Town of Duck Living Shoreline and NC 12 Resiliency Project

Status: Submitted to recipient

Scope of work

The project Scope of Work (SOW) identifies the eligible activity, describes what will be accomplished and explains how the mitigation activity will be implemented. The mitigation activity must be described in sufficient detail to verify the cost estimate. All activities for which funding is requested must be identified in the SOW prior to the close of the application period. FEMA has different requirements for project, planning and management cost SOWs.

Subapplication title (include type of activity and location)	**Town of Duck Living Shoreline and NC 12 Resiliency Project**

Activities

Primary activity type	**Elevation**
Secondary activity type (Optional)	**Utility and infrastructure protection**
Secondary sub-activity type	**Roadway**
Tertiary activity type (Optional)	**Stabilization and restoration**
Tertiary sub-activity type	**Shoreline and/or bank stabilization**
Geographic areas description	**Incorporated in 2002, The Town of Duck is situated along the northern Outer Banks on a narrow strip of land between Currituck Sound and the Atlantic Ocean. Duck is located at the northern end of Dare County, immediately adjacent to Currituck County. The Town is home to a small year-round population of 531 people, but seasonal residents and tourists increase that figure to as many as 25,000 during the peak tourist season of April through October (U.S. Census Bureau 2018 and Duck Fire 2017). There are 2,906 total housing units in the town including 273 occupied units and 2,633 second-homes or vacation rental units. The town is also home to a growing retirement population, attracted to the area by the mild climate and beautiful natural surroundings. The median age of the town population is 62.5 years, while the median age of North Carolina and the United States overall is 38.4 years and 37.8 years, respectively (U.S. Census Bureau 2010 and 2018). N.C. Highway 12 (NC 12) is the only north-south**

roadway through the Town, and provides daily traffic needs, pedestrian and bicycle access, emergency vehicle access, and storm evacuation. Portions of NC 12 are subject to flooding (including areas impacted by stormwater runoff from heavy rains and areas inundated by storm surge from the Currituck Sound). Such flooding prohibits north-south travel through and within the Town, blocking daily travel, emergency vehicles, the evacuation route, and pedestrian and bicycle travel. This issue is particularly acute in areas where NC 12 runs adjacent to the Sound at low elevations. One section of NC 12 at the north end of Duck Village routinely experiences surge flooding from Currituck Sound, and also is threatened by shoreline erosion. For these reasons, Living Shoreline enhancements (DCK13), roadway flooding improvements (DCK15, DCK17), and erosion control measures (DCK24) are identified in the Town's Mitigation Action Plan, Section 7, of the Outer Banks Hazard Mitigation Plan. Over the past 20 years, this area in the northern portion of Duck Village has seen substantial erosion of established marsh vegetation along Currituck Sound that provided important habitat for wildlife and protection from erosion of adjoining properties and NC 12. In portions of the project area, the width of the marsh has been reduced to virtually nothing as the Sound directly abuts a rip-rap border installed by the N.C. Department of Transportation to help protect the adjoining highway. Duck Village, the historic center of the Town, consists of a Town Park, Town Hall, church, and over 150 retail shops and restaurants. The remainder of the Town's land uses are dominated by single-family homes, with some multi-family residences and a primary resort destination (the Sanderling Resort). The Town operates its own police, fire, and ocean rescue services from a public safety building north of Duck Village. These departments provide aid for fire suppression, EMT first response, motor vehicle collisions, weather-related emergencies, ocean rescue, and public service calls. The departments respond to an average of 600 calls for service per year (Duck Fire Department 2019). The Town's Public Safety Building, which includes the Duck Fire Department and the Duck Police Department, is located north of the roadway flooding area, as are the following Currituck County facilities: • Corolla Fire & Rescue • Corolla Fire Station 61 • Currituck County Sheriff's Office •

