

FY 22 HMA – Grant Application Review Summary

Subapplication Number	EMA-2022-BR-001-0007		
Project Title	Surry County BRIC Flood Hazard Mitigation Project in the Yadkin Valley		
Applicant Name	North Carolina Department of Public Safety		
Subapplicant Name	Surry County		
Project Type	Flood Risk Reduction		
Recommendation	Yes with Conditions		
Federal Cost (FEMA GO)	\$1,892,150	Phased Project	Yes
BCR (subapplication)	3.15	Duplicate Project	No
BCR (reanalysis)	1.19	Benefits (reanalysis)	\$3,073,366

Summary

This is a technical feasibility and cost-effectiveness review in support of the National Technical Review process. Additional Environmental Planning and Historic Preservation (EHP), eligibility and completeness, and funding limitation considerations may affect the selection of this subapplication for further consideration and funding. No contact was made with the applicant or subapplicant; this review is solely based on information provided in the subapplication.

Scope of Work

The scope of work is well-defined and clearly explains the activities necessary to complete the work. The subapplicant has submitted a subapplication for two project components: (1) the replacement of the Memorial Park pump station with a gravity sewer line, and (2) streambank stabilization at Dutchman Creek to protect the effluent pipe of an adjacent wastewater treatment plant (WWTP). The project includes demolition of the existing Memorial Park pump station, installation of approximately 2,600 linear feet of buried gravity stormwater sewer line, easement acquisition, stabilization of approximately 800 linear feet of Dutchman Creek, and the restoration of approximately 1.8 acres of riparian and floodplain habitat. The pump station handles effluent from the community's potable water treatment plant (WTP) and is frequently inundated. The WWTP effluent pipe at Dutchman Creek is threatened by erosion; thus, the proposed project is intended to reduce the risk of water and wastewater infrastructure failure caused by flooding and erosion during severe storms.

Technical Feasibility

Project Schedule

The schedule duration is 36 months. The schedule includes all items in the scope of work and is reasonable. Although the overall project duration indicated in the subapplication and documentation are consistent, some line items are divided differently (e.g., design and permitting) or have varying durations (e.g., construction)

Cost Estimate

The cost estimate includes sufficient line items consistent with the scope of work.

Technical Design Information

The following information and documentation were provided to support the project:

Item	Documentation	Evaluation
Proposed Level of Protection	Subapplication narrative (scope of work)	<p>The level of protection for the gravity pipeline that will replace the pump station is not specified. Since the gravity pipe will be underground, the subapplicant states that loss of water services due to flooding will be entirely mitigated; however, no documentation was provided to support that the proposed pipe will not be impacted by flood levels at the Yadkin River outfall or that the pipe has sufficient capacity to handle inflow from the WTP and stormwater runoff from the upstream neighborhood. It is not clear whether a hydrologic and hydraulic (H&H) analysis to confirm that the proposed mitigation will increase the level of protection is included in the cost estimate and the Phase 1 SOW.</p> <p>The proposed stream stabilization activities at Dutchman Creek will protect the WWTP effluent pipe against the 100-year flood event. Documentation includes a statement from a professional engineer indicating the level of protection for the design.</p>
Flood Risk Data	FEMA FIRM, subapplication narrative	<p>Both components of the proposed project are located in the regulatory floodway within the Special Flood Hazard Area.</p> <p>The provided documentation does show how the elimination of the pump station will reduce risk. The pump station is frequently flooded by riverine flooding and its replacement with an underground sewer pipe will significantly reduce the impacts and maintenance needs after flood events. The stream stabilization project component will be designed to protect the WWTP effluent pipe against flood up to the 100-year event.</p>
Residual Risk	Subapplication narrative	<p>Residual risk for the pump station replacement was estimated based on potential damages to the new pipeline vents during flood events. The subapplicant does not identify residual risk to loss of service of potable water services.</p> <p>Residual risk for the stream restoration activities is estimated as the cost of redoing the mitigation for an event with RI equal to the PUL. Because the level of protection of this mitigation is “100-year,” is not reasonable to assume that the same stream</p>

