Balancing Transportation and Community Needs With Sustainable Infrastructure

By
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Nearly one third of the Washington DC real estate is owned and managed by the National Park Service (NPS). Traversing through the middle of the city, from Maryland to the Potomac River, is Rock Creek Park – one of the oldest parks in the NPS system. Oregon Avenue, NW, between Military Road and Western Avenue, is a 1.75-mile section of urban collector roadway adjacent to Rock Creek Park. The corridor's rustic parkland setting in the midst of an urban area makes it unique and a valuable asset for the community, while also providing an important route and a pleasant experience for commuters. However, the Oregon Avenue Environmental Assessment, completed in 2012 by the District Department of Transportation (DDOT), identified multiple existing conditions posing significant transportation deficiencies: deteriorating pavements; substandard roadway geometry; inconsistent roadway width; inadequate stormwater drainage; deficient structures, lighting, and transit facilities; poor sight distance; and a lack of pedestrian facilities.

Volkert, Inc. (Volkert) developed a comprehensive roadway reconstruction design that resolves transportation, community, and natural system issues as part of one holistic project. The design process followed a Context Sensitive Solutions approach that uses sensitive materials and practices, and either preserves or enhances the landscape by incorporating aesthetic treatments that are in context with the surroundings. For example, the design incorporated the following improvements in a context sensitive manner: a new bridge over Pinehurst Run, retaining walls, a new sidewalk along the west side of the roadway, as well as stormwater management facilities, tree preservation, and reforestation plantings.

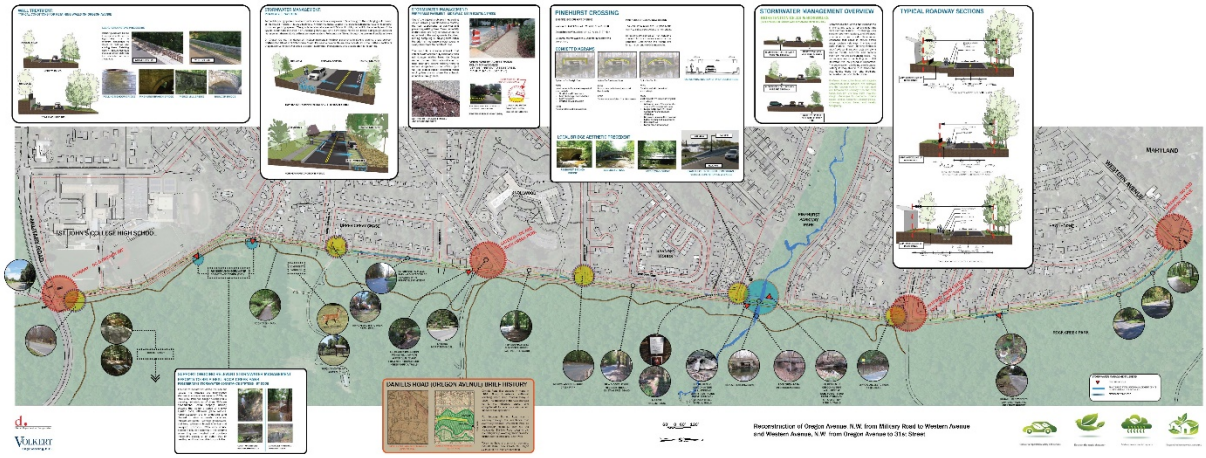


Exhibit 1: Site Plan presented to the US Commission of Fine Arts.

ENVISION

This paper will look at how the design for Oregon Avenue NW followed a comprehensive design process using principles in sustainable design which ultimately helped win an ENVISION Silver Award. The Reconstruction of Oregon Avenue, NW received an ENVISION Silver Award, conferred by the Institute for Sustainable Infrastructure (ISI). The ENVISION framework rates sustainable infrastructure projects across a wide range of environmental, social, and economic impacts. Similar to the LEED program which is focused on designing green vertical habitable buildings, ENVISION is focused on providing sustainable solutions to stakeholders affected by civil infrastructure projects.

ENVISION is an objective framework of criteria and performance achievements that helps identify ways in which sustainable approaches can be used to plan, design, construct, and operate infrastructure projects. The team followed a similar process to engage with the community that

was initially resistant to changes on Oregon Avenue, NW. Volkert documented the design process and followed the principles of ENVISION to develop the design. As part of the finalization of the design process, DDOT and Volkert compiled the documentation and submitted to ISI for the independent, third-party review relative to the ENVISION sustainable infrastructure rating system.