Carova Beach Volunteer Fire Department When the road is flooded (or in the case of erosion and washout), all of these Emergency Management Services are cut off from access to hospitals (there are no hospitals north of the roadway flooding location) and other emergency services. Within Duck Village, NC 12 also provides primary pedestrian and bicycle access to businesses and other destinations. Until recently, pedestrians and cyclists used shared roadway shoulder space, which created crowding and safety issues. To address these concerns, the Town has undertaken a phased infrastructure project adding separated sidewalks to both sides of NC 12 throughout the Village, in conjunction with converting the shoulders to formal bike lanes. The project has involved the removal of several feet width of the asphalt shoulder and the installation of a continuous stormwater infiltration trench between the asphalt and the new concrete sidewalks. In this way, the project has incorporated stormwater management without the need for collection and discharge of runoff. Three phases of sidewalk construction have been completed, and a fourth phase has been designed. The Phase IV project area is the subject of the Town's interest in the BRIC program funding, and is described in more detail below. The need to elevate the roadway in this location has formed an integral part of the design and timing discussions for the Phase IV sidewalk project, but funding to raise the road has not been available. Design work completed to-date has anticipated a potential future roadway elevation, but BRIC now provides an opportunity to fully fund a truly resilient and complete project.

Community lifelines

Primary community lifeline	**Safety and security**
Primary sub-community lifeline	**Fire service**
Secondary community lifeline (optional)	**Transportation**
Secondary sub-community lifeline	**Highway/roadway/motor vehicle**
Tertiary community lifeline (optional)	**Health and medical**

Tertiary sub-community lifeline	**Medical care**

Hazard sources

Primary hazard source	**Flooding**
Secondary hazard source (optional)	**Severe storm**
Tertiary hazard source (optional)	**Infrastructure failure**
Is this a phased project?	**No**
Are you doing construction in this project?	**Yes**
Population affected	**100**
Detail/description of stated percentage	**Because NC 12 provides the only means of emergency services access within Town, 100% of the Town's population is affected by the flooding at this location, and will benefit from the proposed action. When this stretch of NC 12 is flooded, residents and visitors in the communities and neighborhoods to the north are cut off from ambulance service, hospitals, and other medical services. Residents and visitors in the neighborhoods to the south are cut off from service by the Duck police, fire, and ocean rescue departments. In addition, as described below, NC 12 provides the only route for vehicular travel and storm evacuation for a significant percentage of the population in Duck and the entire population of the Currituck County Outer Banks north of the Duck Town Limit.**
Provide a clear and detailed description of your proposed activity	**As mentioned above, the project area includes a section of NC 12 that is the current focus of Phase IV of the Town's sidewalk improvements. The project area includes 1,500 linear feet within the NC 12 corridor, from Resort Realty (1248 Duck Road) to Sunset Grille (1264 Duck Road). This section of the roadway is immediately adjacent to the Currituck Sound, and ranges in elevation from approximately 2.5' to approximately 5'. The shoreline adjacent to the road on the west includes sections of coastal wetlands, eroding areas, and riprap stabilizing the shoreline adjoining NC 12. East of the roadway, developed residential lots and neighborhood streets slope upward dramatically and quickly. Project elements, described in more detail below, generally include a Living Shoreline, pedestrian and bicycle infrastructure, roadway**

elevation, and drainage improvements. The proposed improvements will be made primarily within existing NCDOT right-of-way, but require some easements on private property. Throughout the course of planning, design, and construction of the larger sidewalk project, the Town has worked directly with property owners to obtain easement donations where needed. The Town will continue to coordinate directly with owners and other stakeholders who have expressed interest and support for the project. The N.C. Department of Transportation has also expressed support for the proposed improvements within its right-of-way and has agreed to act as a partner for the project. To mitigate the threat and damages associated with roadway flooding in this location, the proposed project includes three interrelated elements and involves multiple partners and funding sources. First, the project includes Living Shoreline improvements in the form of breakwater sills, marsh protection and restoration, and shoreline stabilization. Specifically, the project includes 988 linear feet of breakwater sills, protection of 21,234 square feet of existing marsh, 12,168 square feet of marsh restoration, and 920 linear feet of riprap revetment. The sills and marsh restoration areas are designed to avoid impacts to submerged aquatic vegetation. The Living Shoreline, which is specifically referenced in the Town's Hazard Mitigation Plan, will help mitigate shoreline erosion (which threatens the roadway and private property), protect and restore coastal wetland habitat, and result in a green infrastructure demonstration project within the Town. The proposed revetment is necessary to prevent erosion and protect the roadway and adjacent private property, and will help attenuate wave energy and prevent debris from accumulating in the roadway. Combined with the proposed roadway elevation element of the project it will also help prevent flooding inundation of the roadway (which routinely results in closure of the only north-south access) and reduce the costs associated with future erosion to this segment of NC 12. Engineering design of the Living Shoreline project elements is complete and ready to be permitted. Second, the project includes the Phase IV sidewalk improvements, extending the modified roadway cross section along this short section of the corridor and completing the bicycle and pedestrian improvements envisioned in the Town's adopted Comprehensive Pedestrian Plan.