Item	Documentation	Evaluation
		restoration efforts would be needed after a flooding event smaller than the level of protection.
Design and Performance Standards	Preliminary design drawings, subapplication narrative	The subapplication states that the project will be designed and constructed in accordance with all applicable federal, state, and local standards, including the North Carolina (NC) Sedimentation Pollution Control Act, NC Rule 15A NCAC 02T, and the NC Department of Transportation Utility Accommodation Manual. The subapplication states that the stream restoration project component will be designed in accordance with the <i>Stream Restoration – A Natural Channel Design Handbook</i> from NC State University.
Design Drawings, Maps, Photographs	Preliminary design drawings, project maps/photos	Documentation was provided to support the project. The Phase 1 SOW includes further studies, such as hydrology and hydraulics (H&H) analysis, surveying, geotechnical investigation, and 30/60/90/100 engineering designs. It is not clear if the H&H will assess hydraulic conditions for the pump station replacement component.
Upstream and Downstream Impacts	Scope of work narrative	The subapplication states that the proposed project will be designed to not have adverse upstream or downstream impacts. Supporting documentation, such as an H&H analysis, is not provided but is included in the Phase 1 SOW.
CLOMR/LOMR	Subapplication narrative	The documentation indicates a no-rise certification analysis will be completed for the stream stabilization component. The documentation does not indicate a CLOMR/LOMR is necessary.
Operation and maintenance (O&M) plans	Scope of work narrative	The subapplication lists the O&M activities for each project element; however, the subapplicant does not indicate that an O&M plan will be developed as part of the project.

Based on the documentation provided, the project is technically feasible and effective at reducing risk to individuals and property from natural hazards. The following conditions were identified:

- Projects that affect the hydrologic or hydraulic characteristics of a flooding source may require a Conditional Letter of Map Revision (CLOMR) and/or a Letter of Map Revision (LOMR) if they result in changes to the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). Projects that include development in the regulatory floodway may require a no-rise analysis and certification.

- Clarify if an H&H analysis will be performed in Phase 1 for the pump station replacement project component to define the project level of protection and confirm the proposed mitigation will not have adverse upstream or downstream impacts. Verify that the cost estimate reflects the cost of this analysis.

Provide the following Phase 1 deliverables needed to determine technical feasibility:

- Hydrologic and hydraulic data/modeling that verifies that the proposed project will not have adverse upstream or downstream impacts.
- Geotechnical investigation and utility location.
- Engineering design (typically 30/60/90) and cost estimate.
- Technical body of information needed to support the desired level of effectiveness/protection or amount of risk reduction.

Cost-Effectiveness

The Benefit-Cost Analysis (BCA) was completed for two mitigation actions—one for the pump station replacement and one for the stream restoration at Dutchman Creek. For the pump replacement component, damages were estimated based on historical damages. For the stream restoration, damages were estimated based on professional expected damages.

The following was found during review of the submitted BCA:

Cost Estimation: Pump Station Replacement

Input	Value	Evaluation
Project Useful Life (PUL)	50 years	This value is consistent with the FEMA standard value.
BCA Toolkit Initial Project Cost	\$2,060,000	This amount is consistent with the subapplication project cost estimate.
Annual Maintenance Cost	\$0	This amount is reasonable; by eliminating a pump station, the project will result in a decrease in maintenance costs.
BCA Toolkit Total Project Cost	\$2,060,000	This amount is calculated based on the initial project cost, the annual maintenance costs, and the PUL.

Cost Estimation: Stream stabilization/restoration

Input	Value	Evaluation
Project Useful Life (PUL)	30 years	This value is consistent with the FEMA standard value for floodplain and stream restoration; however, the subapplicant estimated that the pipe is expected to collapse in 6 to 10 years based on an erosion rate calculated using historical aerial imagery. This approach is consistent with the imminent failure methodology recommended by FEMA. The imminent failure methodology requires that the PUL in the BCA is equal to the estimated time to failure (in this case, 10 years).
BCA Toolkit Initial Project Cost	\$464,500	This amount is consistent with the subapplication project cost estimate.
Annual Maintenance Cost	\$7,135	This amount is based on average annual maintenance costs over the expected PUL for the project type (30 years). Maintenance activities include removal of debris and invasive species. Maintenance requirements are expected to reduce as time progresses and root systems become established. This value appears reasonable.
BCA Toolkit Total Project Cost	\$553,039	This amount is calculated based on the initial project cost, the annual maintenance costs, and the PUL.