ENVISION assesses sustainability in five categories: Quality of Life, Leadership, Natural World, Resource Allocation, and Climate and Resilience. The Oregon Avenue, NW project followed the ENVISION V2 rating system, which as of 2019, was replaced with the V3 rating system. The V2 rating system had a total of 809 possible points. Identifying non-applicable credits reduced the total applicable points to 689 for the project. Award levels are based on the percentage of applicable points achieved within the overall ENVISION framework. Under V2, a project achieving 20% points earned a bronze award, 30% silver, 40% gold, and 50% platinum. Very few projects score well in every category.

Table1 shows the distribution of points achieved for the Oregon Avenue submission. Critical parts of the project contributing to achieving the ENVISION award included: stakeholder engagement, creating livable spaces for residence, converting the roadway to a multimodal corridor, preserving and restoring impacted aspects of Rock Creek Park, and integrating infrastructure projects.

	Submitted			Achieved		
	Applicable	Submitted	Percentage	Applicable	Verified	Percentage
Quality of Life	181	151	83%	181	109	60%
Leadership	121	64	53%	121	29	24%
Resource Allocation	129	12	9%	129	12	9%
Natural World	136	94	69%	136	59	43%
Climate Change	122	15	12%	122	0	0%
Total Points	**689**	**336**	**49%**	**689**	**209**	**30%**

Table 1

Some sustainable features contributing to this project earning ENVISION Silver include:

- **Improving Safety and Access to Alternative Modes of Transportation**: Along the entire 1.75-mile corridor, only 100 feet of sidewalk existed, forcing pedestrians and joggers who frequent the route to use the road. This is especially dangerous as the existing width of the roadway varied from between 22 feet to 60 feet. This condition encouraged speeding and parking along the wider areas and presented dangerous conditions for pedestrians in narrow stretches. The design rectifies this deficiency by including an uninterrupted sidewalk along the west side of the corridor and a consistent 22-foot-wide roadway with curbing on both sides and bulb-outs to define parking areas more clearly.The sidewalk improves pedestrian access and safety and enables students attending St. John's College High School to walk to school and the elderly residing in the Knollwood Military Retirement Community to enjoy peaceful strolls. In addition, bus stops along the route are clearly marked and upgraded to comply with Americans with Disabilities Act (ADA) Standards for Accessible Design.
- **Preserving Views and Local Character:** The rustic setting within an urban area is one of the features that makes Oregon Avenue, NW unique within Washington, D.C. Furthermore, Rock Creek Park epitomizes the character of the area. One of the core goals of the project was to reconstruct Oregon Avenue, NW so that it blends with the landscape and is seen as an

attractive extension of the park. Preserving existing mature tree stands and using architectural treatments similar to structures within Rock Creek Park were top priorities to maintain the rustic character of the area.

- **Providing Ample Opportunities for Stakeholder Involvement:** The Reconstruction of Oregon Avenue, NW project included an extensive stakeholder engagement process that surpassed public expectations. The Environmental Assessment phase of the project included two public hearings, interagency coordination, and public outreach. This was followed by the Design Phase, which included a series of on-site walk-throughs and house visits, five public meetings, an interactive project website, on-site demonstrations of key design elements, and continued and ongoing coordination with impacted agencies and institutions.

ENVISION places a significant emphasis on collaboration. Stakeholder engagement, both internal and external, is therefore highly regarded and can achieve many credits. For this project, public officials, special interest groups, and the public-at-large were considered external stakeholders, while internal stakeholders were staff at DDOT and other government agencies or departments, and utility companies.

By following a Context Sensitive Solutions approach, the team was able to incorporate feedback received from external stakeholders into the design, while addressing regulatory issues from internal stakeholders who have design approval authorization or are responsible for issuing construction permits. These two perspectives are often in conflict and create friction during the design process. The design team needed to resolve this challenge by educating external stakeholders regarding design challenges and budget limitations in non-technical terms, while also resolving technical complexities and providing creative solutions to internal stakeholders with data, analysis, and design recommendations.