Specifically, the project includes 1,500 linear feet of sidewalk, bike lane, and infiltration trench along the west side of the NC 12, and replacement of approximately 1,000 linear feet of sidewalk, bike lane, and infiltration trench on the east side of the road. The new resilient infrastructure will connect to existing sidewalk and bike lane facilities in the vicinity of Resort Realty and will link to an existing crosswalk at Sunset Grille. The Sidewalk Project will improve stormwater runoff conditions along the roadway by creating an infiltration trench between the roadway asphalt and the concrete sidewalk. Combined with the roadway elevation element of the project it will also help maintain safe pedestrian and bicycle travel during and after high water events (current flooding issues block pedestrian and bicycle access). Engineering design of these project elements is complete and ready to be permitted. Third, the project involves elevating the roadway through the section for a distance of 1,260 linear feet. Flooding in the project area affects a short but critical stretch of NC 12. The roadway north and south of this section sits at higher elevations, which limits the length of roadway requiring elevation and also provides logical tie-in points. Intersecting neighborhood streets generally slope up quickly to the east, which will minimize the required amount of regrading and tie-in impacts. Similarly, the residential lots to the east display sharply rising elevations, thereby minimizing potential impacts to private property. Existing drainage patterns allow rain runoff to sheet flow across NC 12 into the Currituck Sound. Pending additional engineering design, this pattern may continue (with the added benefit of the infiltration trench installed as part of the sidewalk project element). However, this proposal assumes that some level of runoff collection and infiltration will be necessary. Similar to projects successfully completed at other locations within the NC 12 corridor, the Town anticipates the use of subsurface infiltration chambers. This green infrastructure will provide runoff storage capacity that maximizes contact with the native sandy soils for infiltration, avoiding direct discharge to the Sound (see additional information in the attached stormwater narrative). The roadway elevation project element involves 2,000 cubic yards of fill, 2,030 tons of asphalt, 1,260 cubic yards of aggregate base course, and 1,197 linear feet of subsurface storm chambers. It also includes replacement of 1,000 linear feet of

	existing sidewalk and infiltration trench along the east side of the roadway. The project responds directly to the regional Hazard Mitigation Plan recommendations for addressing roadway flooding, and the Infrastructure Vulnerability Assessment (see further detail below regarding the Hazard Mitigation Plan and Vulnerability Assessment). Engineering design of these project elements has begun with an anticipated 30% engineering design to be completed and submitted at the time of grant application. By raising the roadway in conjunction with Living Shoreline and Sidewalk improvements, the project will mitigate threats and loss from: • Private and public property loss associated with erosion • Damage to critical infrastructure from roadway flooding and erosion: o Transportation o Public water o Electrical transmission o Telecommunications • Roadway infrastructure replacement costs • Blockage of emergency vehicles impacting response times and hospital access • Blockage of storm evacuation route • Disruption of safe pedestrian and bicycle travel • Ongoing riprap maintenance and replacement Finally, a very small portion of the project budget is dedicated for the design and installation of six (6) interpretive signs intended to educate the public about the design, function, and value of the project to the community. To be located in public areas adjoining the proposed improvements, the signs will also recognize the many financial supporters and partners with the resiliency project. The project is identified in and supported by numerous relevant plans and policies, as detailed below. Outer Banks Regional Hazard Mitigation Plan Infrastructure Vulnerability Assessment Duck 2027 Vision Duck Comprehensive & CAMA Land Use Plan
How will the mitigation activity be implemented?	**The Town has worked with its consulting engineers, VHB, on design of the living shoreline and all phases of the NC 12 sidewalk project to-date. The Town has also worked with VHB to design and implement other successful flooding and drainage mitigation projects elsewhere in the community. VHB has completed the attached preliminary design plans and the cost estimates associated with this funding request. Upon award of the requested BRIC funding, the Town will engage VHB to submit relevant permit applications, complete final design plans and construction documents, assist with bidding, and provide construction phase services. This process**