Historical Damages: Pump Station

Input	Evaluation
Facility Type	Facility types of water and wastewater services were used in the BCA. The Memorial Park pump station pumps filter backwash water from the nearby WTP. When the pump station floods, the WTP cannot operate and potable water service is interrupted, meaning estimating damages related to impact to potable water services is reasonable. However, the pump station does not provide wastewater services. Thus, estimating damages related to impact to wastewater services is not reasonable.
Year Built/ Analysis Duration	A statement indicating the pump station equipment was replaced in 2012 was included to support an analysis duration of 11 years. The value used in the BCA is consistent with the supporting documentation.
Loss of Function	The Memorial Park pump station handles the filter backwash water from the WTP that serves the Town of Elkin and is a bulk provider of water for Ronda, according to the subapplication. The BCA input of 5,059 customers is consistent with the Local Water Supply Plan for each community. The BCA also includes a mitigation action for the loss of function for wastewater services owing to the flooding of the pump station; however, the pump station does not provide wastewater services and, therefore, this loss of function is not reasonable.

Input	Evaluation
Before-Mitigation Damages	<p>Before-mitigation damages are based on loss of function of potable water and wastewater services. The Unknown Frequency Calculator was used to determine the recurrence interval (RI) of the 2016, 2017, and 2018 flood events experienced since the replacement of pump station equipment in 2012. A loss of function of 1 day for each flood event was used. Two events occurred in 2018, so 2 impact days were input for that event, which is not the correct way of estimating impact days. Impact days must correspond to the amount of time in days the potable water service was interrupted due to flooding. Newspaper articles and excerpts from the local hazard mitigation plan are provided to support the dates. No official documentation is included to justify impact days for any of the events.</p> <p>Before-mitigation damages associated with the loss of function of wastewater services are not reasonable because the replacement of the pump station does not impact wastewater services.</p>
After-Mitigation Damages	<p>The BCA assumes that there will be no after-mitigation loss of function because the replacement pipe will be underground and protected from hazards. Documentation to support that the gravity sewer will not experience flooding from the Yadkin River or any other hazard risk was not provided; therefore, the assumption of no after-mitigation loss of function is not reasonable. The BCA also includes \$2,500 of after-mitigation damages for repair of the pipe vents with an RI of 4.9 years. The RI is based on the lowest before-mitigation RI calculated by the Unknown Frequency Calculator. The cost estimate for the pipe vent repairs is supported by a stamped letter by a professional engineer and appears reasonable.</p>

Professional Expected Damages: Stream Stabilization

Input	Evaluation
Facility Type	The BCA uses a facility type of wastewater services. This input is consistent with the proposed project component.
Loss of Function	The subapplication states that the pipe along Dutchman Creek carries all the wastewater effluent from the WWTP that serves the communities of Elkin, Jonesville, and Ronda. The BCA input of 6,716 wastewater customers is based on 2,583 residential wastewater hookups and an average of 2.6 people per household. This input is supported by a stamped letter from a professional engineer and appears reasonable. A loss of function of water services (in the event of pipe failure) of 10 days was used; this is supported by a letter stamped by a professional engineer and appears reasonable.
Before-Mitigation Damages	The BCA used a 40-year RI based on the FEMA standard PUL of 30 years plus 10 years until failure of the pipe, due to erosion. This is not consistent with the FEMA-recommended imminent failure methodology in which the PUL and RI of the failure causing event should both be equal to the estimated time to failure. Aerial imagery and a stamped letter from a professional engineer—stating that the pipe is expected to collapse in 6 to 10 years—was provided to support the