Involving Stakeholders to Define the Overall Project Goals

The design development followed the planning efforts conducted during the Environmental Assessment phase, which defined various goals for the project:

- Create a safe facility for all users of the corridor (cyclists, pedestrian, transit users, and motorists)
- Effectively manage stormwater runoff
- Avoid/minimize disturbance of parkland by staying within the DDOT right-of-way
- Preserve and protect environmental resources – both man-made and natural – and retain the current context of the corridor
- Provide improved pedestrian access to Rock Creek Park
- Utilize environmentally sensitive materials and practices
- Provide a new bridge over Pinehurst Run allowing for the fifty-year storm to pass safely while limiting disturbance to the surrounding parkland. The previous bridge would frequently overtop causing flooding and damage to infrastructure and the parkland.

Early public outreach raised community concerns regarding changes to the character of the corridor and identified support for the following issues:

- Involving the entire community in the planning and design phase(s)
- Keeping the natural topography and geometry of the street
- Having natural-looking walking trails for pedestrians
- Leaving mature trees in place
- Improving lighting, but maintaining a similar character
- Avoiding hill cutting and minimizing retaining walls
- Providing accessibility and connectivity to the park
- Addressing stormwater concerns comprehensively
- Maintaining the integrity of Rock Creek Park
- Address environmental issues on Pinehurst Run around the existing bridge

Exhibit 2 - Walkthroughs with concerned residents helped foster environmental awareness and advocacy for sustainable stormwater management processes.

The Design Phase addressed all the issues noted above through a collaborative process including the use of an interactive project website, small group face to face meetings, site walks *(see Exhibit 2)*, public meetings, and coordination with other agencies. The design team engaged with multiple key stakeholders who have design approval authority, vested interest for adjacent properties, or related infrastructure projects nearby. These stakeholders included:

- National Park Service (NPS)
- United States Commission of Fine Arts (CFA) – *(See Exhibit 1)*
- District of Columbia State Historic Preservation Office (SHPO)
- Rock Creek Conservancy
- District Department of Environment and Energy (DOEE)
- St. John's College High School – Collaborated in placing the new sidewalk on a permanent easement, rather than within the existing right-of-way and disturbing the appearance of Rock Creek Park
- DC Water – Coordination with Oregon Avenue Water and Sanitary Sewer Replacement Project.
- Utility Companies
- International Dark Sky Association (IDA) – Coordination to support the Initiative to improve neighborhood lighting along sidewalks, roadways, and alleys throughout the District of Columbia

The Environmental Assessment process required evaluating multiple alternatives, from a "No Recommendations" option to an extreme scenario of transforming the corridor to more roadway surface coupled with extensive disturbance. Resistance from the community was inevitable. The corridor's character is dominated by Rock Creek Park. Fear of a high-speed roadway to accommodate high traffic volumes were justified due to historical examples of traditional transportation projects throughout North America.

