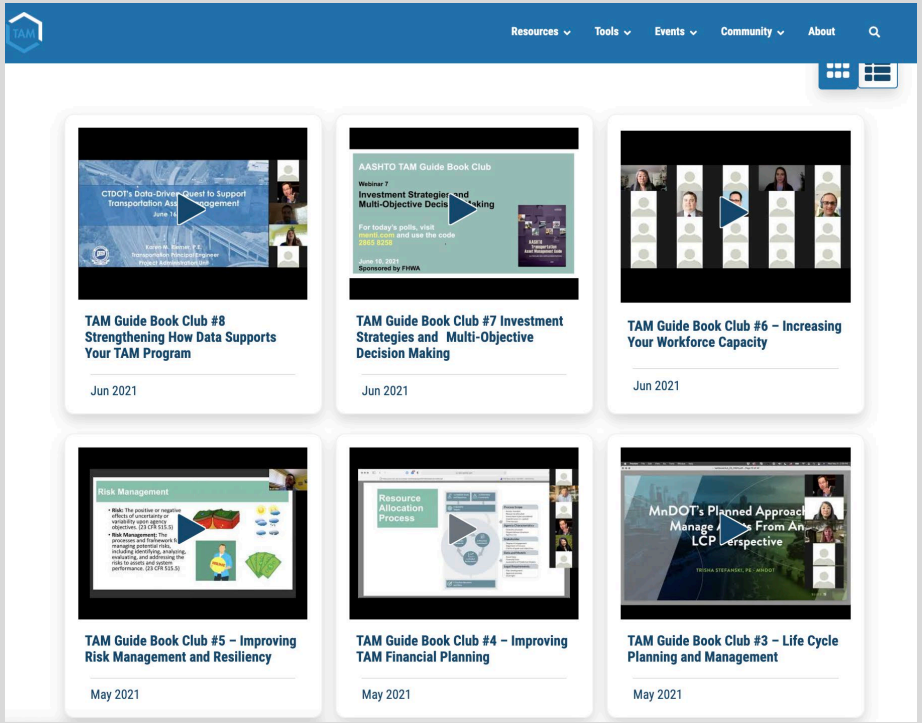
U.S. Department of Transportation
Federal Highway Administration

AASHTO
The Voice of Transportation

June 18th, 2025

FHWA/AASHTO Asset Management Webinar Series

- This is the 75th in a webinar series that has been running since 2012
- Webinars are held every two months, on topics such as off-system assets, asset management plans, asset and risk management, and more
  - Usually, the 3rd Wednesday of the month, 2PM Eastern
- We welcome ideas for future webinar topics and presentations
- Submit your questions using Zoom's chat feature



Welcome

FHWA and the AASHTO Subcommittee on Asset Management are pleased to sponsor this webinar series

- Sharing knowledge is a critical component of advancing asset management practice
- FHWA Asset Management Hub: https://www.fhwa.dot.gov/asset/pubs.cfm

Webinar Objectives

- Explore risk management and its role as a critical component of TAMPs and TAM programs at state DOTs;
- Feature case studies from state DOT managers who are prioritizing risk and resilience in their 2026 TAMPs;
- Showcase programs that effectively track risks and ultimately improve risk mitigation;
- And finally, SHARE LESSONS LEARNED, IDEAS, KNOWLEDGE!!!

Webinar Agenda

2:00 **Welcome, Overview, and Agenda**
Anna McLaughlin, AASHTO; Tashia Clemons, FHWA; Hyun-A Park, Spy Pond Partners

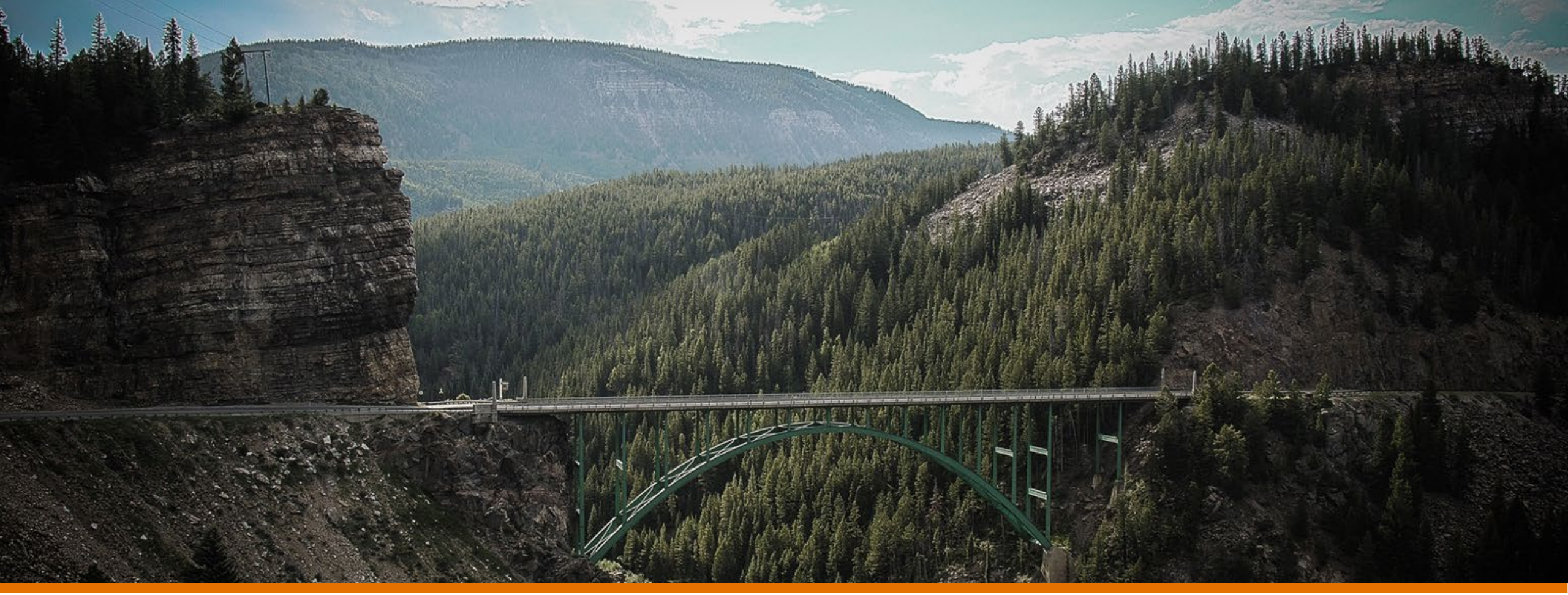
2:15 **Topic Introduction**
William Johnson, Colorado Department of Transportation

2:20 ***Risk and Resilience in the Transportation Asset Management Plan***
Claire Martini and Toby Manthey, Colorado Department of Transportation

2:35 ***Incorporating Risk into TAMPs***
Shaker Rabban, Minnesota Department of Transportation

2:55 ***2026 California TAMP Risk Management Plan Update***
Mike Johnson, CalTrans

3:15 **Q&A Discussion and Wrap Up**
Hyun-A Park, Spy Pond Partners



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Risk & Resilience in the Transportation Asset Management Plan

Toby Manthey, Asset Management Program Manager
Claire Martini, Risk and Resilience Program Manager

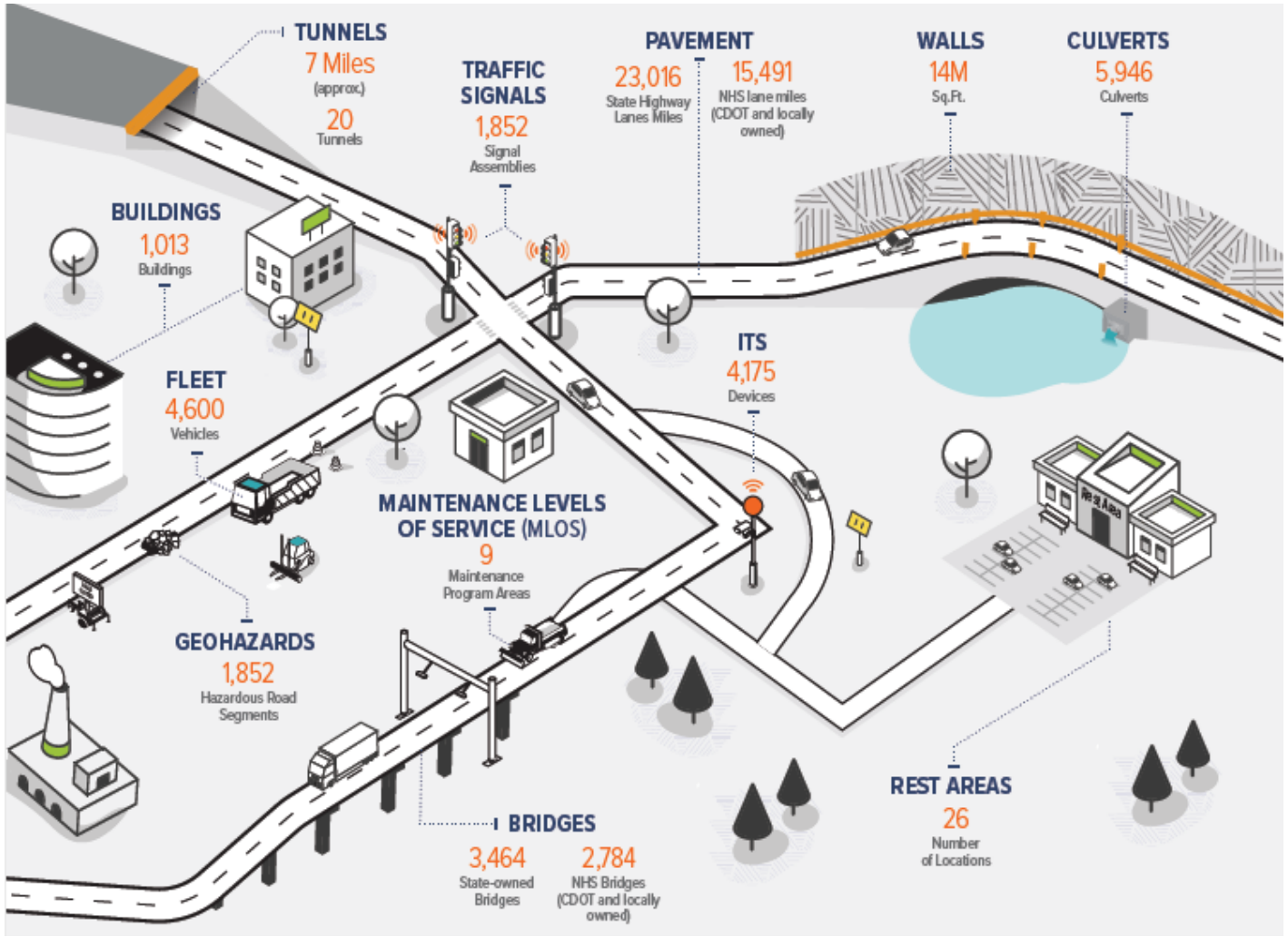
Transportation Asset Management Program

TAM Program Overview

- Began in 2012 to implement more data and performance-driven asset investments.

12 Asset Classes

- Pavement
- Bridges
- Maintenance
- Intelligent Transportation Systems
- Road Equipment
- Buildings
- Culverts
- Tunnels
- Geohazards
- Walls
- Traffic Signals
- Rest Areas



Risk and Resilience within the TAMP

CDOT considers risk and resilience in three key ways:

1. Managing risk across various levels: Agency, program, and project/activity levels.

2. Defining the risk process: Developing the risk register to establish risk-management priorities.

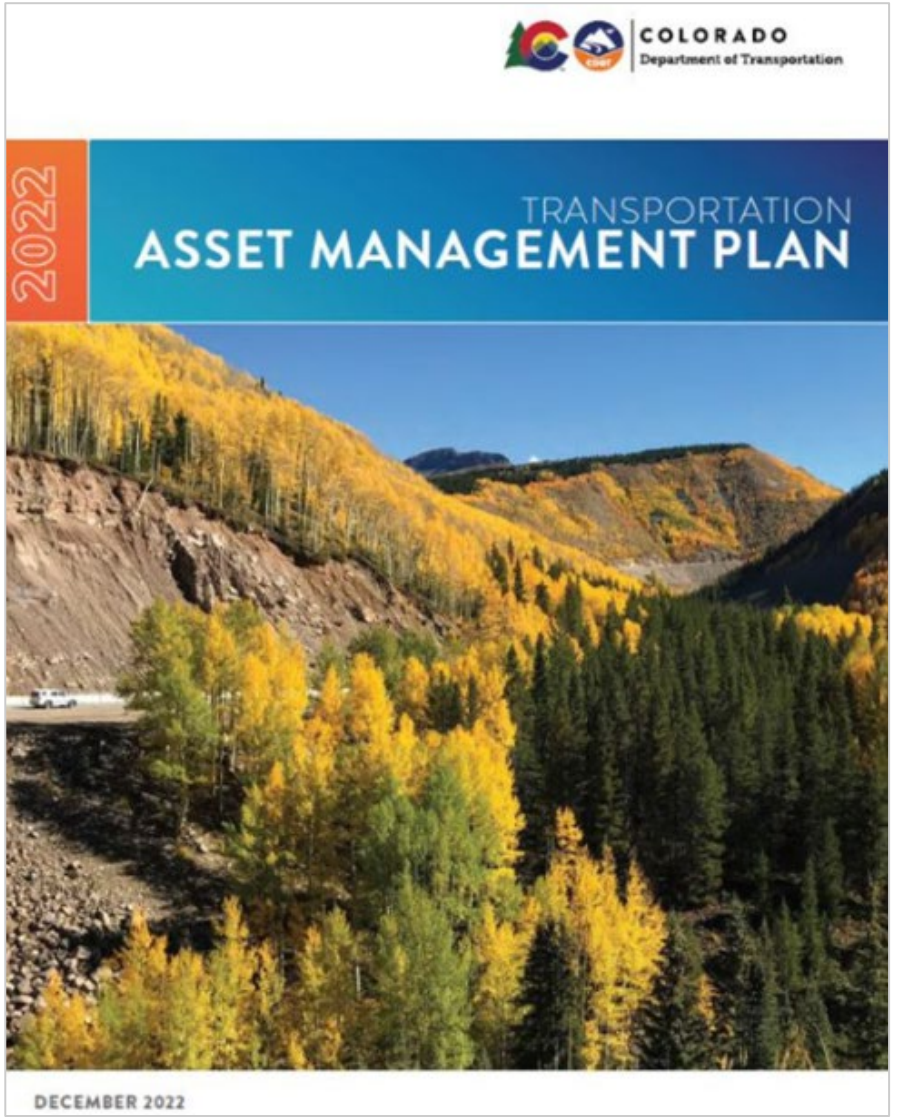
3. Considering risk and resilience as part of life-cycle planning and life-cycle cost analysis.