	is consistent with other successfully completed infrastructure projects within Town. Funding from other project partners (as described in the Budget section) has been secured and the Town is ready to proceed with implementation pending the requested BRIC funding. During the final design and permitting processes, the Town of Duck and VHB will coordinate with several of the key project partners such as the N.C. Coastal Federation on the Living Shoreline improvements and the NCDOT on the road elevation and sidewalk/bike lane elements of the project.
Describe how the project is technically feasible and will be effective in reducing the risk by reducing or eliminating damage to property and/or loss of life in the project area. Please include engineering design parameters and references to the following: preliminary schematic or engineering drawings/design; applicable building codes; engineering practices and/or best practices; level of protection (e.g., life safety, 100-yr flood protection with freeboard, 100-yr wind design, etc.):	**The Town's engineering consultant, VHB, has completed preliminary design plans (attached) in support of this application. The plans are consistent with the design parameters of other recently completed sidewalk and drainage projects within the NC 12 corridor. To support the preliminary engineering, VHB conducted field delineations of wetlands and submerged aquatic vegetation. VHB's subconsultants have completed topographic and boundary surveys and a geotechnical assessment of water table depth and soil infiltration rates. As with the other similar, recent sidewalk and drainage projects, the Town has coordinated with affected property owners and gained their support for and participation in the project. The Town has also coordinated with the NCDOT and garnered their participation as a supporting partner. The NCDOT has previously played a similar role in the other projects within the NC 12 corridor. The vast majority of the construction work will occur within the NC 12 right-of-way. In addition to utilizing the successful design parameters of recent projects, the proposed action employs best practices for shoreline protection and living shorelines, including techniques that have been used successfully on recent projects in adjacent communities. By incorporating these measures to protect the shoreline in combination with elevation of the roadway, the project will help prevent erosion and washout of the road and utilities, and will dramatically reduce the occurrence of roadway flooding. Existing elevations of the roadway and private properties north and south of the project area limit the extent to which the road can be elevated. However, the proposal will raise the road above the 100-year flood elevation (the road is classified as AE-4, while the Sound is classified as AE-5). Finally, the project includes subsurface**

	storm chambers, an innovative and low-impact measure to provide both stormwater quantity and water quality benefits. Similar chambers have been used successfully on other projects within the NC 12 corridor.
Who will manage and complete the mitigation activity?	**The Town of Duck will manage and complete the mitigation activity. Coordinating with our project partners (North Carolina Department of Transportation, National Fish and Wildlife Federation, Dare County Tourism Board, utility providers, adjacent property owners, and other stakeholders), the Town will build upon its successful implementation model that has completed similar projects at multiple locations within the NC 12 corridor. The Town will be responsible for obtaining relevant permits, managing the engineering design consultant, bidding the project, managing construction, and monitoring the completed project.**
Will the project address the hazards identified and what risks will remain from all hazards after project implementation (residual risk)?	**As stated above, the project will address the identified hazards of roadway flooding (which prevents travel along NC 12, including emergency vehicles and storm evacuation) and roadway erosion and washout. Residual risk will remain in the form of potential flooding at an elevation above the feasible limit of roadway elevation. However, the project will elevate the road above the 100-year flood and would have prevented roadway flooding during the following recent events (all of which flooded the roadway): Hurricane Irene: 08/27/2011 – 3.90' above gauge height of 0.7' Hurricane Mathew: 10/8/2016 – 2.25' above gauge height of 0.7' Hurricane Dorian: 9/9/2019 – 1.75' above gauge height of 0.7' Fall Storm: 10/14-16/2019 – 2.00' above gauge height of 0.7' Winter Storm: – 2/7/2020 – 2.75' above gauge height of 0.7' The threat to infrastructure also carries potential impact to the tourism revenue on which the region relies. In 2019, direct tourist spending in Dare County totaled $1.27 billion and Currituck County totaled over $250 million. Tourism employs 13,880 people in Dare County as more than one-in-three residents are employed in a travel and tourism related job. As a point of reference, in 2019, the Town of Duck accounted for 14% of the occupancy and meals collections within Dare County. Also, as an example of the impact of temporary disruptions to the tourism economy, in 2017 a construction-related power outage affected southern Dare County and resulted in a class action lawsuit that was settled for $10.35 million. The proposed action**