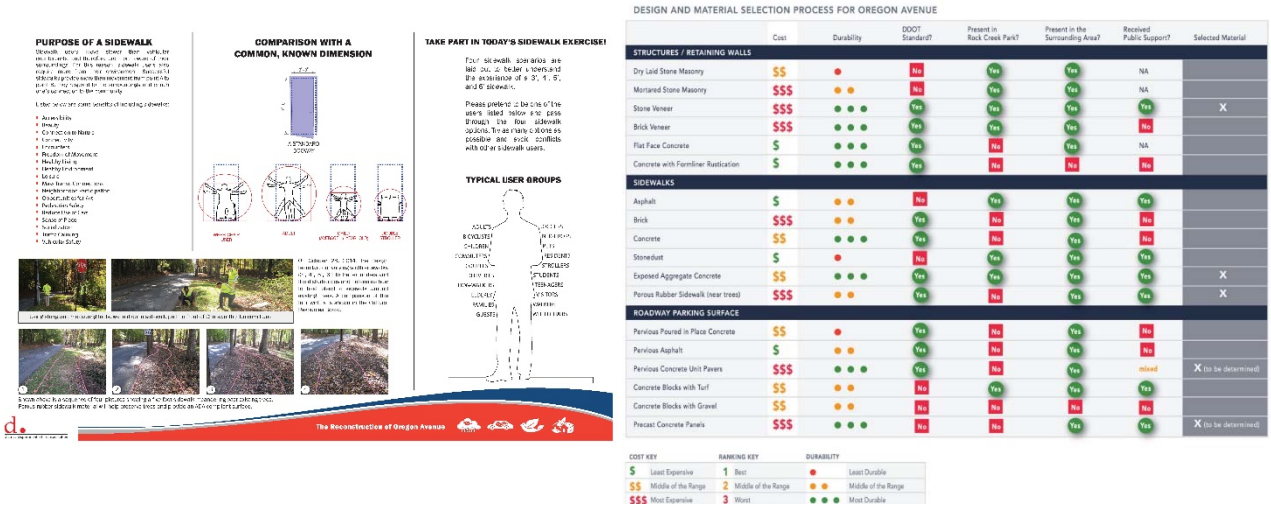


Exhibit 3 - Transparency in design direction and educating stakeholders on the need for improvements was critical in achieving support for the project.

ENVISION places an emphasis on stakeholder engagement and collaboration. DDOT's and Volkert's emphasis on developing a design following a Context Sensitive Solutions approach was critical during the public engagement process. The design team developed a project specific website providing standard information for the community to be aware of past meetings, future expectations, and the project's goals *(See Exhibit 3)*. The website also provided people the opportunity to participate in polls to rank their highest concerns about the potential changes to the corridor.

Design enhancements such as street lighting options and reforestation tree plantings – were clearly explained and depicted on the website and further polls were offered to solicit public input and maintain open lines of communication *(See Exhibit 5)*. The continuous public feedback received through the website helped in developing presentation materials for the public meetings and, as a result, the meetings became more productive as the presentations focused on relevant issues revealed through the website's feedback.

Another important part of the public outreach effort was educating stakeholders about levels of involvement and realistic expectations during various phases of the project. An entire section of the website explained engineering standards, requirements, and responsibilities in laymen's terms to help educate the public about the technical challenges and required infrastructure improvements. Complete transparency in decision-making and process was welcomed by the public who previously felt unheard. The design process was a consistent balancing act between meeting the needs of commuters traveling the corridor and the local community; as well as incorporating the principles of sustainable design – environmental, economic, and social sustainability.

The sustainability benefits offered by the Park are immeasurable, thus improvements to Oregon Avenue, NW had to be compatible with the preservation of the Rock Creek Park character.

Exhibit 5 - Public meetings provided innovative physical to-scale mockup for people to understand the required dimensions for sidewalks and the diverse abilities of user groups. On-site light pole demonstration installations of the proposed light fixtures helped final selection of LED luminaire. Residents were able to express their opinion in a poll provided through the project website and show support for one of the two installations installed by DDOT.

Social Sustainability

Rock Creek Park is a large urban park that bisects the Northwest quadrant of Washington DC. The park was created by an Act of Congress in 1890 and is administered by the National Park Service. The 1,754-acre parkland connects multiple cultural institutions in the Northwest quadrant of Washington DC with a network of roadways and trails. This network provides access and connectivity for leisure and for commuting; as well as wildlife biodiversity.

Part of the park is located along the entire east side of Oregon Avenue NW, which first appears on maps as old as 1888 as Daniels Road. The road constantly changed appearance to accommodate changing modes of transportation. From a dirt path for logging and farming, to a cobblestone road and eventually today's roadway, Oregon Avenue NW has helped shape Rock Creek Park and, to an extent, Washington DC itself. For decades, Daniels Road was a road through the woodlands. As urbanization absorbed parts of Rock Creek Park to development, Daniels Road became the unofficial boundary line for the park. A clear physical boundary was needed to stop the uncontrolled development in the late 19th century. Raising social awareness of Oregon Avenue's historical significance became useful in gaining acceptance for the design and reconnecting the roadway as an extension of the woodlands.

The new sidewalk provides a safe, attractive, and convenient alternative to vehicular transportation and will finally allow residents to safely walk to surrounding destinations, visit neighbors, or simply go out for a stroll. Convincing a population that grew up in a car-dominated society to accept a pedestrian facility in lieu of a roadway is a challenge. The team used an intense stakeholder engagement process to show that a pedestrian facility could complement the surrounding context. The design team also had to educate people about the requirement to meet current civil rights, and how the project would also be beneficial to society in general.

