

AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. Sponsoring DOT (State): California Department of Transportation (Caltrans)
2. Name and Title: Joaquin Pedrin, Senior Landscape Architect & Branch Chief; Jeanne Gorham, District Landscape Architect

Organization: California Department of Transportation (Caltrans), District 4

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Innovation Description (10 points)

The term “innovation” may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

360 Tours

4. Please describe the innovation.

360 Tours is the winner of the [2022 AASHTO America's Transportation Awards](#) (at 7min mark), Small Category Technology and Innovation Award, the **2021 WASHTO Innovation Award**, **Caltrans 2021 Excellence in Transportation Award** for innovation, featured at **TRB's 2021 annual meeting** and presented to a national audience at the **2020 FHWA EDC Summit**.

360 Tours is a web-based visualization interface that takes public engagement to the next level. It encourages stakeholder participation by presenting complex transportation projects in a compelling and centralized space easily accessible by the majority of our communities. Stakeholders can explore alternatives, view simulations of impacts such as sea-level rise, view related external websites, make comments, and access supporting environmental documents from one immersive experience. To formalize 360 Tours engagement, we have begun publishing QR codes with links to the project's 360 Tour in the public notice of the Draft Environmental Document in newspapers and mailers. This engagement is then tracked using Google Analytics to measure engagement by assessing the number of unique individual visitors, time on site, and city of visitor. These metrics allow us to quantify the success of our engagement efforts and the effectiveness of a project's 360 Tour. We are also integrating Building Information Modeling for Infrastructure (BIM4I) efforts at Caltrans to synchronize the project development team's internal 3D model with external stakeholder visualizations. Our current process is to rapidly develop prototypes from 2D information. The promise of BIM4I is to accelerate the 360 Tour process.

To date, our success has not just been in winning awards, but in successfully getting project approvals from regulatory agencies, city departments, and community groups. A picture isn't just worth a thousand words, it's worth a thousand words in a thousand languages.

5. What is the existing baseline practice that the innovation intends to replace/improve?

As a state agency, we have an obligation to inform the public of our projects. But project simulations aren't typically made available in a format or a timeframe that allows for meaningful engagement with the proposed design alternative. Historically, the visualizations our agency developed were static exhibits buried within environmental documentation, and they were used to assess a project's visual impacts. This documentation was typically developed and released after design alternatives are selected, either in a PDF or in a one-time in-person public meeting. This process gave stakeholders little chance to fully understand a project through simulations. This lack of understanding has often resulted in a lack of support; and broad public support is essential to getting high-profile projects built on time and on budget.

6. What problems associated with the baseline practice does the innovation propose to solve?

360 Tours make a project proposal available and understandable to diverse stakeholders. The engineering plans and project descriptions that we typically share with local agencies and the public are difficult for a layperson to access and read, and often don't elicit meaningful feedback. Recent research by the FHWA on Virtual Public Involvement (VPI) has shown that mobile devices are the most common way stakeholders access project information. The research further showed that mobile technologies were the most equitable way to reach and

interact with our stakeholders. This innovation takes our simulations out of a lengthy document and puts them into a mobile-friendly interactive format that is available 24 hours a day to agencies, the public, and our own project development teams. Partner agencies have been able to access our 360 Tours while developing their staff reports, which deepened their understanding of project details. We were also able to add topography, aerial imagery, and supplemental visualizations as staff requested information and improvements to address public and agency concerns. In addition to these advancements in external communication, 360 Tours have also enhanced our internal collaboration. We have used 360 Tours to rapidly prototype project alternatives for our internal teams to efficiently select design alternatives at the least expensive phase of project development.

7. Briefly describe the history of its development.

Our use of visualizations has evolved from the creation of static before & after images, created in-house or by consultants, to the development of 3d models embedded in interactive 360 Tours. As we have seen how effective simulations are in developing design solutions and building public support for projects, we have begun producing visualizations earlier in the project development process - at the planning or early environmental study phases, instead of the end of the project approval & environmental study phase. Landscape Architects in our agency have advanced their process to take advantage of modeling, rendering, and photosphere software to build, render, and share these models in an easily accessible format. The platform is scalable and has allowed us to add layers of information (like GIS map data), additional viewpoints (for expansive project corridors), and embedded videos (to provide narrated explanations). Today we are able to provide understandable and interactive visualizations, scaled to the complexity of a project, as we are seeking feedback and support from the public and our public partners.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

We have seen that Landscape Architects already possess the skills needed to implement this innovation, and when project managers allocate resources to develop visualizations early in the design process, our Landscape Architectural staff has the capacity to produce them. Landscape Architects, unlike Professional Engineers, are trained in visual communication in the course of their professional education. With these skills and the use of various software packages, our staff has developed 3d models and renderings required for 360 Tours. With the collaboration of environmental planning, public affairs officers and project managers, these visualizations can be easily disseminated for team collaboration and public engagement.