- Using a comprehensive decision-making process that includes risk management and resilience as a part of budget setting and treatment selection. This also applies to the identification and treatment of twice-damaged assets (as required under 23 CFR 667).

CDOT TAMP Overview

2022 TAMP:

- Exceeds FHWA requirements by including 12 asset classes vs. required two.
- Designed to memorialize CDOT's business practices.
- Built in a modular fashion.
- Graphical Executive Summary
- Chapter 6 focuses on Risk and Resilience at CDOT



Program-Level Asset Class Risk

Each of the 12 asset class owners identify and SCORE risks as part of CDOT's regular update to the register.

Bridge threats

- Bridge strikes
- Essential repairs reducing funding for other projects
- Inadequate funding
- Flood

Pavement threats

- Construction cost escalation
- Forecasting misalignment
- Fire
- Flood

Project Selection: Geohazards

Figure A.4-5 *Geohazards Project Selection, Cost-Benefit Analysis Example*

Benefit-cost analysis is utilized to compare different treatment options over a 50-year timeframe. The example illustrates the results from analysis of two segments on State Highway 133, and the green highlighting identifies the preferred options.

Beginning Mile Post	Ending Mile Post	Mitigated Benefit (50 year Present Worth)	Treatment Option	Risk Rating	Option Cost	Benefit / Cost Ratio
29.39	29.90	N/A	Do Nothing	N/A	$69,304,005	N/A
29.39	29.90	$ 51,978,004	A – Buttress	75%	$2,019,600	25.7
29.39	29.90	$ 34,652,002	B – Brow excavation + netting	50%	$4,199,200	15.9
29.39	29.90	$ 34,652,002	C – Brow excavation + attenuator	50%	$4,199,200	8.3
30.72	30.95	N/A	Do Nothing	N/A	$8,891,526	N/A
30.72	30.95	$ 7,113,220	A – Rock reinforcement + netting	80%	$1,132,960	6.8
30.72	30.95	$ 7,113,220	B – Soil nail wall to increase catchment	80%	$829,360	8.6
30.72	30.95	$ 7,113,220	C – Attenuator	80%	$1,821,600	3.9

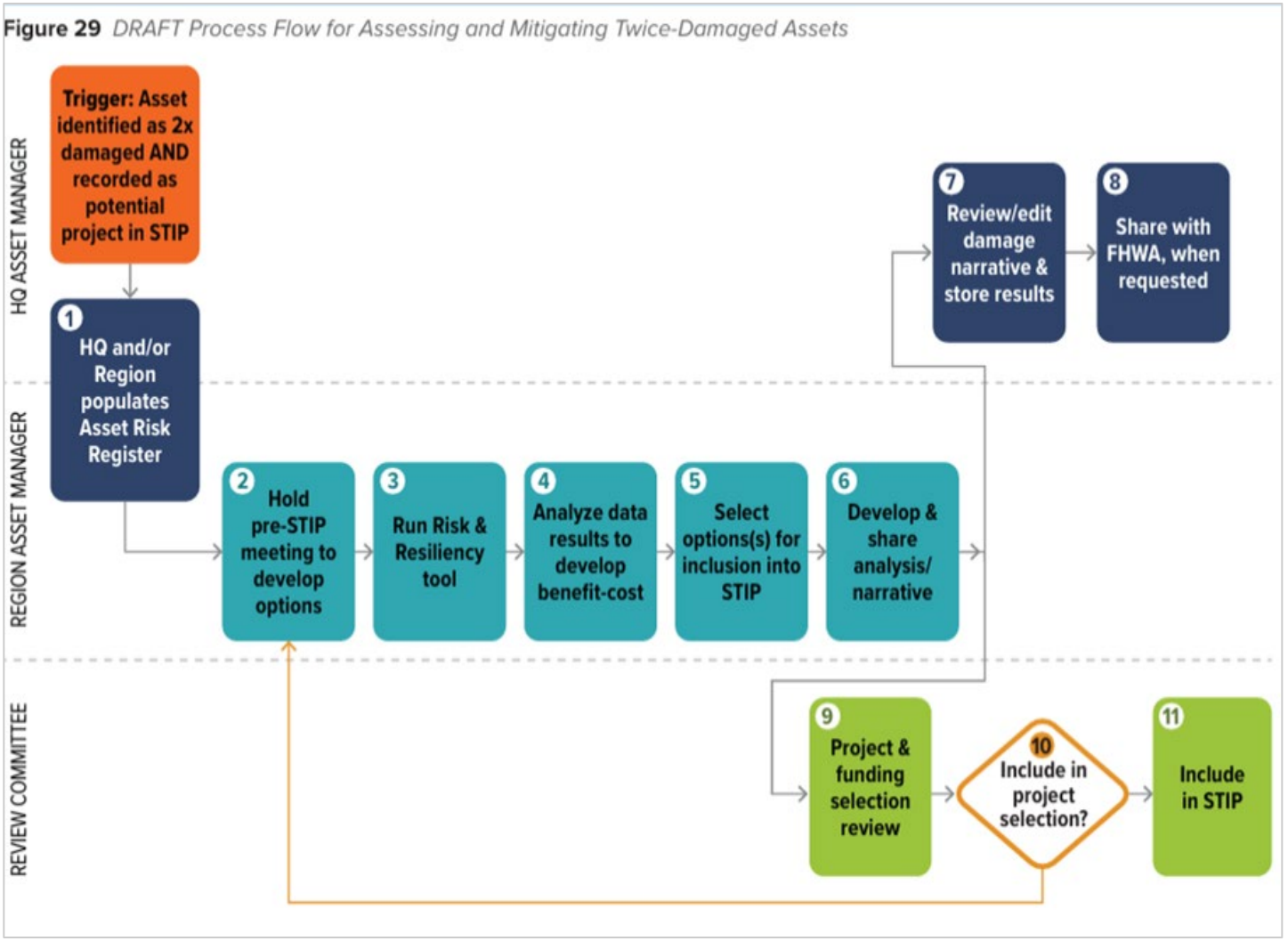
Bridges: Risk-Mitigation Metrics

Performance Measure	Current Performance (2021)	Target	Performance Gap *(Current State vs. Target)*
Percentage of CDOT-owned bridges over waterways that are scour critical	5.5%	5.0%	-0.5 % points
Percentage of bridge crossings over Interstates, U.S. routes and Colorado state highways with a vertical clearance less than the statutory maximum vehicle height of 14-feet-6-inches	2.0%	1.0%	-1.0 % point
Percentage of bridge crossings over Interstates, U.S. routes and Colorado state highways with a vertical clearance less than the minimum design requirement of 16-feet-6-inches	19.8%	18.0%	-1.8 % points
Percentage of CDOT-owned bridges with a load restriction	2.4%	0.9%	-1.5 % points
Percentage of CDOT-owned bridges posted for load	0.4%	0.1%	-0.3 % points

Documenting processes in the TAMP: Repeatedly Damaged Assets

Identifying and tracking twice-damaged assets

- Currently tracking sites/projects funded by emergency response dollars.
- Developed database of once- and twice-damaged assets.
- Process diagram in TAMP looks at roles and responsibilities: Who confirms that an asset has been damaged twice? Who fills out a risk register for the asset? Who develops mitigation treatments? Who calculates the cost-benefit of those treatments? How is data shared and stored?
- **Current step:** Developing mobile app for data collection, photographing, describing and analyzing data in ESRI/GIS.



Current Asset-Management Risk Initiatives

- **Pavement program:** Overlaying map of pavement needs with geohazard needs in our asset model. Should we give pavement projects “points” for also addressing geohazards risk?
- **Geohazards program:** Expanding inventory—Don’t just include sites that have suffered a geohazard event. Expand analyses to sites that have the same characteristics/risk profile, but have suffered no previous events.
- **Twice-damaged assets app:** Assigning maintenance teams task of documenting damaged assets after floods and other emergency events.

Organizational Structure

Asset Management Program

Coordinates with FHWA, the Department's asset-program managers, CDOT Regions, and other agencies to manage the 12 asset classes. The program meets federal requirements for asset management (e.g., TAMP development), and coordinates budget setting and treatment-list development for the four-year program for the asset classes.

Performance Management Program

Collects performance data for various CDOT programs and meets National Performance Measure reporting requirements (including PMI, PM2, and PM3 measures/ targets). The program also develops CDOT's state-required *Performance Plan*, which contains the Department's annual strategic goals and reports on annual performance against PD 14.0 targets.

Risk and Resilience Program

Develops tools and processes to analyze and enhance resilience considerations in support of federal and state requirements, and leads the implementation of PD 1905.0 for CDOT.

Economic Analysis Program

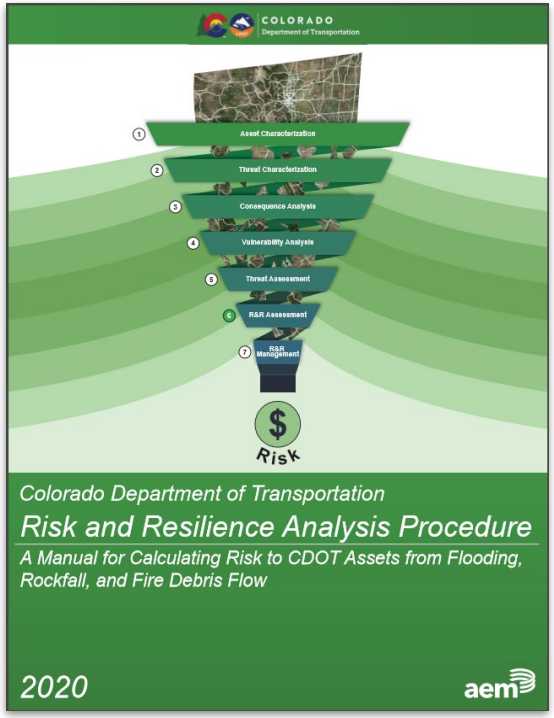
Develops asset valuations and economic forecasts in support of asset management. The program also performs cost/benefit analysis for federal grant opportunities, and maintains and develops tools for economic analysis and project selection and prioritization.

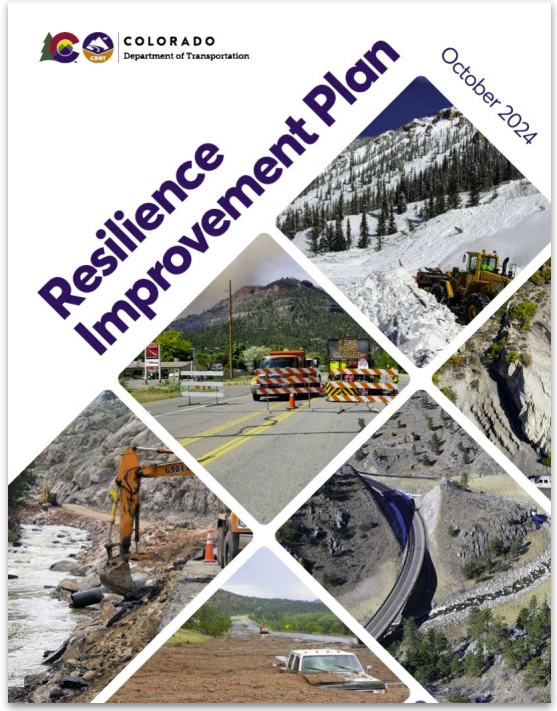
Risk and Resilience Program

Risk refers to the effects of uncertainty or variability upon agency objective.

Resiliency is “the ability to prepare and plan for, absorb, recover from, or more successfully adapt to adverse events” (AASHTO).

For CDOT, resilience is the ability to keep our roads open and functional in the face of unexpected events and challenges.





Policy Directive (PD) 1905.0

PD 1905.0- Building Resilience into Transportation Infrastructure and Operations (adopted in 2018):

- Established the CDOT Resilience Program
- Directed CDOT to incorporate resilience into strategic decisions about transportation assets and operations
- Positions CDOT well to meet federal requirements to consider resilience as part of life-cycle cost and risk management

Enterprise Risk Management

Level	Responsibility	CDOT Risk Management Initiatives
Enterprise	**Senior Executives, policy makers**	• **Enterprise Risk Register (Enterprise-wide, Strategic, Corporate Risks)** — Documented list of risks that affect the mission, vision, and overall results of the asset management program.
Program	**Program Managers**	• **Enterprise Risk Register (Programmatic, Business Line Risks)** — Documented list of risks that affect CDOT's ability to deliver projects and meet targets within a program (but not related to a specific project). • **Asset Class-Specific Risk Register** — Documented list of risks that specifically affect one of CDOT's 12 asset classes. • **4R Framework for Identifying and Evaluating Resiliency in Transportation System Assets and Organizations** — Details the "4R Principle" framework, providing examples of both a resilient organization and asset.
Project	**Project Managers**	• **CDOT Risk and Resilience Analysis Procedure** — A Manual for Calculating Risk to CDOT Assets from Flooding, Rockfall, and Post-Fire Debris Flow (Pilot) • **Project Prioritization Score Sheet —** An Excel tool that allows users to prioritize projects based on the level of risk mitigation addressed by each project. • **CDOT Project Risk Assessment Tool** — An Excel tool that described how risk management will be structured and performed on CDOT projects; it follows the common risk-management approach and a standard risk register format, tailored to CDOT. • **Region Engineers' Project Risk Management** — In project delivery, CDOT uses a Project Risk assessment tool that provides a process and record for risk identification, analysis, response strategy definition, monitoring, and control.
Activity	**Activity Managers, staff**	• **CDOT's Damaged-Asset Database** — A database containing past damaged assets, which can be updated as additional assets sustain damage in emergency events. • **Asset Criticality Model for System Resilience** — A process for determining asset criticality (impact to CDOT if an asset were to fail). • **Asset Resiliency Mapping Application** — A GIS mapping tool that allows users to assess risk as it relates to environmental risk factors, including drought severity and wildfire risk, as well as asset conditions like highway drivability life, and social vulnerability. • **Risk and Resiliency Tool** — An Excel tool that allows users to calculate the total risk for an asset by inputting pre-mitigation data on each of the six criticality factors and performing a benefit-cost analysis on mitigation tactics.