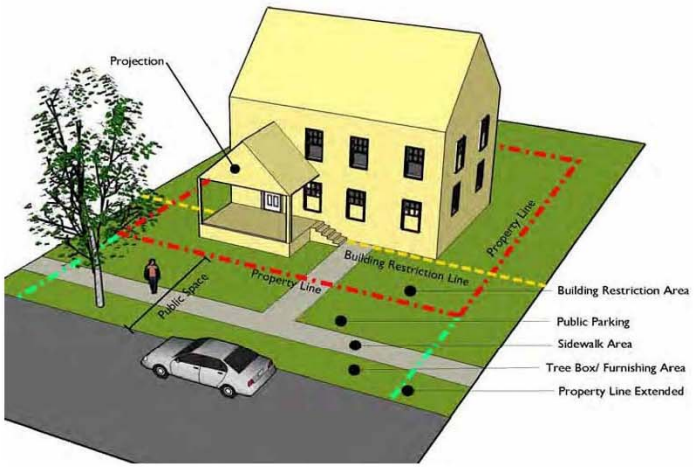
Environmental Sustainability

The entire corridor design followed a Context Sensitive Solutions approach which placed an emphasis on minimizing impacts to the park and helping enhance aspects of the corridor which could lead to improvements for the natural environment. This led to the following betterments for the project:

- The new bridge over Pinehurst Run not only allows for the fifty-year storm to pass safely, but also restores the stream and enables upstream fish passage, an enhanced trailhead, a sidewalk and a viewing area for pedestrians.
- Roadway runoff is captured in a series of green infrastructure facilities throughout the corridor. Bioretention planters, permeable pavements, and bioswales retain runoff on-site and help improve the water quality of nearby streams and reduces erosion around outfalls.
- Large tree stand clusters along the 1.75-mile corridor are preserved to maintain the natural character and support wildlife habitats. Over 90% of the trees in the right-of-way were saved.
- Rock Creek Park is more accessible to the community. The new sidewalk and crosswalks on Oregon Avenue NW, and the improved entrances to the park create an inviting experience that is safe and comfortable.
- A tree reforestation initiative, specific to this project, was introduced to gain support from the community and enhance the tree canopy over the roadway *(See Exhibit 6).*

In selecting trees, five simple rules apply:

1. Trees will be installed on the private property side within the public parking area, within 10 feet of the sidewalk.
2. As with all vegetation within the public parking area, maintenance responsibility is that of the abutting property owner.



3. Trees must be from the plant list provided in the enclosed Selection Card.
4. Residents must commit to watering their trees on a regular basis.
5. Trees will be located in areas not in conflict with utilities or stormwater management devices.

Exhibit 6 - A reforestation initiative, specific to the project and with native species to the Rock Creek area, will plant trees behind the sidewalk that is still within the public right of way. In Washington DC, the Right-of-Way boundary is often set back far away from the sidewalk (shown as a red line) and part of the private front yard is located within public space. By offering to plant large canopy tree in front of resident's houses, the project enhances the character of the entire corridor, gained community support, and supported Rock Creek Conservancy's conservation efforts.

Economic Sustainability

The park presents valuable qualitative experiences for visitors and residents and has a significant impact in attracting a well-educated workforce to the area. Properties adjacent to the park or within its vicinity consistently increase or maintain their value partly because of the tranquility and connection to nature the park offers. Businesses and educational institutions promote their proximity to the park as an added value to gain client's interests or to retain their workforce. Commuters often choose to use the park's roadway system because of its scenic values. Respecting the character and the history of the park was important in developing the roadway's design and maintaining the park's integrity.

The design incorporated elements that were innovative at the time and helped reduce operation costs. The entire corridor was illuminated by High Pressure Sodium lights. The design replaces these High Pressure Sodium lights with LED lighting achieving close to 60% energy conservation. In addition, due to community concerns about standard white LED roadway lighting DDOT installed demonstration projects along the corridor to test several alternative fixtures. Through this process, typical DOT standard 4000k (white color) light was replace with a LED fixture closer to 3000k (amber color) light. Selection of the light was an extensive process with residents, elected officials, and the International Dark Sky Association, which promotes the protection of night skies for present and future generations. The design team developed roadway lighting with full cut-off fixtures reducing glare, skyglow, and light trespass. As a result of Oregon Avenue NW, DDOT is now considering LED lights at 3000k as standard lights in residential streets.

The roadway and adjacent properties around the existing Pinehurst Run bridge faced consistent damage during large rainstorm events. The bridge built in the 1920's would overtop frequently requiring closure during and after these storms. The storms would also cause continuous repair to the structure and the roadway itself. A new bridge with longer span was carefully analyzed to allow the 50-year storm to pass and prevent floods causing infrastructure damage. Multiple versions with options in architecture, costs, and water flow; as well as limiting damage to the park were considered.