Three of our recent 360 Tours are available online at these links:

[Tamalpais Dr. Overcrossing 360 Tour](#) (alternative analysis, distributed through QR codes in newspapers)

[Gleason Beach 360 Tour](#) (illustrates coastal erosion, highway realignment, and design options with embedded maps and videos).

[SR37 360 Tour](#) (explores sea level rise threats to state route 37 for a PEL study)

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.

U.S. Highway 101 Tamalpais Drive Overcrossing in Corte Madera, Marin County.

Public Comment Period: July 7, 2022 to August 22



SCAN THIS CODE FOR A 360 TOUR OF THE ALTERNATIVES

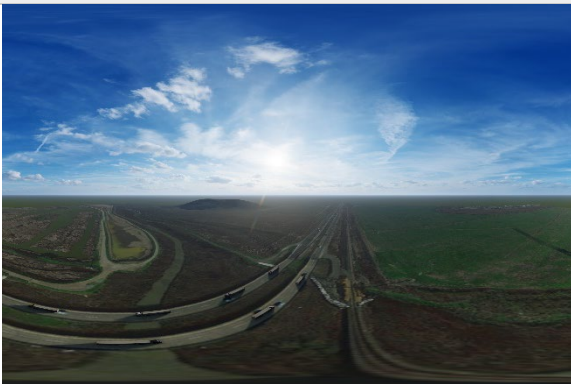
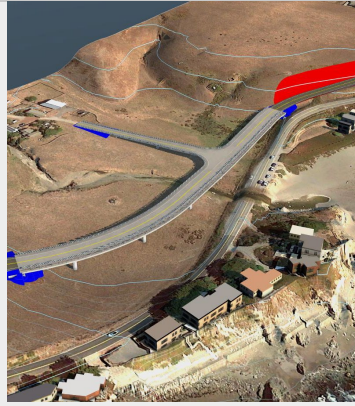
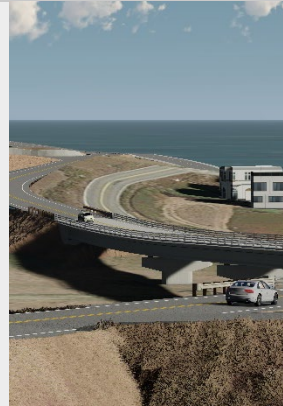
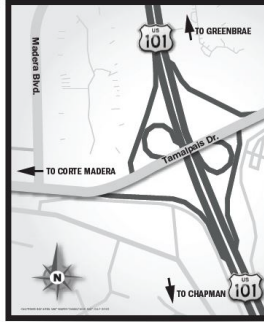
PUBLIC NOTICE

What is being planned?

Caltrans has prepared an IS/ND for the U.S. Highway 101 (U.S. 101) Tamalpais Drive Overcrossing Project (Project). The Project is located in Corte Madera, Marin County, on U.S. 101 at post mile (PM) 7.37. The Project proposes to upgrade the structure over U.S. 101 at Tamalpais Drive Overcrossing (OC) by replacing the existing nonstandard pedestrian facilities with Americans with Disabilities Act (ADA) compliant features. The Project also includes seismic structural improvements, intersection modifications, reconfiguration of the U.S. 101 on/off-ramps, and repairs and maintenance of the existing structure.

Why this advertisement?

Caltrans, as the lead agency under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), has prepared the IS/ND to analyze potential effects the proposed Project may have on the environment. This notice is to inform you of the public comment period.



State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The All selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

- Prototype is fully functional and yet to be piloted
- Prototype has been piloted successfully in an operational environment
- Technology has been deployed multiple times in an operational environment
- Technology is ready for full-scale implementation

360 Tours are now being developed regularly for large-scale and high-visibility projects within our district. The Tamalpais Drive Overcrossing 360 Tours was deployed in July 2022, the SR37 tour was deployed in September 2020, and the Gleason Beach tour was deployed September 2020.

10. What additional development is necessary to enable implementation of the innovation for routine use?

No further development is necessary. Resources are currently being allocated for implementation of 360 Tours on high-profile projects, and broader implementation is forthcoming.

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology?? Yes No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
FHWA	Jeffrey Zaharewicz, Acting Director, FHWA Center for Accelerating Innovation	(202) 366-1325	Jeffrey.Zaharewicz@dot.gov
TRB	Ilir Bejleri, Associate Professor, University of Florida, on behalf of the TRB Interactive Visual	(352) 294-1489	ilir@ufl.edu

	Simulation Sub-Committee		
Metropolitan Transportation Commission (MTC)	Jeanette Weisman State Route 37 Corridor Program Manager	(510) 410-4949	jweisman@bayareametro.gov

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice .

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

360 Tours provide state of the art visualization to our customers and stakeholders with the public, partner agencies, and within our own internal project development team. The quality of the information and the ease with which it is understood make our project proposals easier than ever to understand, access, and share. The SR37 tour has been shared with partners in four counties and with members of the public to illustrate the pressing need to address sea level rise and to catalyze support for the project design. The Gleason Beach tour was referenced extensively by local and statewide agencies, allowing them to develop staff reports and recommendations, and to request additional information. Due to the scalable nature of the platform, we were able to add layers of information to address both agency and public concerns. This provides unparalleled quality of information, available at any time on any device, to support collaboration with our stakeholders.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Improved Customer Service	Tours make our proposed projects easier than ever for the general public to understand. While we regularly share project descriptions and plans and request public comment, the feedback we get is only as good as the content we're able to communicate. 360 Tours help the layperson understand not only the need for the project with videos, maps, and overlays; they also allow our customers to explore our proposed solution. Our Tours are not only informative, they are also fun to view. An interactive model is easy for public information officers and

	engaged citizens to share on social media, helping us to spread the word and even create a buzz about upcoming projects.
Organizational Efficiency	Easy-to-understand simulations are as informative for our partners as our customers. By making these Tours available early in the environmental study phase of the project, our project development team members and partner agencies are able to identify environmental issues at a point when we still have plenty of time to coordinate solutions. The tours also serve as an information hub for reviewers, providing a shareable project overview and allowing us to add requested information in one convenient location, without tracking circulation lists or managing versions.
Other (please describe)	360 Tours have been an innovative application of technology that our DOT was already investing in. We were able to leverage a combination of existing software packages and already-approved licenses, to create a new visualization product, with minimal capital costs or bureaucratic approvals.

Provide any additional description, if necessary:

One of the promises of early outreach and better communication is the ability to reduce risks. While no two projects are alike and savings are difficult to quantify, we are anticipating that the use of these Tours will help us to avoid the schedule delays that can stem from incomplete environmental reviews and legal challenges. By making the project design simpler to understand, we are making it easier for stakeholders to identify concerns. Publishing this information before we move into detailed project design also helps us address and resolve issues before we commit more resources. We are looking forward to using 360 Tours to help us shift our collaboration work to the phases where it is most efficient in both time and resources.

14 How broadly might this innovation be deployed for other applications. in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

360 Tours offer benefits for all types of site-specific development projects. Similar visualizations are already being employed by the real estate industry, but we have found a way to repurpose the tools to support virtual public involvement in state transportation projects. We have adapted our models to showcase not only a design proposal, but also to illustrate the constraints - from sea level rise, to bluff erosion, to existing and anticipated wetland ecosystems - that inform and shape our design. The educational layers we have integrated offer potential for broader use in supporting the analysis of environmental impacts under NEPA and state guidelines, and provide opportunity to use simulations as educational resources, as well.

Market Readiness (20 points)

The All selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
<input type="checkbox"/>	Gaining executive leadership support	Click or tap here to enter text.
<input checked="" type="checkbox"/>	Communicating benefits	It is essential that the project management team understand the benefits of developing and sharing project simulations at the early planning and environmental study phases. Allocating resources to Landscape Architecture staff at the proper time allows us to share information when it is most useful and most effective.
<input type="checkbox"/>	Overcoming funding constraints	Click or tap here to enter text.
<input type="checkbox"/>	Acquiring in-house capabilities	Click or tap here to enter text.
<input type="checkbox"/>	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
<input type="checkbox"/>	Resolving conflicts with existing national/state regulations and standards	Click or tap here to enter text.
<input type="checkbox"/>	Other challenges	Click or tap here to enter text.

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

Cost: The primary capital outlay involved in developing these Tours is for the software tools involved. There are numerous software packages on the market, and most DOTs already license some version of these products. The specific software we employed was: Sketchup (for modeling) \$300/year, Lumion (for rendering) \$3,500, and Kuula (360 photosphere hosting) \$200/year. Thus, our combined software capital costs for all three of the featured 360 Tours was a total of \$4,000.

Level of Effort: The level of effort involved in creating these tours is typical of the scope of simulations required for complex or high-profile projects.

Time: The staff hours involved in creating 360 Tours has averaged approximately 300 hours per tour. Of course, this varies with the complexity of the design and the scope of the tour.

17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

Most DOTs already employ Landscape Architects with the skills, aptitude, and training to develop 360 Tours, although these tours can also be developed by consultants. There are various software developers that offer programs with modeling, rendering, and photosphere hosting capabilities, and many DOTs already license these software packages.