Quantifying Risk

Risk (R) = T x C x V

Risk (R) → Level of operational uncertainty in a threat-filled environment ($)

Threat Likelihood (T) → Potential of threat occurrence (%)

Consequence (C) → Result of failure ($)

Vulnerability (V) → Susceptibility to the threat (%)

Threat Likelihood

Table 9 *Threat Likelihood Scoring Rubric*

Level	Descriptor	Description	Annual Probability Range	Probability
1	Low	50+ years between events	<2%	1.0%
2	Medium - Low	20 to 50 years between events	2% to 5%	3.5%
3	Medium	5 to 20 years between events	5% to 20%	12.5%
4	Medium - High	1 to 5 years between events	20% to 100%	40.0%
5	High	Once annual occurrence or greater	100%	99.0%

Consequences and Considerations

Table 10 *Consequence and Consideration Scoring Rubric*

Level	Descriptor	Description	Cost Range for Event	Set Safety Cost for Event
Safety				
1	Negligible	Negligible safety hazard	<$100K	$50,000
2	Minor	Minimal safety hazard	$100K to $500K	$300,000
3	Major	Likely minor injuries	$500K to $2M	$1,250,000
4	Critical	Likely major injuries	$2M to $10M	$6,500,000
5	Catastrophic	Likely fatalities and major injuries	>$10M	$20,000,000
Mobility				
1	Negligible	Situation affects a small area (neighborhood or town) and/or small number of travelers for a short time (minutes).	<$100K	$50,000
2	Minor	Situation affects a small area (neighborhood or town) and/or small number of travelers for a moderate time (hours).	$100K to $500K	$300,000
3	Major	Situation affects a small area (neighborhood or town) and/or small number of travelers for a sustained period (days-weeks).	$500K to $2M	$1,250,000
4	Critical	Situation affects a large number of travelers for a short period (minutes-hours).	$2M to $10M	$6,500,000
5	Catastrophic	Situation affects a large number of travelers for a sustained period (days-weeks).	>$10M	$20,000,000
Asset Damage				
1	Negligible	Minimal or cosmetic damage	<$100K	$50,000
2	Minor	Minor damage requiring repair	$100K to $500K	$300,000
3	Major	Moderate damage requiring repair	$500K to $2M	$1,250,000
4	Critical	Extensive damage requiring significant repair or replacement	$2M to $10M	$6,500,000
5	Catastrophic	Destroyed or large-scale damage requiring replacement	>$10M	$20,000,000
Other Financial Impacts				
1	Negligible	Negligible financial impact	<$100K	$50,000
2	Minor	Minor financial impact	$100K to $500K	$300,000
3	Major	Major financial impact	$500K to $2M	$1,250,000
4	Critical	Critical financial impact	$2M to $10M	$6,500,000
5	Catastrophic	Catastrophic financial impact	>$10M	$20,000,000

$$C = Os \times [(Ss + Ms + Ds + Fs)/4]$$

Os = Considerations Value = 1 + (0.05 × [Number of Selected Considerations])

Ss = Safety Value

Ms = Mobility Value

Ds = Asset Damage Value

Fs = Other Financial Impact

Vulnerability

Table 11 *Vulnerability Scoring Rubric*

Score	Level	Description
1	Very low	» Established risk management process(es) exist for event » CDOT responses and contingency plans already in place, and are fully tested » Asset engineering design or asset condition ensures full functionality » Previous resilience efforts provide a high degree of protection
2	Low	» Established risk management process(es) mostly exist for event » CDOT responses and contingency plans already in place, but with limited testing » Asset engineering design or asset condition ensures mostly full functionality » Previous resilience efforts provide a moderate degree of protection
3	Medium	» Risk management process(es) for event being fully developed » CDOT responses and contingency plans partially in place, with limited or no testing » Asset engineering design and asset condition ensure only partial functionality » Previous resilience efforts provide a low degree of protection
4	High	» Established risk management process(es) for event in early development » CDOT responses and contingency plans in early development, with no testing » Asset engineering design and asset condition provide little assurance of functionality » Previous resilience efforts provide a very low degree of protection
5	Very High	» Established risk management process(es) do not exist for event » No CDOT responses and contingency plans being developed » Asset engineering design and asset condition will not assure functionality » Previous resilience efforts provide no level of protection

Managing Risk

- **Treating the risk**—taking action to reduce the chance of the risk occurring or lessening impacts
- **Tolerating the risk**—accepting the current risk profile and planning for appropriate response if the risk event occurs.
- **Transferring the risk**—allowing another agency or third party to take on the risk exposure instead of CDOT
- **Taking advantage of the risk**—seizing opportunities, such as by using unexpected revenue to improve the transportation network.
- **Terminating the risk**—taking action to eliminate a risk event or impacts.

Top Enterprise Risks

Threat/Opportunity:

1. Flood
2. Post-Fire Debris Flow
3. Funding Uncertainty (positive and negative)
4. Geohazards
5. Cost Uncertainty
6. Fire
7. Missing Infrastructure Targets for National Performance Measures
8. Snow (Avalanche)
9. Cybersecurity
10. Staffing: Attrition

Risk Register

Enterprise Threats	Risk Statement	Risk Score	Risk Management Strategy
Flood	There is a risk that flooding occurs leading to asset/route damage that causes mobility and safety impacts as well as increased asset management cost.	68 (T)5*(C)4.5*(V)3	Treat by implementing design standards; following agency continuity of operations plan; maintaining incident command center management structure; maintaining an Office of Emergency Management (OEM). Use tools and processes developed under the resilience program to identify high risk assets and corridors for focused analysis.
Post-Fire Debris Flow	There is a risk that post-fire debris flow occurs leading to asset/route damage that causes mobility and safety impacts as well as increased asset management cost.	48 (T)4*(C)3*(V)4	Treat by maintaining and office of OEM. Maintenance landscaping, erosion control, jersey barriers, and other practices.
Geohazards	There is a risk of geotechnical failure that causes mobility and safety impacts as well as increased asset management cost.	33 (T)5*(C)3.3*(V)2	Treat by implementing the geohazards management program and robust geohazards management plan.
Fire	There is a risk that fire occurs, leading to asset/route damage that causes mobility and safety impacts as well as increased asset management cost.	14 (T)4*(C)1.2*(V)3	Tolerate in the case of wildfires; and treat by tunnel fire-suppression systems and bridge-design standards, etc. Use tools and processes developed under the resilience program to identify high risk assets and corridors for focused analysis.
Snow (Avalanche)	There is a risk of avalanche occurring that causes mobility and safety impacts as well as increased asset management cost.	11 (T)4*(C)2.7*(V)1	Treat by maintaining a Winter Operations Program. Use tools and processes developed under the resilience program to identify high-risk assets and corridors for focused analysis.

Key Considerations & Next Steps

1. **Integrate resilience into the long-range transportation plan.** Developed guidance to analyze threats, document proactive management of identified threats, and assess criticality of projects in the next 10 Year Plan.
2. **Advance project development at the nexus of asset condition and resilience.** Using discretionary grant opportunities to focus on asset and natural hazard needs.
3. **Pursue data that can be used to improve long-term asset durability.** In particular, future natural hazard vulnerability data, including extreme weather data.
4. **Build resilience into the asset management model.** Develop resilient treatment recommendations.

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Thank You

- For questions or comments, contact:
  - William Johnson, Performance and Asset Management Branch Manager, will.johnson@state.co.us
  - Toby Manthey, Asset Management Program Manager, toby.manthey@state.co.us
  - Claire Martini, Risk and Resilience Program Manager, claire.martini@state.co.us

DEPARTMENT OF TRANSPORTATION

Incorporating Risk into TAMP's

Shaker Rabban| Asset Management Planning Director I Office of Transportation System Management

June 18, 2025

Agenda

- Trivia Question
- 2026 TAMP Risk Process
- Resilience Risks
- Corridor Risk Tool

Trivia Challenge

Name/Title, and Trivia Answer
Match the Agency with the correct answer?

A. Largest system size by acres/lane miles/sq foot
B. Largest by $ value
C. Most number of individual assets

1. Mn Dept. of Transportation
2. Mn Dept. of Human Resources
3. Mn Dept. of Natural Resources
4. Mn Dept. of Public Safety
5. Mn Dept. of Corrections

Trivia Answer

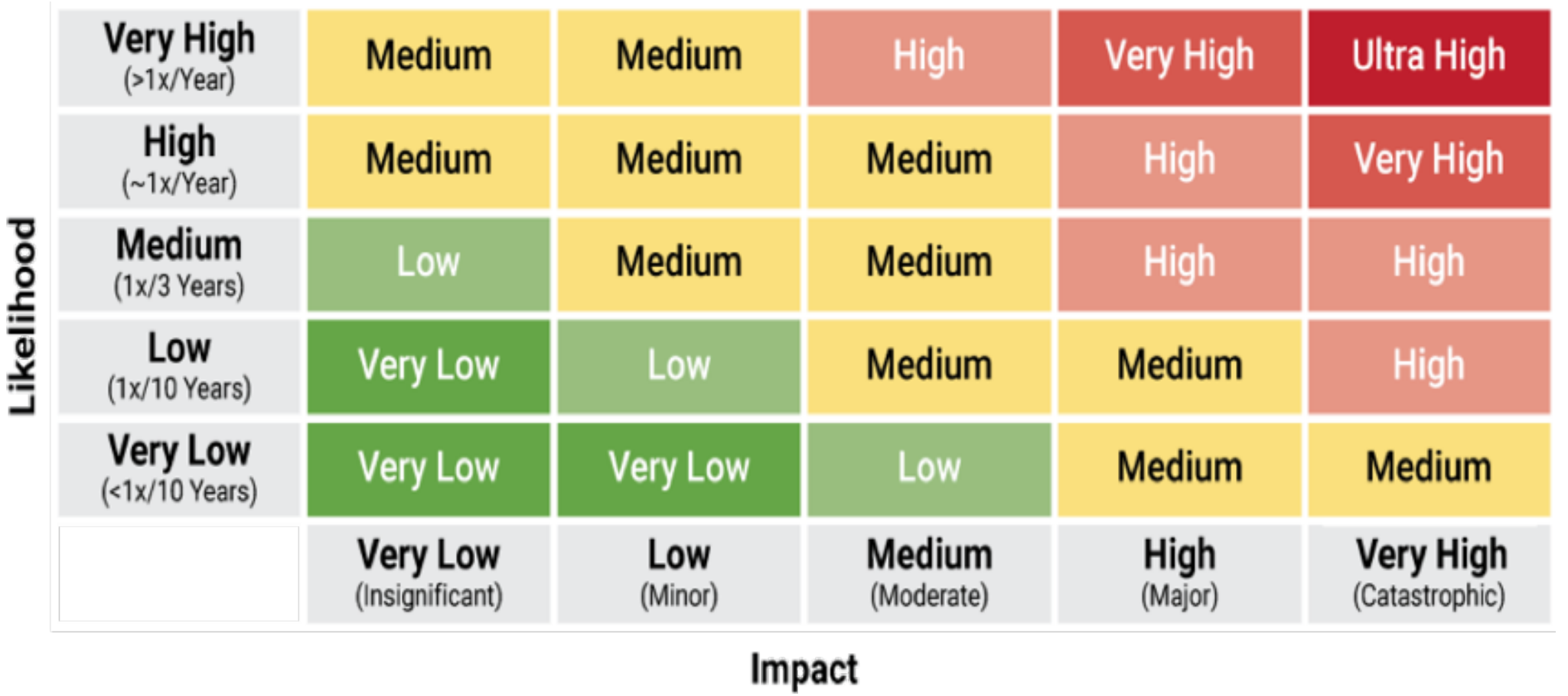
A. Largest system size by acres/lane miles/sq foot - MN DNR
B. Largest by $ value – Dept of Corrections
C. Most number of individual assets - MnDOT

TAMP Risk Review and Matrix

- 2022 TAMP Risk Mitigation Process
- 2026 TAMP Risk Matrix and Changes
- Fall Risk Workshop
- Visuals

TAMP Risk Review and Matrix

2022 TAMP Risk process



Likelihood	Very Low (Insignificant)	Low (Minor)	Medium (Moderate)	High (Major)	Very High (Catastrophic)
Very High (>1x/Year)	Medium	Medium	High	Very High	Ultra High
High (~1x/Year)	Medium	Medium	Medium	High	Very High
Medium (1x/3 Years)	Low	Medium	Medium	High	High
Low (1x/10 Years)	Very Low	Low	Medium	Medium	High
Very Low (<1x/10 Years)	Very Low	Very Low	Low	Medium	Medium

Impact

TAMP Risk Review and Matrix

2022 TAMP Risk Process

Risk Management Priorities	Score
Aging Infrastructure	1
Data Management + Quality	2
Funding	3
Infrastructure Resilience	4
Multimodal Safety	5
Competing Stakeholder Expectations	6
Continuity Of Operations	7
Response to Disruptive Transportation Technologies	8

+

Risk reduction	Score
Reduction to No Risk	0
High → Medium	1
Medium → Low	2
High → High	3
Medium → Medium	4
Low → Low	5

+

Cost estimate	Score
No cost	1
$ = Less than $50K	2
$$ = $50K to $250K	3
$$$ = about $500K	4
$$$$ = $1M to $2M	5