Conclusion

The USGBC's LEED rating system has become the standard for the building industry's sustainability design metric and has proven to be worth the investment for new building construction. ENVISION has the potential to guide decisions about sustainable infrastructure projects proactively, instead of re-actively. It provides a framework to improve the way we develop infrastructure and its impact on our daily lives.

Transforming transportation systems to multi-mobility and extending improvements to the broader public realm, not just the roadway, has been a trend for decades in urban areas. The project's high scores for Quality of Life were therefore not surprising, and high scores in this category should be sought for urban transportation projects.

Oregon Avenue, NW's unique setting next to Rock Creek Park allowed the team to seek many credits under the category of Natural World. Significant improvements to the bridge over Pinehurst Run helped achieve credits such as Preserve Species Biodiversity, Avoid Unsuitable Development on Steep Slope, and Preserve Floodplain Function.

DDOT's commitment and Volkert's ability to apply a Context Sensitive Solutions approach in the development of the project, as well as the integration of multiple infrastructure improvements such as the undergrounding of secondary powerlines, the reconstruction of water and sewer lines,

and the construction of a drainage system which incorporated on-site stormwater retention systems helped achieve many points under the Leadership category.

Table 2 below show room for improvements under Resource Allocation and Climate Change. Points under these categories could be achieved with more comprehensive planning and construction methods that consider using recycled materials and other more sustainable resources. This is not to say that more points could not have been achieved under Quality of Life, Leadership, and Natural World. Additional points and new credits could be achieved by supporting local economic improvements, collaboration, and management of the environment.

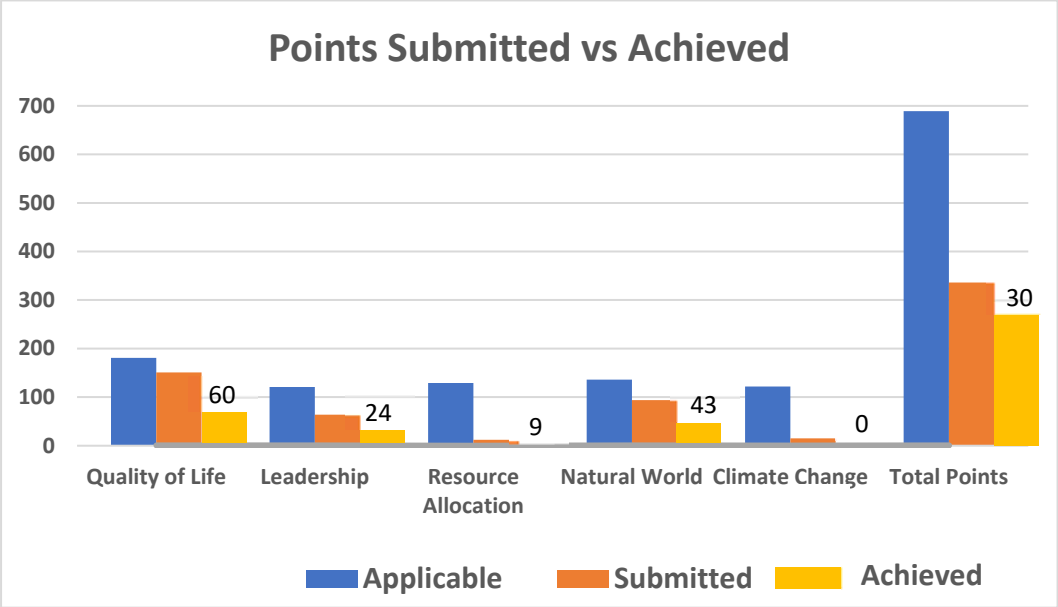


Table 2

ENVISION can be used by infrastructure owners, designers, community groups, environmental organizations, contractors, regulators, and policy maker to:

- Quantify the qualitative benefits, including preserving local character
- Apply a consistent, transparent approach to sustainability
- Help communities address long-range needs
- Evaluate environmental and economic benefits
- Extend the useful life of a project
- Improve the efficiency of a project
- Demonstrate good governance of resources

ENVISION is laying the groundwork for making sustainable design the new standard for all infrastructure projects.

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