Input	Evaluation
	time until imminent failure. Before-mitigation damages for the failure event include a loss of wastewater services of 10 days, \$76,000 for pipe repairs, and \$464,500 for the construction of the proposed project for long-term mitigation. Costs for before-mitigation damages are supported by a stamped letter from a professional engineer. Although including 10 days of impact days and \$76,000 for repair costs appear reasonable, including the cost of the project (\$464,500) as an expected damage is not.
After-Mitigation Damages	The after-mitigation damages assume that the project will have to be rebuilt at the end of its useful life (RI of 30 years) at a cost of \$464,500. No loss of function is included. This is not a reasonable approach.

Additional Benefits: Stream Stabilization

Input	Documentation	Evaluation
Environmental Benefits	Scope of work narrative	The project used 1.83 acres of riparian area. The total project area and percentage of area corresponding to riparian land cover is consistent with the project description and supporting documentation.

Reanalysis BCA

A reanalysis BCA was performed, and the following edits were made:

Input	Value	Explanation
Mitigation Action for Pump Station Replacement		The mitigation action for the pump station replacement was removed from the BCA. Benefits from the stream restoration mitigation action are sufficient to verify cost-effectiveness for the entire project. This change was done to reduce documentation requirements to the subapplicant.
Mitigation Action for Stream Restoration: Initial Project Cost	\$1,892,150	The initial project cost was increased to include the cost of both project components (elimination of pump station and stream restoration of Dutchman Creek).
Stream Stabilization Before-Mitigation Damages	10 days of loss of wastewater service and \$76,000 repair cost with an RI of 10 years	Based on the estimated time to failure indicated in the documentation, a PUL of 10 years was used. Following the imminent failure methodology, an event with an RI of 10 years was used to describe the failure causing event. Impact days for the event were unchanged (10 days). Additional damages to account for repair cost (\$76,000) were included. Damages equivalent to the project cost (\$464,500) were removed.

Input	Value	Explanation
Stream Stabilization After-Mitigation Damages	10 days of loss of wastewater service and \$76,000 repair costs with an RI of 100 years	Since the project level of protection is 100 years, after-mitigation damages for an event with an RI of 100 years were estimated to be similar to the before-mitigation damages for the failure causing event (\$76,000 for repairs and 10 days impact days).

Based on the reanalysis BCA, the total benefits associated with this project, \$3,073,366, are greater than the total project cost of \$2,574,613, producing a BCR of 1.19.

Based on the documentation provided, the project is cost-effective. The following condition was identified:

Provide the following Phase 1 deliverables needed to determine cost-effectiveness:

- Refinement of the benefit-cost analysis.

Conclusion

Based on the information provided, the project is technically feasible and cost-effective; therefore, it is recommended for further consideration with the following conditions:

- Projects that affect the hydrologic or hydraulic characteristics of a flooding source may require a Conditional Letter of Map Revision (CLOMR) and/or a Letter of Map Revision (LOMR) if they result in changes to the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). Projects that include development in the regulatory floodway may require a no-rise analysis and certification.
- Clarify if an H&H analysis will be performed in Phase 1 for the pump station replacement project component to thereby define the project level of protection and confirm the proposed mitigation will not have adverse upstream or downstream impacts. Verify that the cost estimate reflects the cost of this analysis.

Provide the following Phase 1 deliverables needed to determine technical feasibility and cost-effectiveness:

- Hydrologic and hydraulic data/modeling that verifies that the proposed project will not have adverse upstream or downstream impacts.
- Geotechnical investigation and utility location.
- Engineering design (typically 30/60/90) and cost estimate.
- Technical body of information needed to support the desired level of effectiveness/protection or amount of risk reduction.
- Refinement of the benefit-cost analysis.
- Additional documentation required to support compliance with eligibility, technical feasibility, cost-effectiveness, and EHP requirements.

This review is an evaluation of the project’s technical feasibility and cost-effectiveness. Additional EHP, eligibility and completeness, and funding limitation considerations may affect the selection of this subapplication for further consideration and funding.