TAMP Risk Review and Matrix

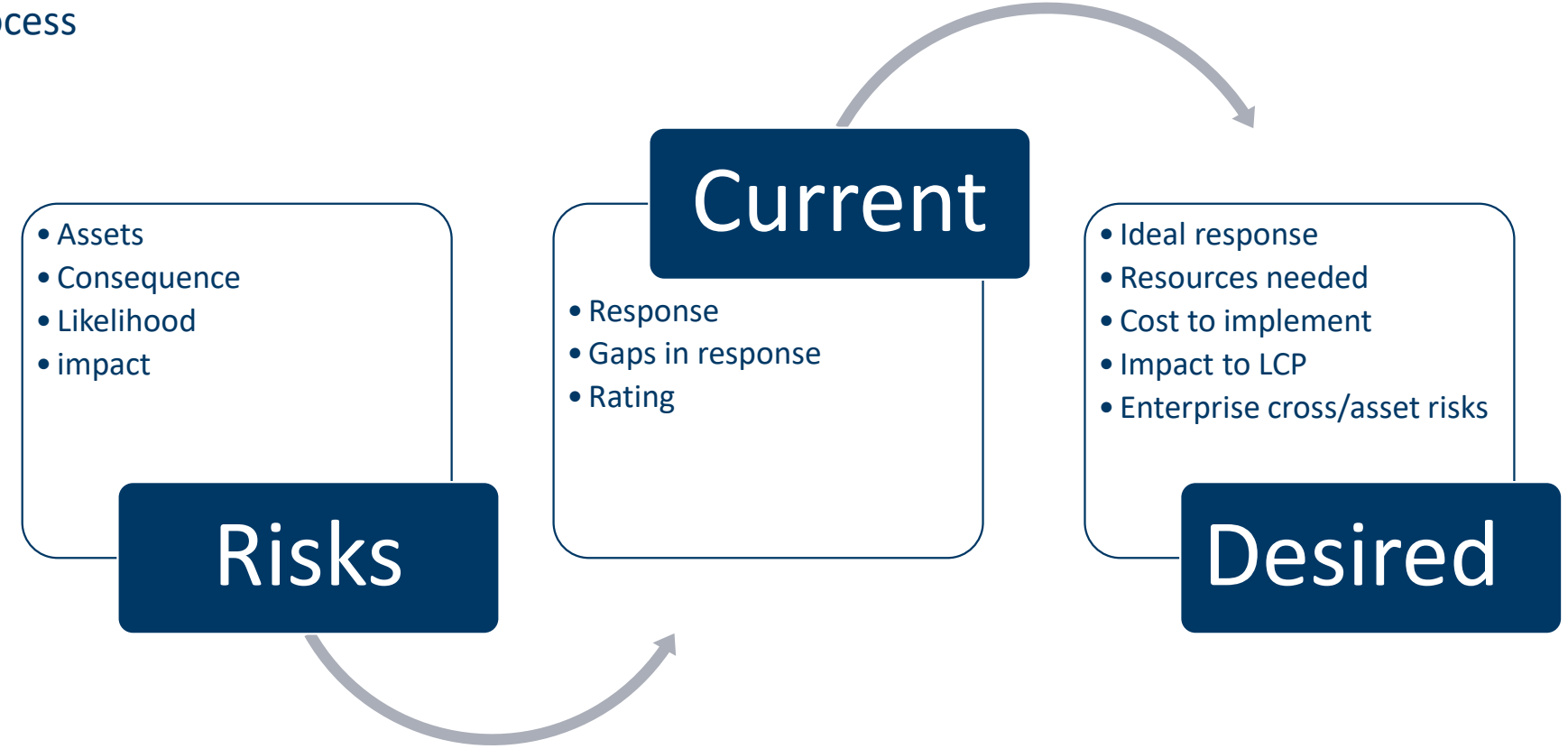
2022 TAMP Risk Mitigation Priorities

Tier 1 Mitigation Strategies

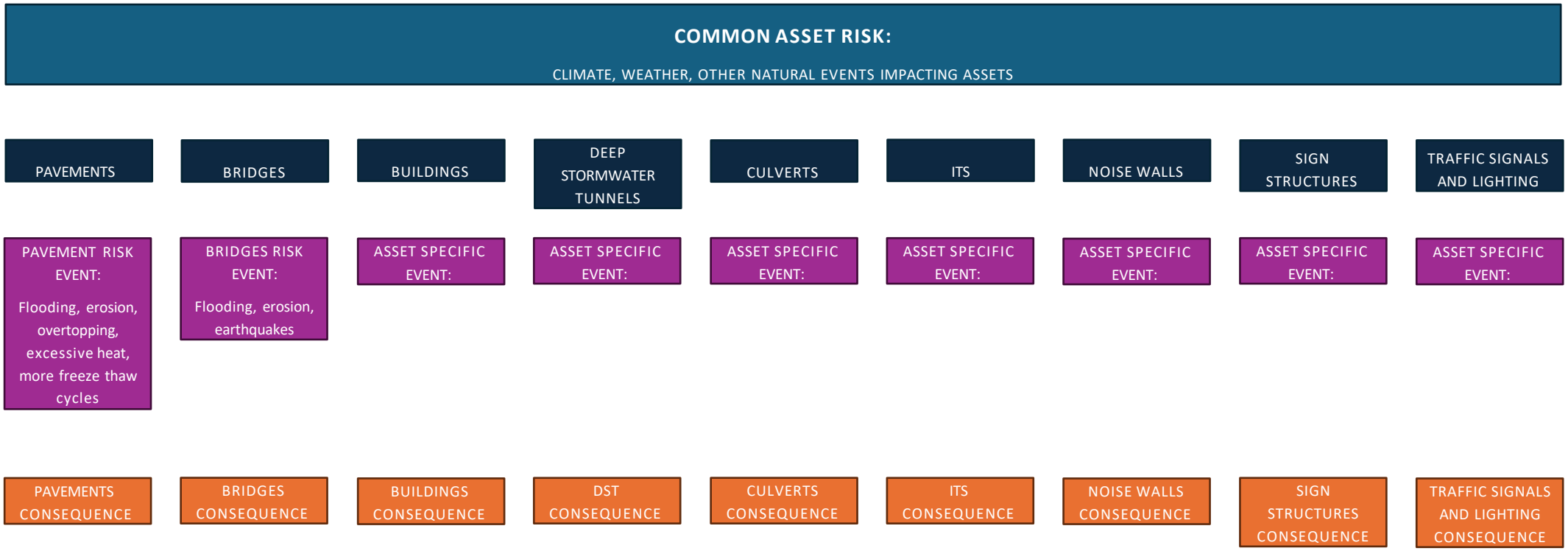
	Asset Work Group	Risk	Ideal Mitigation Strategy	Current Likelihood	Overall Risk Rating (Impact x Likelihood with ideal strategy)	Risk Management Priority	Risk Management Priorities	Reduction (Risk Reduction Score)	Cost Estimate (1=No Cost; 5= 1M to 2M)	Starting Score (Category + Reduction + Cost)
1	Bridges	Premature deterioration of the asset (e.g., service lives 10 to 20 percent shorter than expected, material defects, quality of initial construction etc)	Improve design and construction practices.	Medium	Low	Aging Infrastructure	1	2	1	4
2	Culverts Deep Stormwater Tunnels	Failure/collapse of culvert due to age or lack of maintenance	Be more proactive by doing rehab on culverts before failure occurs, and make more permanent fix during future pavement projects	High	High	Aging Infrastructure	1	3	1	5
3	Buildings	Temporary or permanent building closures	Develop a plan for how to gather this data and execute data collection and maintenance.	Medium	Medium	Aging Infrastructure	1	4	1	6
4	Culverts Deep Stormwater Tunnels	Inability to manage culverts to lowest life cycle cost	Better model and research deterioration. Address culvert needs earlier in pavement project scoping	High	Medium	Aging Infrastructure	1	4	1	6
5	Overhead Signs	Premature deterioration of the asset (ex. salt corrosion, loose nuts, etc.)	Inspect regularly (every 5 years) with standard inspection form and identify those that may require more frequent inspections. Revise standards (for example, we used to use grout, but found it led to premature deterioration)	Medium	Medium	Aging Infrastructure	1	4	1	6
6	Bridges	Poor inspection data, improper data stewardship, software limitations	Dedicated full-time inspectors and PA staff with proper training. Focus more QA and training resources to state-owned system	Low	Medium	Data Management/ Lack of Data/ Quality of Data	2	4	1	7
7	Noise Walls	Not keeping asset inventory and condition data current and consistent in TAMS	LiDAR to annually collect this data. Conducting a regular inspection schedule (to collect data that cannot be captured by LiDAR) Noise walls need to be inspected at appropriate frequencies to address fixes in a timely manner	Medium	Low	Data Management	2	2	3	7

TAMP Risk Review and Matrix

2026 TAMP Risk Process



Risk Visual


COMMON ASSET RISK:
CLIMATE, WEATHER, OTHER NATURAL EVENTS IMPACTING ASSETS
PAVEMENTS
BRIDGES
BUILDINGS
DEEP STORMWATER TUNNELS
CULVERTS
ITS
NOISE WALLS
SIGN STRUCTURES
TRAFFIC SIGNALS AND LIGHTING
PAVEMENT RISK EVENT:
Flooding, erosion, overtopping, excessive heat, more freeze thaw cycles
BRIDGES RISK EVENT:
Flooding, erosion, earthquakes
ASSET SPECIFIC EVENT:
ASSET SPECIFIC EVENT:
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ASSET SPECIFIC EVENT:
PAVEMENTS CONSEQUENCE
BRIDGES CONSEQUENCE
BUILDINGS CONSEQUENCE
DST CONSEQUENCE
CULVERTS CONSEQUENCE
ITS CONSEQUENCE
NOISE WALLS CONSEQUENCE
SIGN STRUCTURES CONSEQUENCE
TRAFFIC SIGNALS AND LIGHTING CONSEQUENCE

Risk and Resilience

- RIP and extreme weather-related risks
- Repeat damage to ancillary assets by extreme weather
- Resilient targeted LCP for some assets
- Geotech working on contract to update Extreme Flood Vulnerability Assessment tool
- Metro doing Flood Risk Assessments for specific sites and to create tool


Hwy 101 during Spring 2011 Flood

Legislature Requirements – Sec 174.03 MN Statutes

Subd. 12: Trunk highway performance, resiliency, and sustainability. (a) The commissioner must implement performance measures and annual targets for the trunk highway system in order to construct resilient infrastructure, enhance the project selection for all transportation modes, improve economic security, and achieve the state transportation goals established in section 174.01.

- (b) At a minimum, the transportation planning process must include:

1. an inventory of transportation assets, including but not limited to bridge, pavement, geotechnical, pedestrian, bicycle, and transit asset categories;

2. lag (resulting), and where practicable lead (predictive), performance measures and annual targets that are:
   - (i) statewide and district-specific;
   - (ii) for assets in each asset category specified in clause (1) for a period of up to 60 years; and
   - (iii) identified in collaboration with the public;

3. gap identification and an explanation of the difference between performance targets and current status

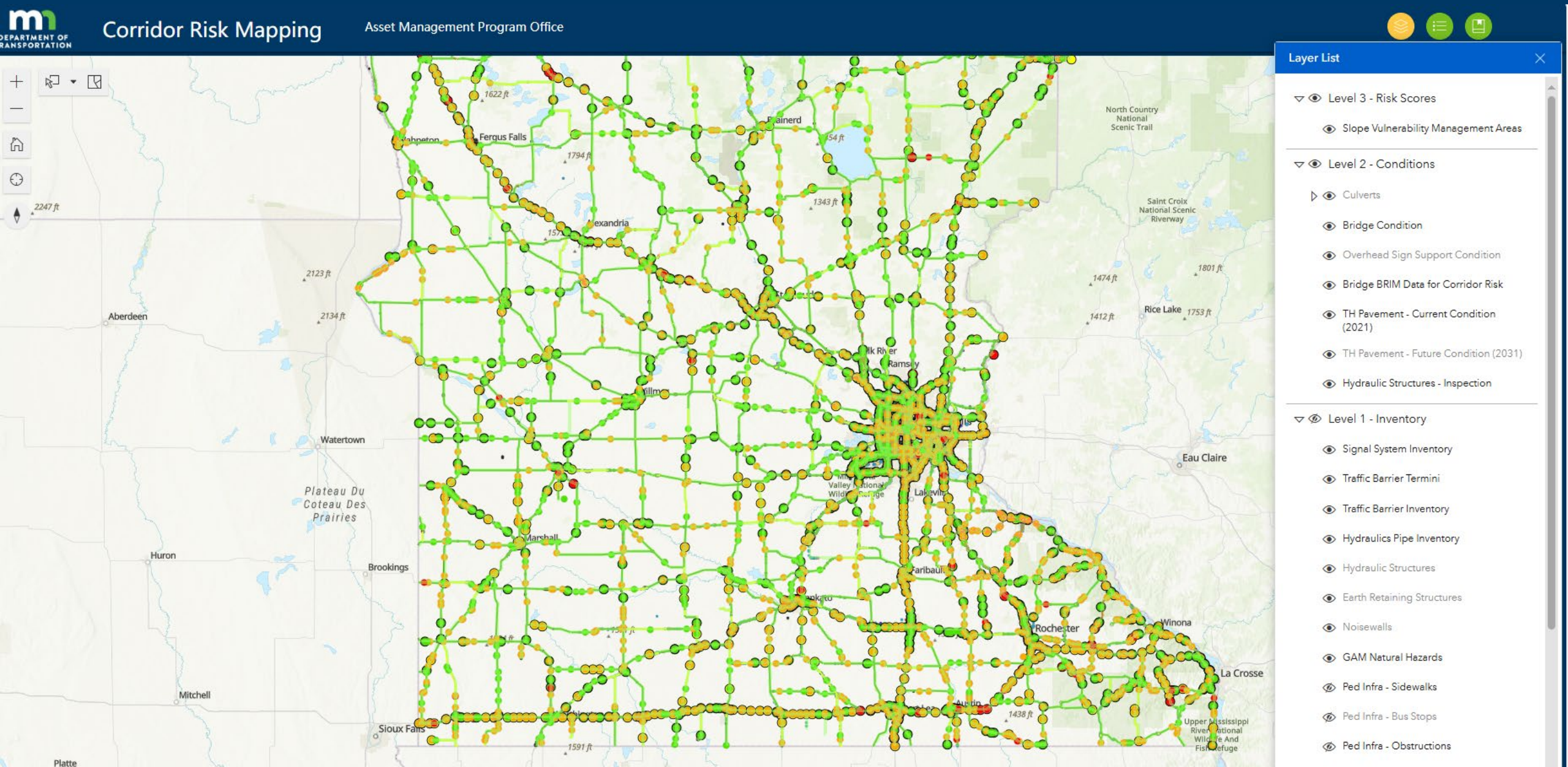
Legislature Requirements – Sec 174.03 MN Statutes

4. life cycle assessment and corridor risk assessment as part of asset management programs in each district of the department.
   - (c) At a minimum, the ten-year capital highway investment plan in each district of the department must:
     - 1. be based on expected funding during the plan period;
     - 2. identify investments within each of the asset categories specified in paragraph (b), clause (1);
     - 3. recommend specific trunk highway segments to be removed from the trunk highway system; and
     - 4. deliver annual progress toward achieving the state transportation goals established in section 174.01.
   - (d) Annually by December 15, the commissioner must report trunk highway performance measures and annual targets and identify gaps, including information detailing the department's progress on achieving the state transportation goals, to the chairs and ranking minority members of the legislative committees having jurisdiction over transportation policy and finance. The report must be signed by the department's chief engineer.

