

Integrating Resiliency at CDOT

Asset Management Fact Sheet



The Concept and Value

As part of our Resiliency Program, CDOT plans to use data from past natural hazard events and predictive data from those same risks on our system to improve asset management decisions. A team of CDOT and FHWA subject matter experts have:

- Built a step-by-step process for identifying assets that have been damaged once or twice in the past by natural hazards,
- Developed a method for evaluating resilient alternatives for reducing risk to an acceptable level, and ultimately designing and constructing the most cost-beneficial options, and
- Tested the new process in a case study that helped refine this method.

The goal of the process is having a benefit/cost trade-offs analysis in place to guide the department's future resource allocation decisions.

The process described above is required by the FHWA Transportation Asset Management Plan rules (Part 667). Merging this new process into existing CDOT processes, developing a mechanism to fund the resiliencies, and rolling the process out CDOT-wide for consistency will demonstrate success of this case study.

The process is being integrated into existing procedures and will allow CDOT to take a proactive approach to not only meet Part 667 requirements but, when resiliency is built into a twice damaged asset, allow CDOT to remove that asset from future Part 667 reporting requirements.

Asset Management Process

The asset management resiliency project integrates into the Department-wide STIP process. A detailed process map with step-by-step guidance is available here [Resiliency website](#).

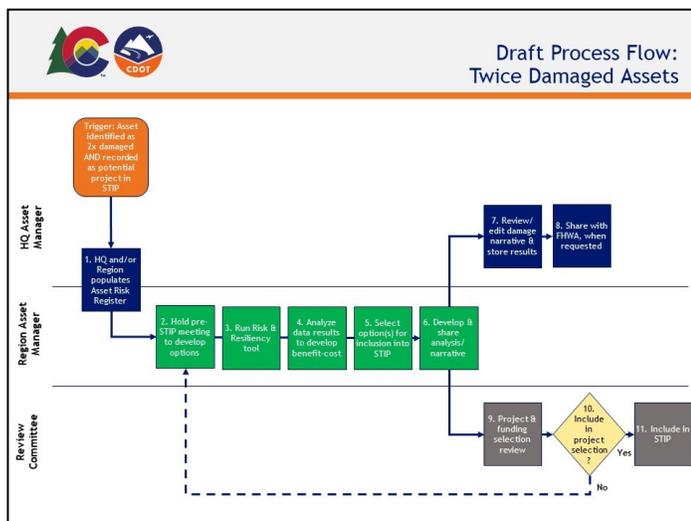
RESILIENCE

American Association of State Highway and Transportation Officials (AASHTO) Adopted Definition:
Resiliency is “the ability to prepare and plan for, absorb, recover from, or more successfully adapt to adverse events.”

Colorado Resiliency Working Group Definition:
Resiliency is the ability of communities to rebound, positively adapt to, or thrive amidst changing conditions or challenges – including disasters and climate change – and maintain quality of life, healthy growth, durable systems, and conservation of resources for present and future.

Detailed Process Map

Step-by-Step Guidance



Process Step	Owner & Guidance	Supporting Information
1	The HQ Asset Manager or Region Asset Manager will access the risk register and identify any new entries. Then document all newly identified Twice Damaged Assets.	Link to asset risk register
2	The Region Asset Manager will form a team and hold a pre-STIP meeting to fill out CDOT form 1048 to develop resilient options and run the Resiliency cost worksheet. The outputs from this meeting will be used to identify and gather data needed to run the Risk & Resiliency tool (RnR)	Form 1048
3	The Region team will run the RnR tool for each option to create conceptual cost estimates.	Link to RnR tool
4	The Region team will analyze the risk reduction results from the Risk & Resiliency tool to establish a benefit-cost of the proposed mitigation.	RnR results
5	The Region team will select one or more options for developing the initial cost estimate for including this project and resilient options into the STIP.	Cost Estimate
6	The Region team will develop a narrative to report and share results with the HQ Asset Manager	Narrative
7 & 8	The HQ Asset Manager will receive the results of the twice-damaged asset analysis, review and edit the narrative as required and share the narrative with FHWA when required. They will then prepare for any Risk and Resiliency EOC or Commission presentations.	Information from Region
9, 10 & 11	After these steps are completed the Region Planner will include this project in the STIP.	STIP

*If the project is funded and constructed the HQ Asset Manager will review the project and potentially remove the asset from the twice-damaged database.

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Case Study Results

The Regions collected data on actual upcoming projects and the Team ran the data through the R&R tool. The results will be put into a narrative used to inform the CDOT HQ Asset Manager that CDOT has met the requirements of Part 667. The Asset Manager will review and edit the narrative as necessary to be ready to share the information with the FHWA Division office when required.

The following are the main insights discovered throughout this Case Study:

- CDOT does not currently have a reliable library or database housing twice-damaged assets and relevant information.
- Initial analysis of twice damaged projects required a huge effort from the Regions. It was difficult to predict the level of effort and kinds of details the Regions would need early in the process development so actually having the Regions go through the process helped the Team optimize the process.
- Having a HQ Asset Management program expert who is able to either assist the Regions or conduct a short training session will be a key component to meeting the Part 667 requirements.
- Once all data is collected for each resilient option developed in the project estimating meeting, the team will run the Resilience cost worksheet and the RnR tool for each likely option and create conceptual cost estimates.
- The existing CDOT Risk and Resiliency (RnR) tool has been refined including instructions for ease of use in this process.
- Risk reduction results are then analyzed from the RnR tool to establish a benefit-cost of the proposed mitigation.
- Based on the outcome of the planning-level BCA, the team selects one or more options to develop initial cost estimate for including the project in the STIP.

Lessons Learned

- A cost estimating spreadsheet was developed to assist the Regions in costing the resilient options selected and the R&R tool was revised with instructions in each tab to be more user friendly.
- If As-Builts cannot be readily accessed the default data in the R&R tool can be used to generate baseline costs to compare to the resilient options and generate a valid BCA.
- There were several questions about who should perform the analysis on twice damaged sites, the CDOT HQ office who managed the asset vs. the Region Asset Manager and engineering.

Key Takeaways

- Process only works when the Regions are trained and understand how to run a Planning level BCA.
- This is a living process that will require updating on an annual basis.
- Regions need to realize this is a Federal requirement and prioritize appropriately to meet them. There is potential funding for the project if the results show a positive cost benefit.
- Have Geotech group handle all rockfall events
- A short video was developed to walk through the steps for the R&R tool.

Contacts and Resources

For questions, please contact:

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Additional resources include:

- [Resiliency website](#)
- RnR Tool: <https://www.codot.gov/programs/planning/risk-and-resiliency-tool-6-21.xlsx>
- Part 667 guidance: https://www.fhwa.dot.gov/programadmin/23cfr667_qa.cfm