	will help avoid and minimize potential economic impacts from flooding.
When will the mitigation activity take place?	**Preliminary design plans have been completed in support of this application. Final design and permitting could take place as early as February through October 2021, with construction occurring from November 2021 to May 2022. To avoid the heavy traffic associated with the tourist season in Duck, this type of large-scale construction project will be scheduled to take place during the off-season (November-May). This is consistent with construction of other projects in the NC 12 corridor, including the recent sidewalk projects and other stormwater drainage projects.**
Explain why this project is the best alternative. What alternatives were considered to address the risk and why was the proposed activity considered the best alternative?	**NC 12 is the only north-south route within Duck and the only north-south route serving the northern Outer Banks. As previously stated, NC 12 provides daily access for vehicles, bicyclists, and pedestrians. It also provides the only means of emergency vehicle access and storm evacuation for large populations. The section of NC 12 that is the subject of the proposed project lies immediately adjacent to Currituck Sound on the west, while land to the east consists of fully-built out residential subdivisions with no north-south access. Any new north-south roadway alignment would require either a cost-prohibitive and visually obtrusive bridge in the Sound or condemnation of extensive, developed residential properties. For these reasons, the proposed action is the most cost effective and best alternative. Within the proposed project, several design-specific alternatives were considered, including various roadway elevations, revetment types, and revetment crest elevations. These engineered designs are described in additional detail in the Clean Water Act section of this application. In addition, by integrating the roadway elevation component with living shoreline and pedestrian/bicycle improvements, the selected alternative brings funding and implementation partners to the project. Specifically, the National Fish and Wildlife Foundation and Dare County Tourism Board have committed funds to the project, as described in the Budget section. The Town will also be seeking additional financial partners including the Dare County Soil & Water Conservation District and N.C. Division of Coastal Management. The NCDOT is a cooperating partner offering the use of its right-of-way to support the proposed project. Lastly, the preferred alternative**

protects utility infrastructure, and represents a spot improvement that benefits large numbers of people in surrounding communities while impacting a relatively small area.

Please identify the entity that will perform any long-term maintenance and provide a maintenance, schedule and cost information. The subapplicant or owner of the area to be mitigated is responsible for maintenance (including costs of long-term care) after the project is completed?

The N.C. Department of Transportation currently maintains the roadway and the existing shoreline riprap. Upon completion of the proposed work, NCDOT will continue to maintain the road, and the Town of Duck will maintain the sidewalks and living shoreline elements of the project. This arrangement is consistent with the maintenance structure for the Town's other sidewalk improvements as the Town has secured an Encroachment Agreement from the NCDOT to construct and maintain the sidewalks while the NCDOT continues to maintain the NC 12 roadway.

Additional comments (optional)

Attachments

Filename	Date uploaded	Uploaded by	Label	Description	Action
NC-12 Shoreline and Resiliency Project_2020-12-18_Final.pdf	12/18/2020	cdewitt@vhb.com	Scope of Work Attachments	*No description given.*	
stormwater narrative.docx	12/17/2020	cdewitt@vhb.com	Scope of Work Attachments	*No description given.*	

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