Development of The Corridor Risk Tool

- Who we worked with
- How and when we pull data
- Whats it for
- Where do we keep it

Indicators of Risk: Existing Layers



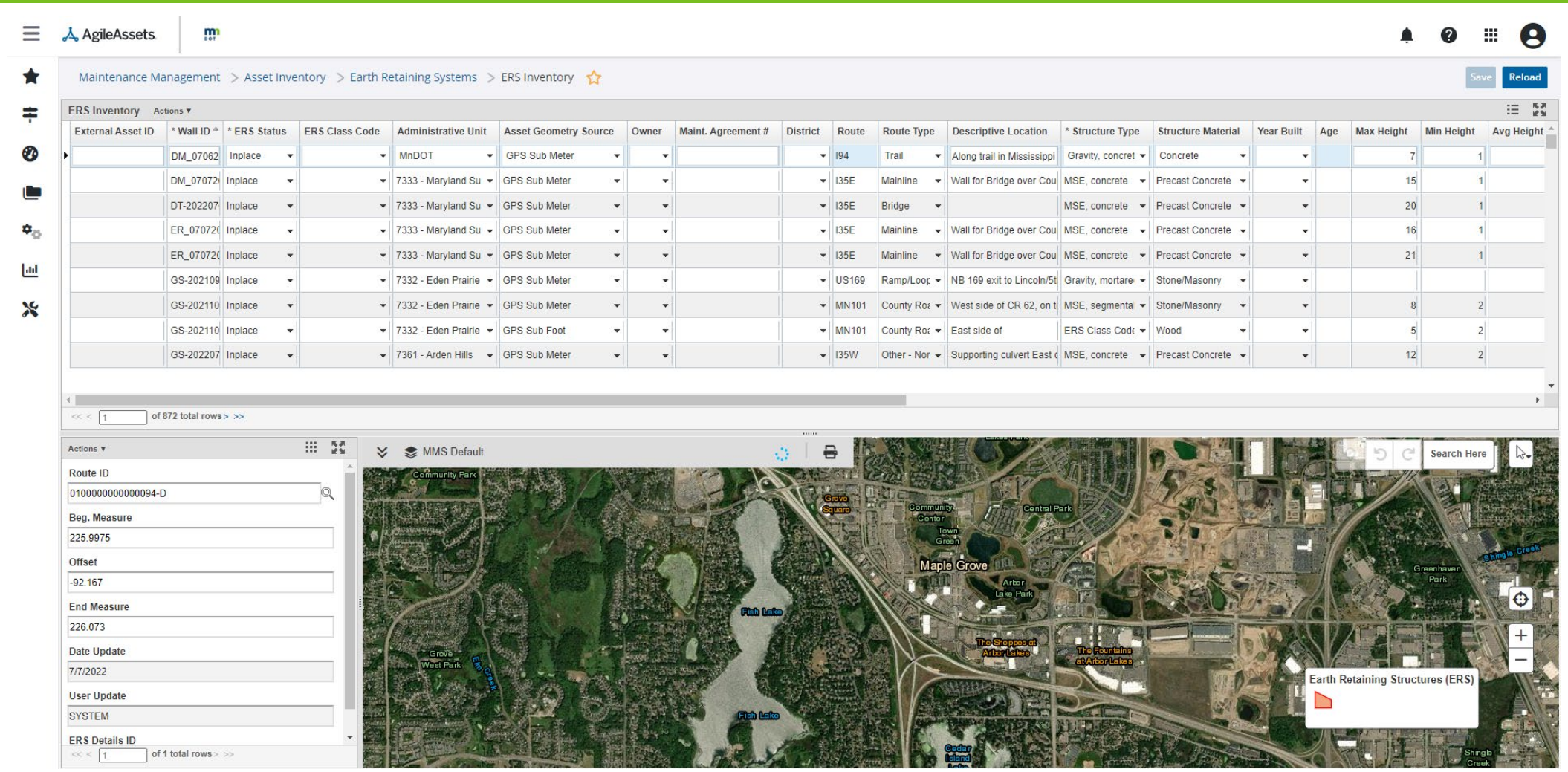
Indicators of Risk: Existing Layers

- Bridges
  - Bridge Planning Index
  - Overall Condition Rating
  - BRIM Recommendations
- Hydraulics
  - Culverts & Structures
    - Overall Condition Rating
- Noise Walls
  - Risk Assessment
- Geotechnical
  - Earth Retaining Structures
    - Risk Assessment
  - Natural Hazards
- Overhead Signs
  - Asset Inspection Scale
  - Overhead sign support condition
- Pavement
  - Current Condition
  - Future Condition
- MnDOT Construction Districts
- MnDOT Control Sections
- Pedestrian Infrastructure
- Bikeways and Trails
- Slope Vulnerability Management Areas

What's in TAMS?

- Signal Systems
- Lighting
- ITS
- RWIS
- WIM & ATR
- Pavement Marking
- Noisewalls
- Earth Retaining Structures
- Hydraulics – pipes, structures, ponds, tunnels
- Sidewalk & curb ramps
- Traffic Barriers
- Sign Panels & Structures
- Snow Fence & Snow Traps
- Entrance Monuments
- Weigh Stations
- Geotechnical Assets

Earth Retaining Systems - Inventory

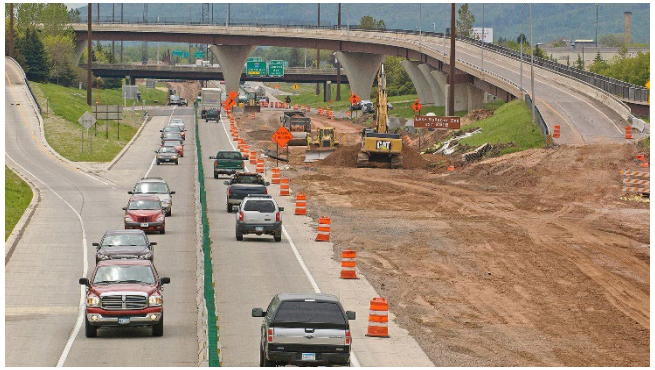


Future Layers

- Extreme flooding vulnerability assessment - Update soon
- Signs
  - Maintenance history, asset inspection work needs, vertical clearance
- Safety
  - Crash Rate Index – Portal Soon(!)
  - District Safety Risk Score
    - The areas are calculated from several risk factors including horizontal curves, commercial development at intersection, vicinity to rail road crossing, traffic volume, crash history, and clear zone assumptions
  - Space/PAWS Score - Equity
    - Latent demand for people walking/biking

Future Layers

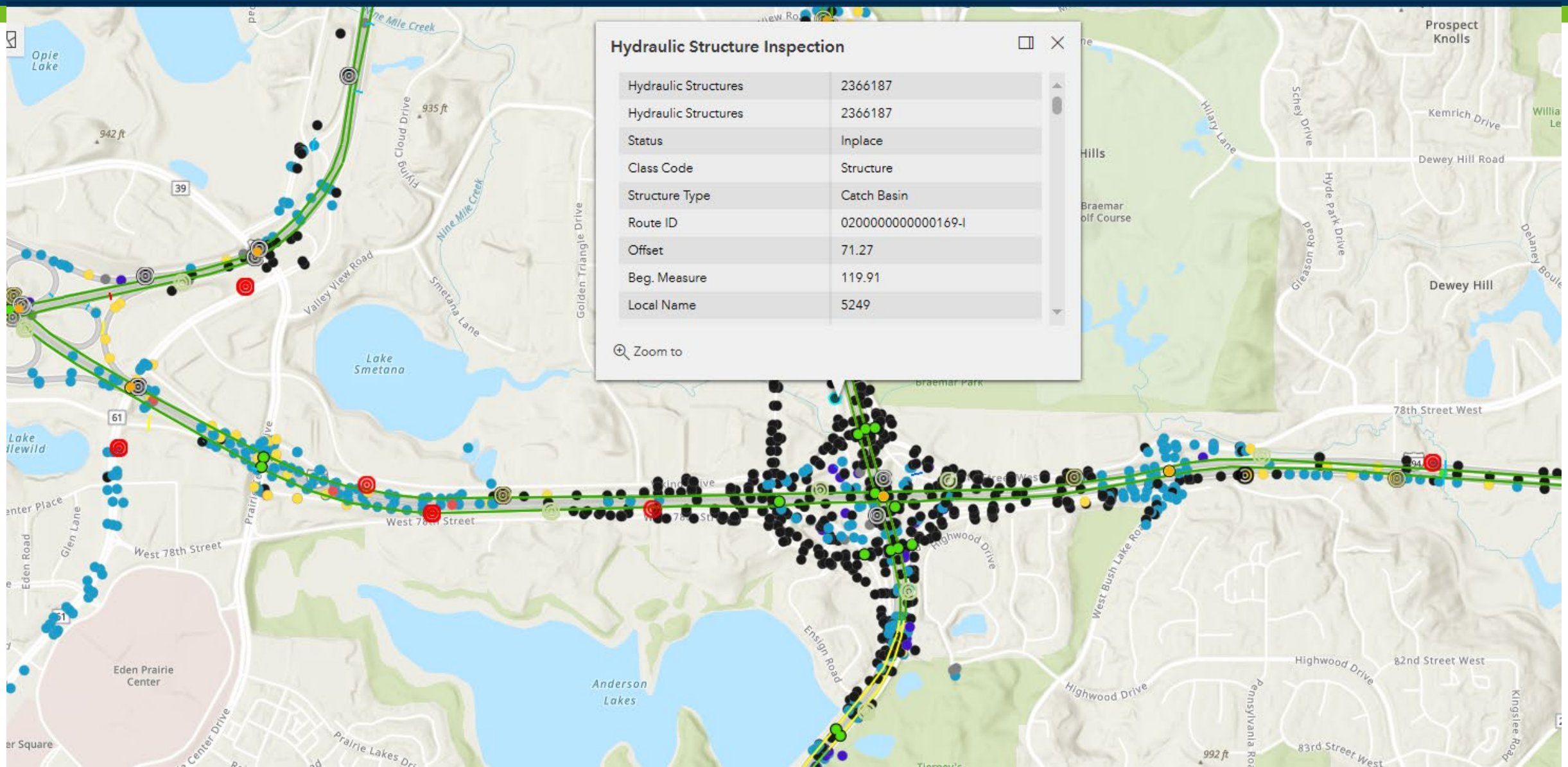
- Linear barriers & termini defects
- Climate Resilience
  - Asset Vulnerability Score
- Signals
  - Poor structural condition
  - Exceeding Lifecycle
  - Exceeding re-timing measure
- Transit
- Pavement
  - Age of grade, subgrade improvements
  - Excessive deterioration rates
  - Very poor condition causing safety issues
  - Blowup Potential
    - Undoweled White top
- Social Vulnerability & Transportation Equity
  - 40% of overall benefits of certain Federal investments flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution.



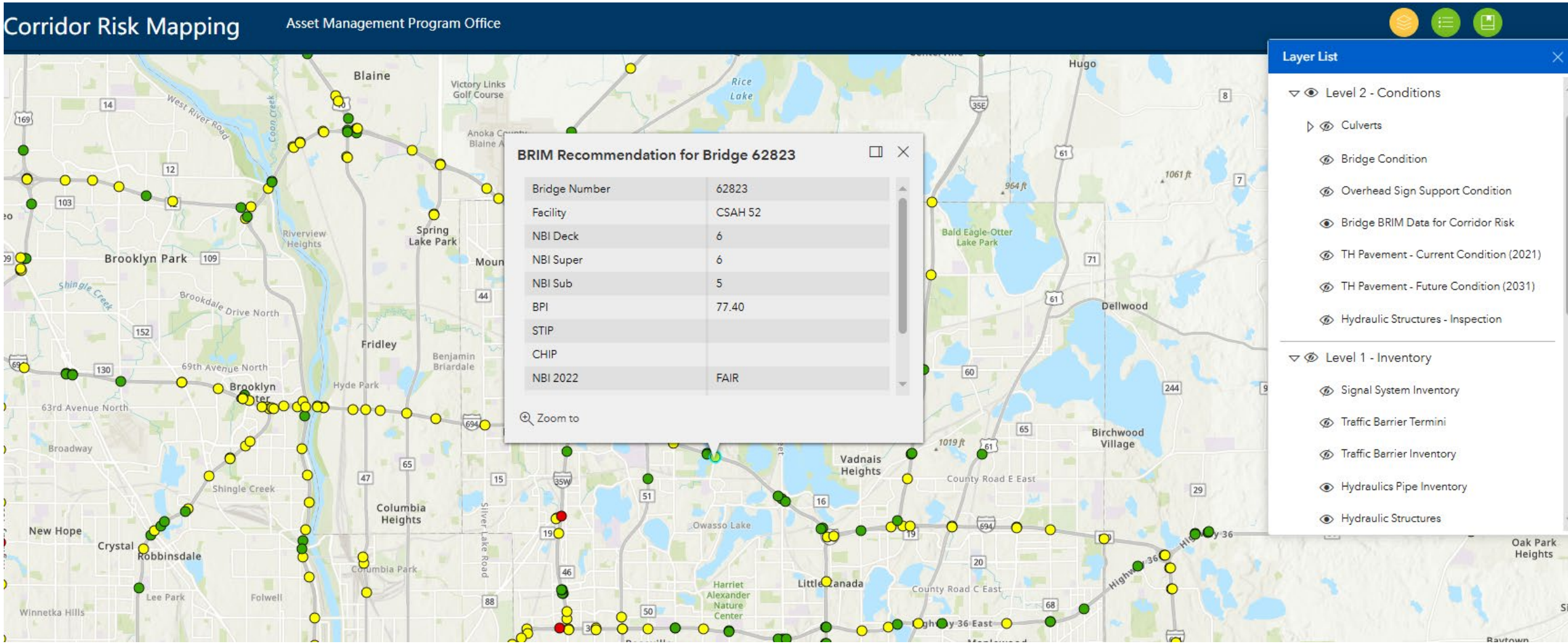
What's Next

- Ability to export selected data
- Project Management: Scoping map overlap?
- Define the risk(s)
- Prioritize risk layers
- Corridor risk score

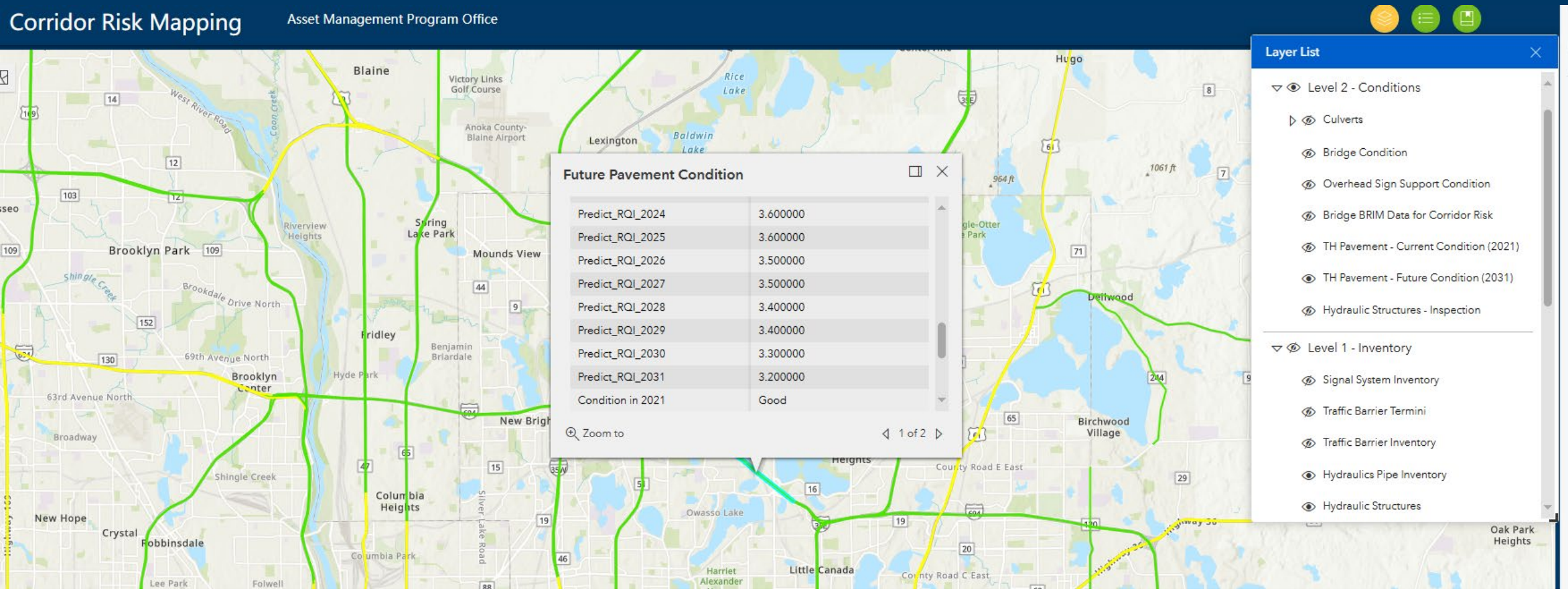
Corridor Risk Mapping Application in ArcGIS Portal



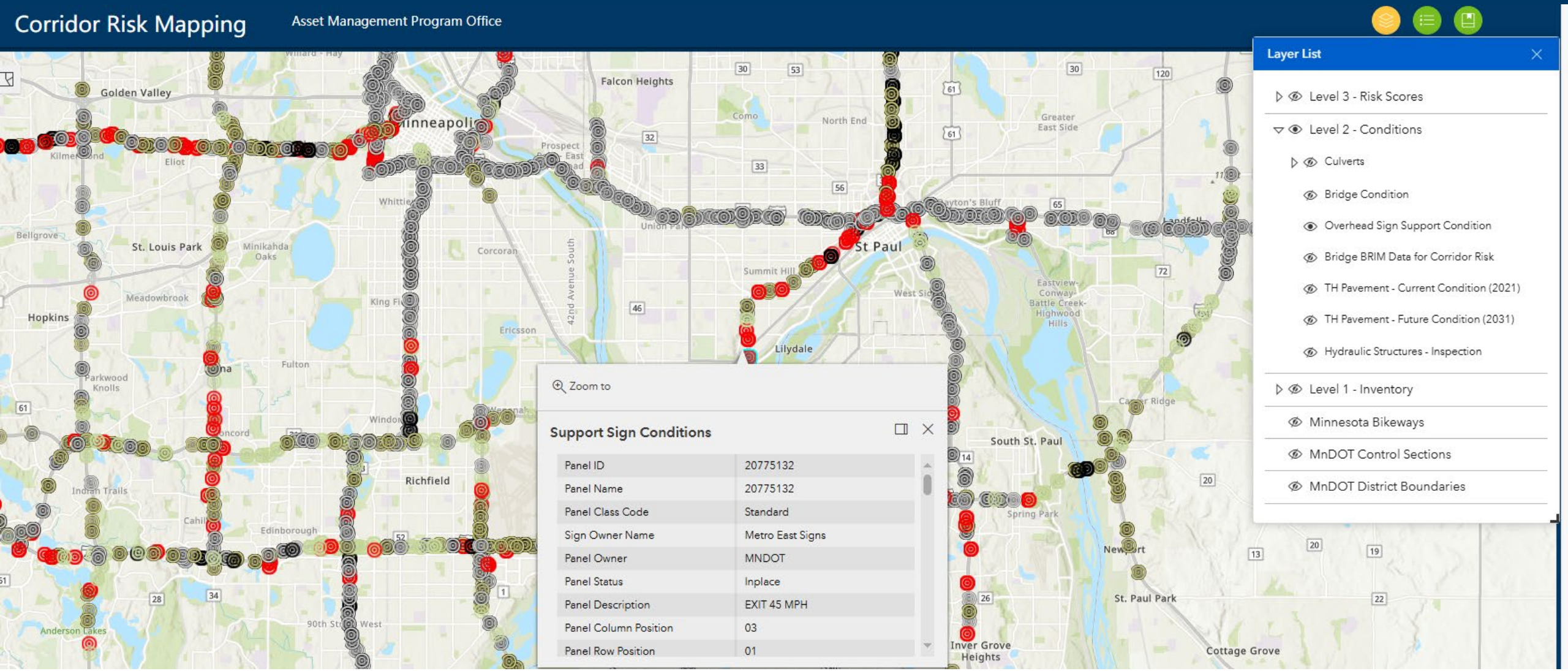
Select Bridge Condition



Select: Future Pavement Condition



Overhead Sign Structure Condition



Next Steps and Future Uses

- Corridor Planning Unit
- Corridor Risk Scores
- Historical and future operations and maintenance needs
- Cross Asset Risk Evaluation

Shaker Rabban

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2026 California Transportation Asset Management Plan

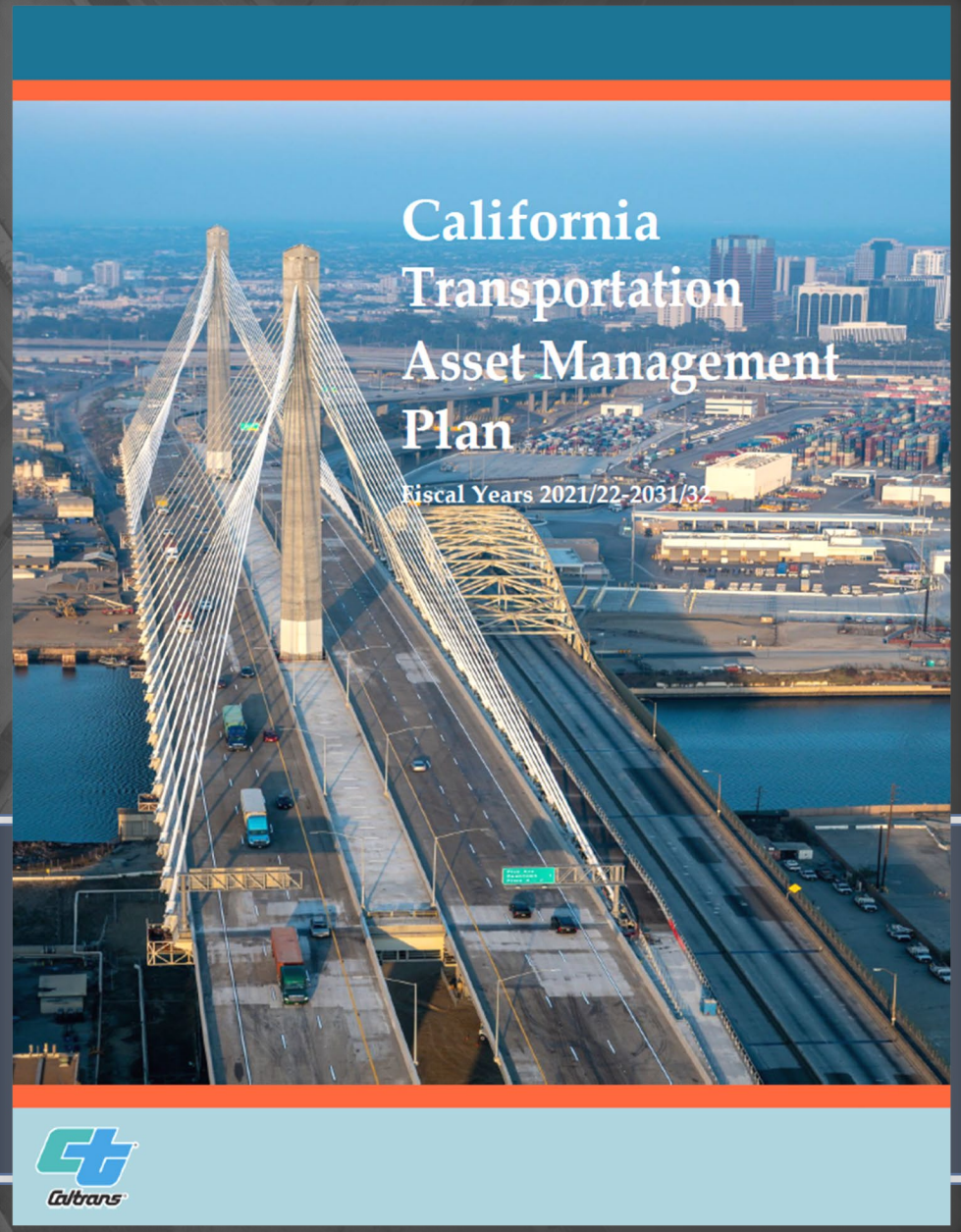
Risk Management Plan Update

Michael Johnson

State Asset Management Engineer

California Department of Transportation

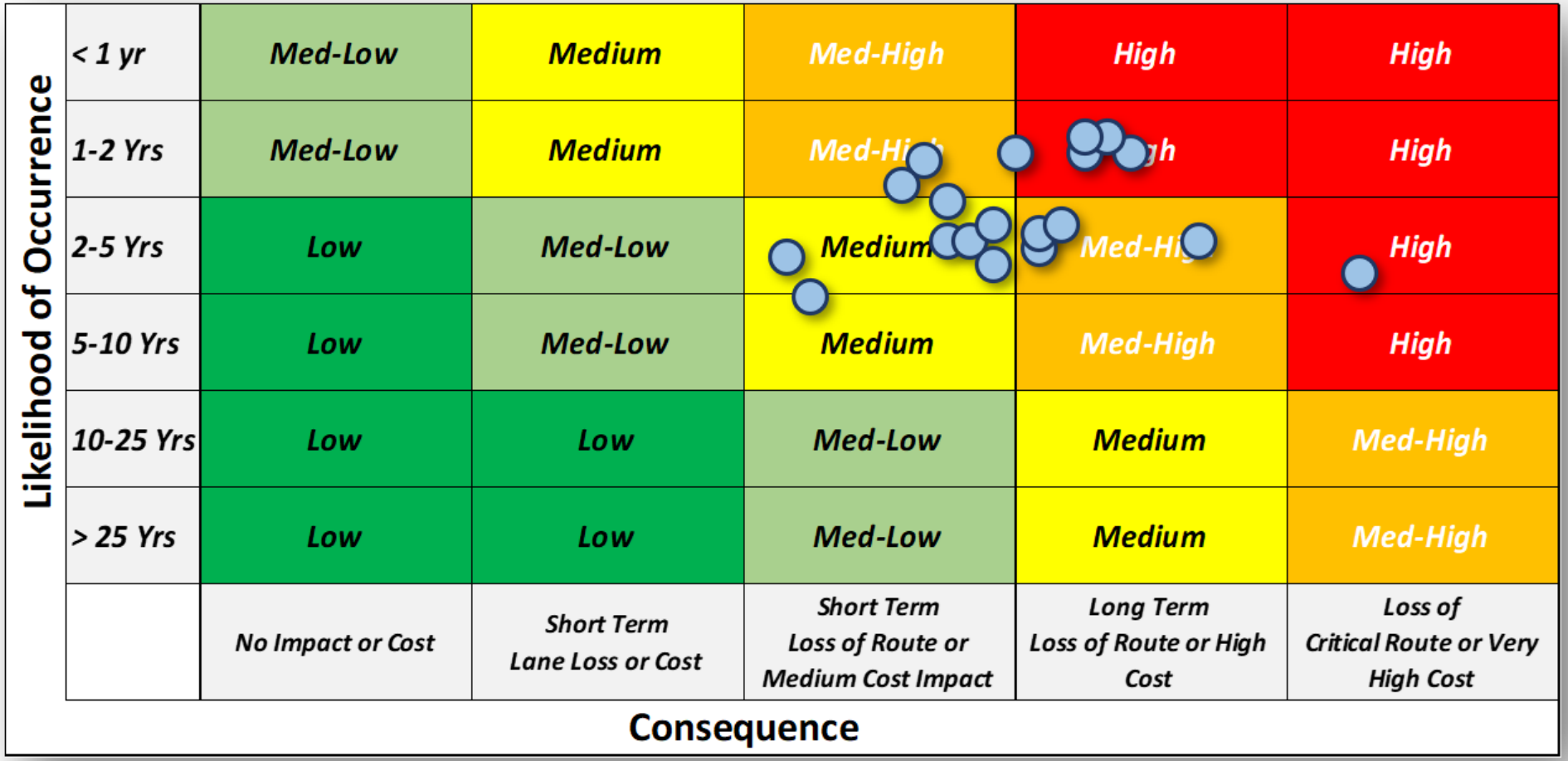
June 2025



2026 TAMP Risk Development Workshops

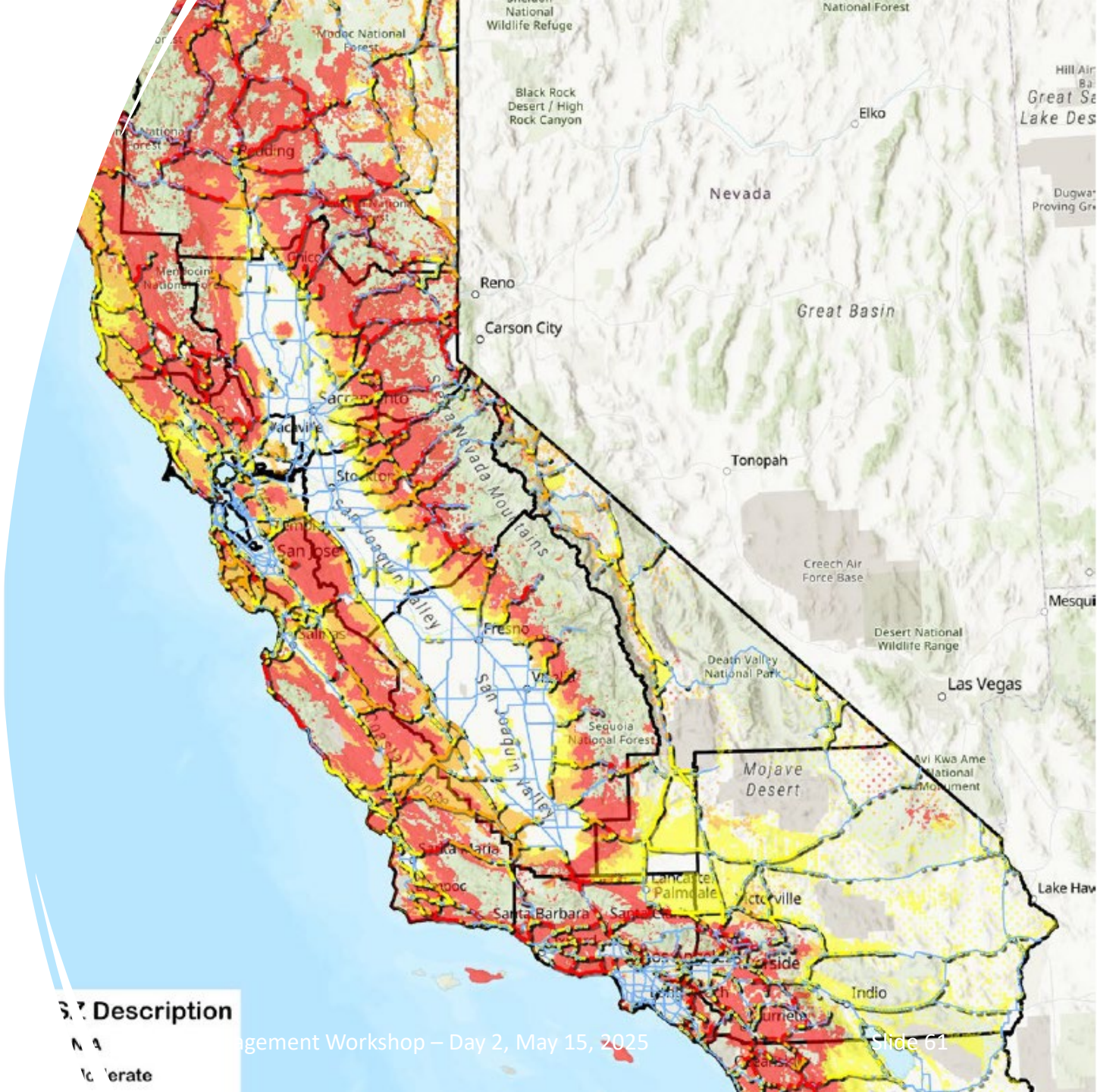
- Caltrans conducted risk workshops with stakeholders
  - 18 Metropolitan Planning Organizations
  - 43 Regional Transportation Planning Agencies
  - Over 600 cities and county NHS owners
- In total 19 risks were identified through the workshop
- 11 risks were classified Medium-High to High by the group
- Breakout groups focused on individual risks and developed the risk statements, mitigation strategies and monitoring approaches.

Identified Risks



Emerging Caltrans Risk Work

Wildfire Hazards



State Highway System Fire Hazard Intersection

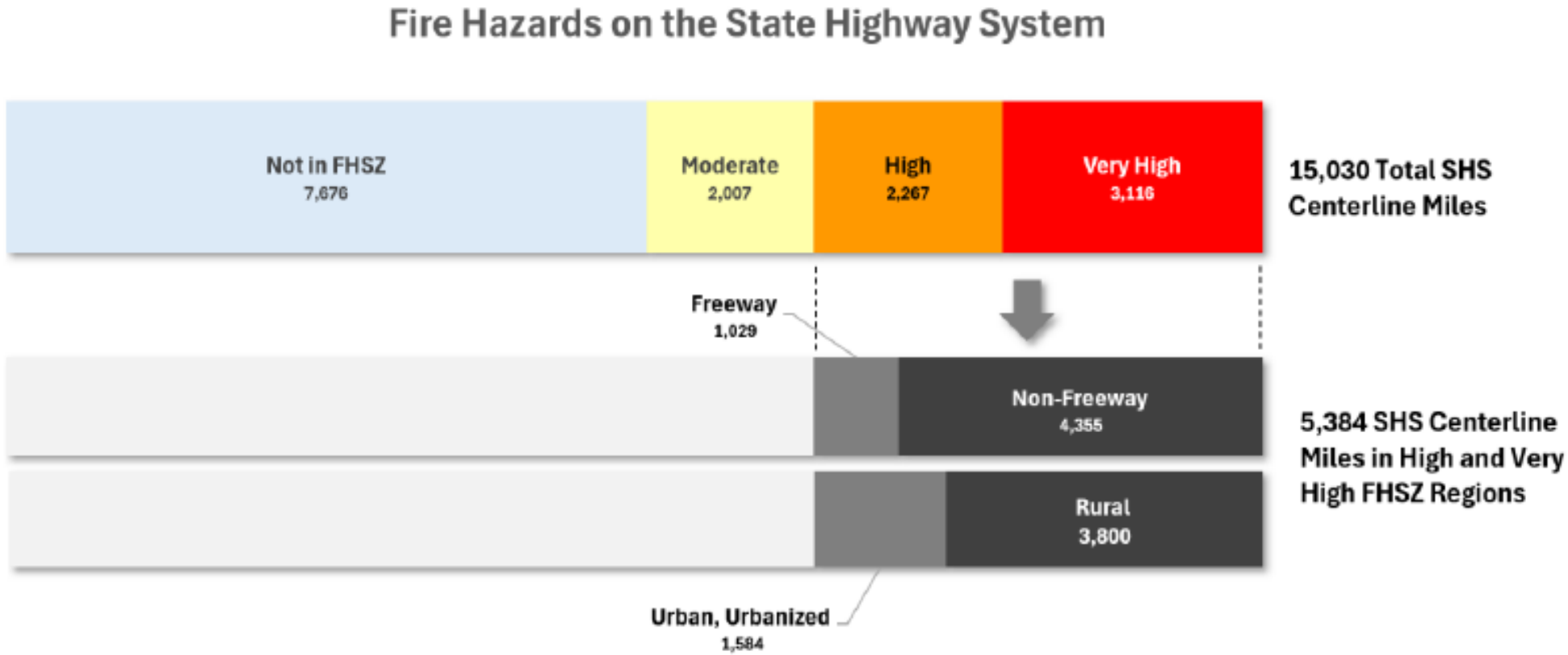
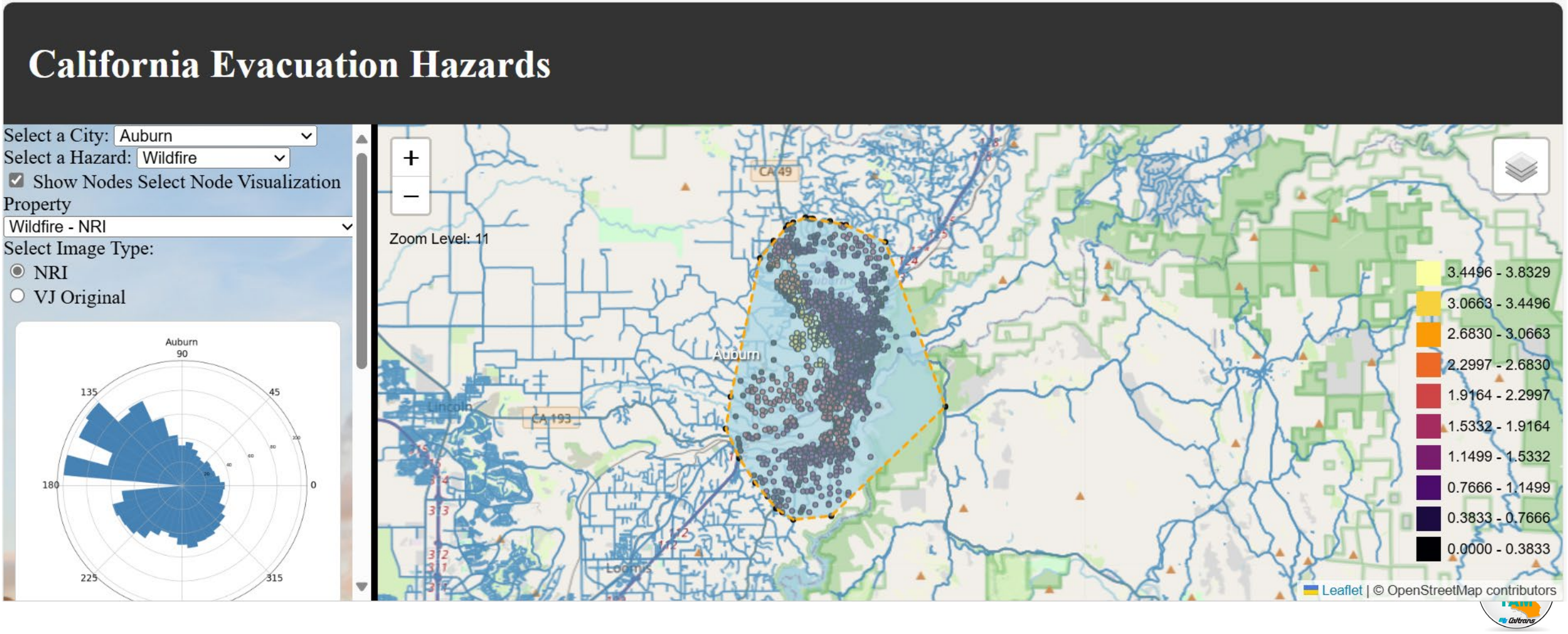


Figure 5-5. Types of SHS Routes in High and Very High Fire Hazard Severity Zones

Wildfire Evacuation



Sea Level Rise Threat

YEAR	LOW	INT-LOW	INTERMEDIATE	INT-HIGH	HIGH
2020	0.2	0.2	0.2	0.2	0.3
2030	0.3	0.4	0.4	0.4	0.4
2040	0.4	0.5	0.6	0.7	0.8
2050	0.5	0.6	0.8	1.0	1.2
2060	0.6	0.8	1.1	1.5	2.0
2070	0.7	1.0	1.4	2.2	3.0
2080	0.8	1.2	1.8	3.0	4.1
2090	0.9	1.4	2.4	3.9	5.4
2100	1.0	1.6	3.1	4.9	6.6
2110	1.1	1.8	3.8	5.7	8.0
2120	1.1	2.0	4.5	6.4	9.1
2130	1.2	2.2	5.0	7.1	10.0
2140	1.3	2.4	5.6	7.7	11.0
2150	1.3	2.6	6.1	8.3	11.9

Figure 5-9. Statewide Averages in Feet for Five California Sea Level Scenarios (OPC 2024)

Sea Level Rise and Coastal Cliff Retreat

Table 5-7. Roadway and Bridge Adaptation Strategies

Approach	Adaptation Option
Protect	Provide major structural protection
	Provide protection at existing elevations/locations
	Utilize nature-based solutions to protect assets like vegetated dunes, cobble berms, marsh sills, tidal benches, oyster reefs, and eelgrass beds
Accommodate	Elevate the infrastructure above the impact zone
	Enhance drainage to minimize closure time and/or deterioration levels
Retreat	Abandon infrastructure
	Relocate infrastructure or realign highway outside of exposed areas
	Temporarily restrict use of infrastructure
Changes in policies or practices	Increase the infrastructure's maintenance and inspection interval and continue to monitor/evaluate
	Modify land use and development policies to account for future impacts
	Develop a detailed detour plan for assets susceptible to temporary flooding

Sea Level Rise/ Coastal Erosion Adaption Estimates

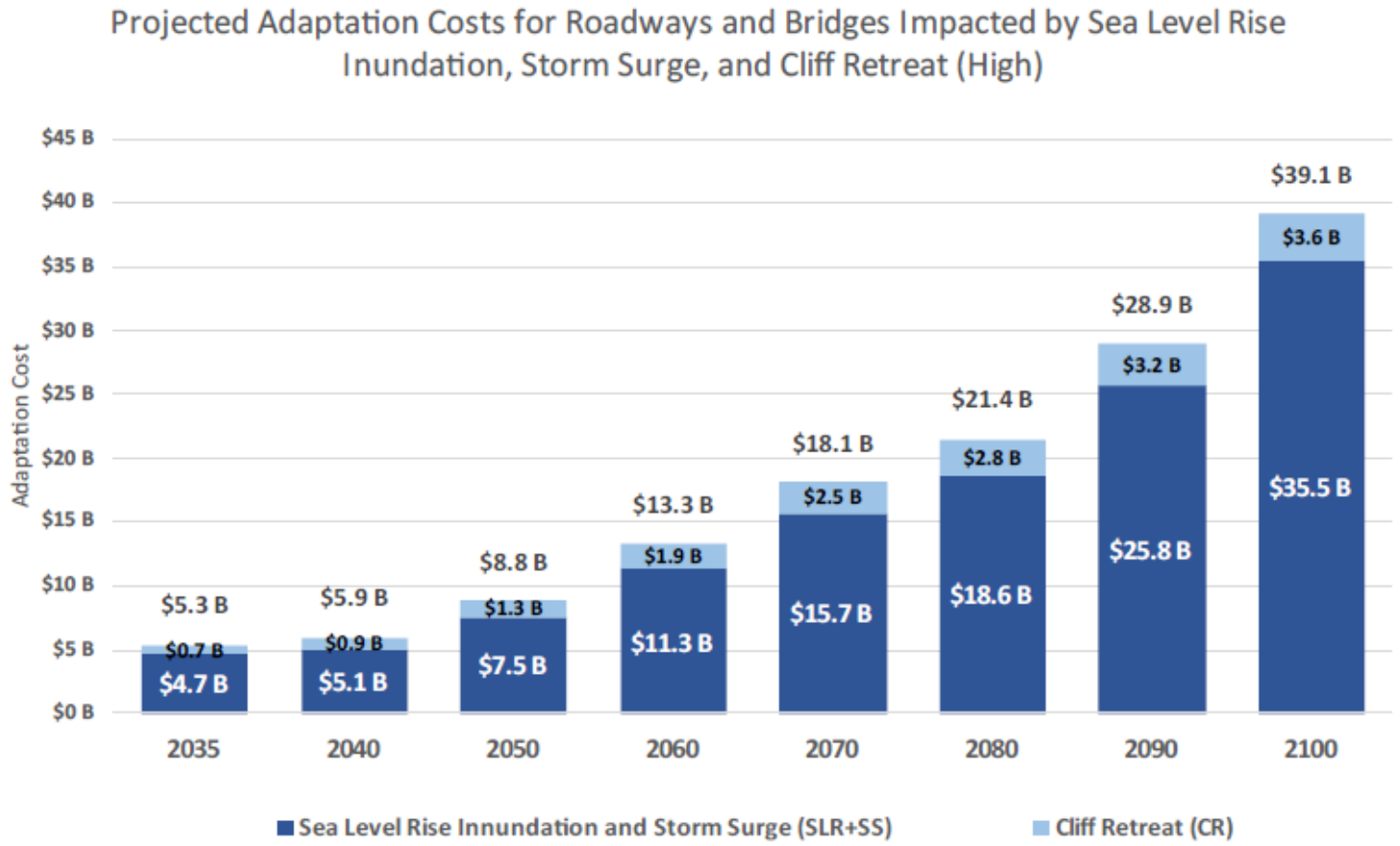
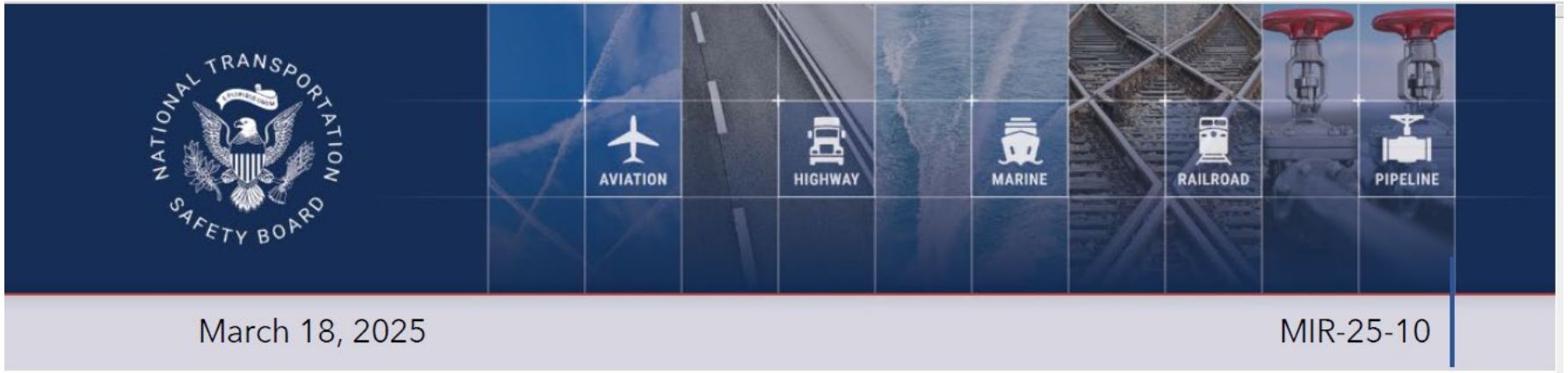
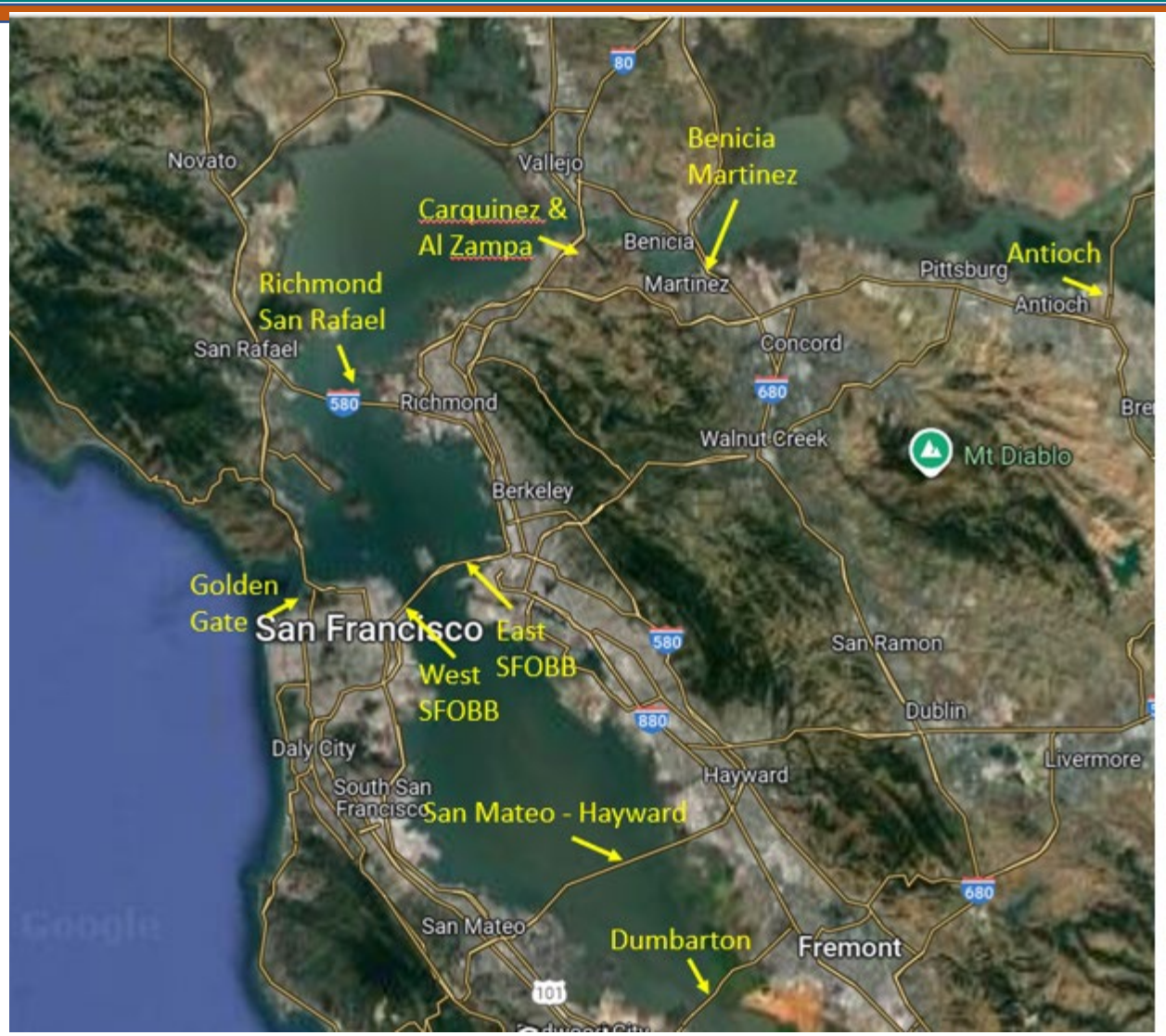


Figure 5-11. Projected Adaptation Costs for Roadways and Bridges Impacted by Sea Level Rise Inundation, Storm Surge, and Cliff Retreat (2024 OPC High Scenario)

Bridge Vessel Strike Risks

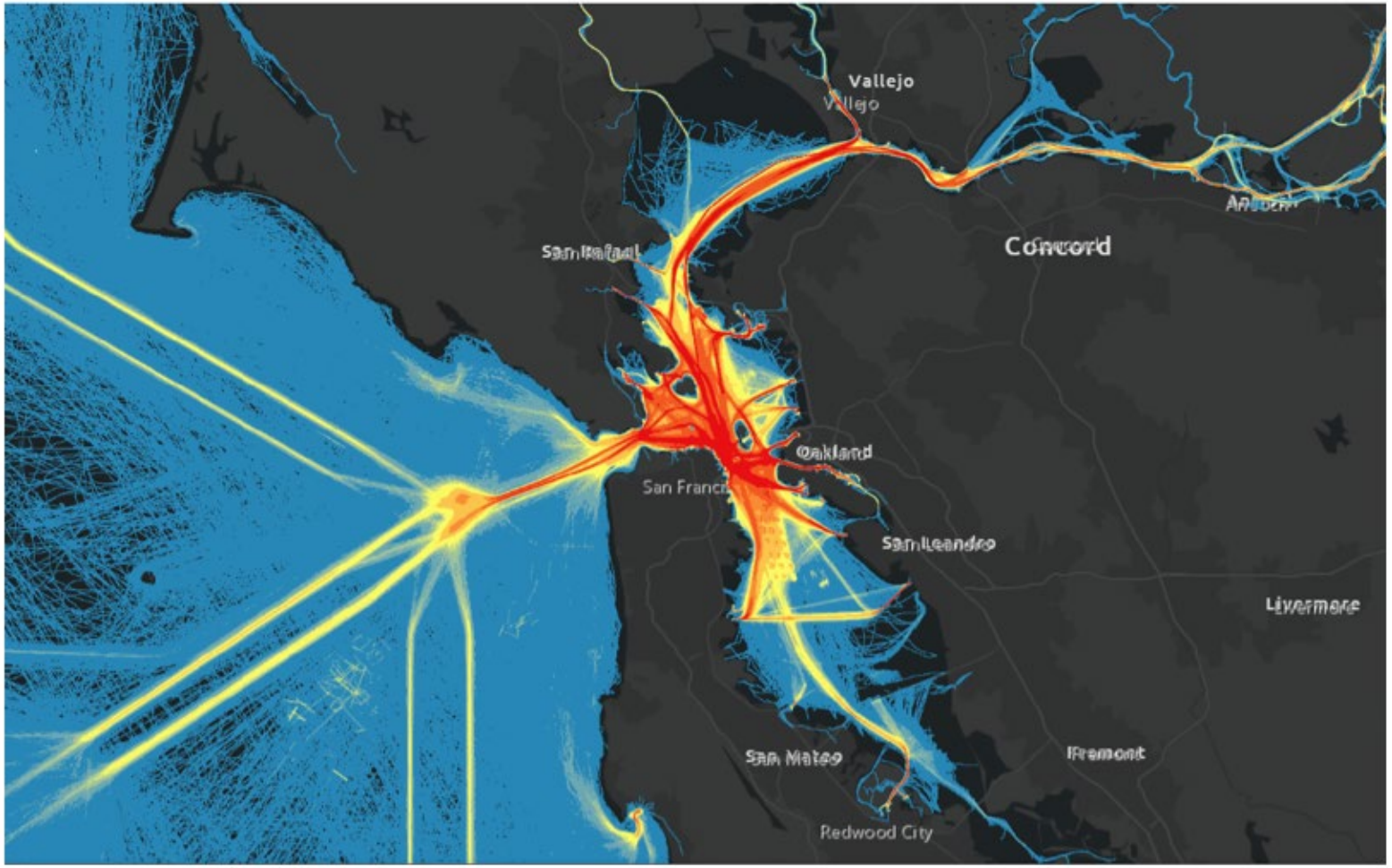


San Francisco Bay Bridges



Vessel Frequency Heat Map

Vessel Traffic Heat Map



Conclusion

- Caltrans continues to lean in to risk assessments as an organization
- Risk mitigation is included in our TAMP Investment Scenarios as costs that take funding that will not be available for condition improvement.
- Emerging risk work on wildfire evacuation, vessel impact and coastal erosion and sea level rise actively being pursued.

Q&A and Discussion

Submit your questions using the Zoom's chat feature or raise your hand!

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Topic: Recent Research Roundtable

More to follow!

U.S. Department of Transportation Federal Highway Administration

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