FY 22 HMA – Grant Application Review Summary

Subapplication Number	EMA-2022-BR-01-0018		
Project Title	City of Greenville-Drainage Improvements and Stream Restoration at East Firetower Road		
Applicant Name	North Carolina Department of Public Safety		
Subapplicant Name	Greenville City Financial Service		
Project Type	Flood Risk Reduction		
Recommendation	Yes with Conditions		
Federal Cost (FEMA GO)	$9,205,611	**Phased Project**	Yes
BCR (subapplication)	1.11	**Duplicate Project**	No
BCR (reanalysis)	1.38	**Benefits (reanalysis)**	$20,291,418

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 drainage improvements and floodplain benching along two streams that cross East Fire Tower Road in the City of Greenville, NC. The project will upsize a culvert that crosses East Fire Tower Road increasing the level of protection from a 2-year event to a 50-year event. The project will also include extensive floodplain benching along three reaches of the Fork Swamp mainstem and an unnamed tributary. These efforts intend to lower surface water elevations and stream velocities by increasing flood storage volume and retention which will reduce damages to residential structures and roadway loss of function.

Technical Feasibility

Project Schedule

The schedule duration is 35 months. The schedule does not include all items in the scope of work but appears reasonable. Culvert replacement is listed in the scope of work, which would require road surface replacement, but is not included in the project schedule. However, these activities could occur simultaneously with the floodplain benching construction, which is 12 months in duration. Subapplication also states additional hydrology and hydraulics (H&H) analyses will be performed in Phase 1 but are not included in the project schedule.

Cost Estimate

The cost estimate does not include sufficient line items consistent with the scope of work. No costs are included for the culvert replacement and road surface replacement. Line-item costs were submitted as lump sums without quantities or unit prices. Unclear if additional H&H analyses are included in the cost estimate. No supporting documentation for the cost estimate (i.e., contractor estimates) was included.

Technical Design Information

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

Item	Documentation	Evaluation
Proposed Level of Protection	Subapplication narrative, preliminary engineering report, BCA methodology technical memorandum	The project proposes to protect a culvert, roadway, and five structures during the 50-year event. The subapplication states the project will remove 26 properties from the 100-year floodplain and reduce flood depths for 90 structures, but the supporting documentation only shows flood reduction benefits for 31 structures.
Flood Risk Data	FEMA FIRM, preliminary engineering report	The proposed project is in the Special Flood Hazard Area. Proposed project will have construction activities in the 100-year floodplain and regulatory floodway. The provided documentation does show how the proposed project will reduce risk.
Residual Risk	Subapplication narrative, preliminary engineering report, BCA methodology technical memorandum	The subapplicant indicates a level of protection up to the 50-year event for the roadway with residual risk from less-frequent events. Residual risk would remain for some residential structures at the 25-, 50-, and 100-year events, but overall damages are reduced.
Design and Performance Standards	Subapplication narrative	The subapplicant indicates all local, state, and federal codes and standards will be adhered to.
Design Drawings, Maps, Photographs	Preliminary engineering report, conceptual drawings, project maps/photos	Documentation was provided to support the project. The documentation includes a preliminary engineering report with conceptual stream cross sections after floodplain benching, photos of existing conditions, maps, discharge volumes, and water surface elevations for various recurrence intervals (RIs).
Upstream and Downstream Impacts	No documentation provided	The documentation does not indicate whether the proposed project will have adverse upstream or downstream impacts.
CLOMR/LOMR	Subapplication narrative	The documentation indicates a CLOMR/LOMR is necessary and is addressed in the subapplication narrative but not in the scope of work, budget, or schedule.

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:

- Amend the proposed schedule to include essential scope of work elements, such as culvert replacement and road surface replacement.

- Verify that the cost estimate reflects the full cost to implement the project.
- Verify that the cost estimate matches the supporting documentation. If they do not match, amend the cost estimate to match the supporting documentation.
- Cost estimate should not be submitted as a lump sum. Amend the cost estimate to contain sufficiently detailed information. Refer to HMA Guidance, Part IV, Section H.1. for guidance on creating a cost estimate.
- 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).

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

- Hydrologic and hydraulic data/modeling
- 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 based on professional expected damages.

The following was found during review of the submitted BCA:

Cost Estimation

Input	Value	Evaluation
Project Useful Life (PUL)	30 years	This value is consistent with the FEMA standard value.
BCA Toolkit Initial Project Cost	$12,274,148	This amount is not consistent with the subapplication's project cost estimate. The initial project cost in the BCA is $1 less than the project cost estimate.
Annual Maintenance Cost	$12,000	This amount is reasonable.
BCA Toolkit Total Project Cost	$12,423,056	This amount is calculated based on the initial project cost, the annual maintenance costs, and the PUL.

Flood Data

Input	Value	Evaluation
Lowest Floor Elevations (LFEs)	58.42–64.12 ft (NAVD)	No documentation was provided to support these inputs. LFEs were obtained from the County Assessor's office but could not be verified through the public-facing Assessor's website. Values appear reasonable based on publicly available topographic data.

Input	Value	Evaluation
		The values used in the BCA are consistent with the supporting documentation.
Flood Hazard Data	Water Surface Elevations (WSE) 25-year: 57–63.36 ft 50-year: 57.68–63.5 ft 100-year: 59.04–64.72 ft (NAVD)	Results from an H&H analysis were provided to support this input. The values provided come from a HEC-RAS model, but model data were not provided; therefore, WSE could not be verified. The values used in the BCA are consistent with the supporting documentation.
Depth-Damage Function	USACE Generic one-story and two-story without a basement	This curve is consistent with the structure type(s) and mitigation action.
Building Size	No documentation provided	No documentation was provided to support this input. The provided BCA methodology report states building sizes were obtained from County Assessor's office, so values are likely reasonable. Building size data were not included in the supporting documentation and could not be verified. The values used in the BCA are consistent with the supporting documentation.
Building Replacement Value (BRV)	No documentation provided	The BRV used in the BCA is not included in documentation. BCA methodology report provided by subapplicant states that the building value was obtained from the County Assessor's office. However, is not clear if this is the assessed market value or BRV, and no values were provided in the supporting documentation.
Displacement Costs	No documentation provided	Documentation provided does not include the lodging and meals per diem used to calculate displacement costs and it is unclear if default values or nonstandard values were used. Number of residents being displaced is not included in the documentation. Duration of displacement is based on flood depth and USACE Generic DDFs, which is reasonable.

Professional Expected Damages

Input	Evaluation
Facility Type	The facility types of a 'Roadway Closure' and 'Critical Facility – Fire Station' were used in the BCA. These inputs are consistent with the proposed project in the subapplication.
Loss of Function	Loss of function of roadway for the 25-, 50-, and 100-year events were estimated at 30, 90, and 180 days, respectively. H&H analysis was used to determine RIs that would result in road overtopping and structural damage. Duration of loss of function determined by city engineers based on estimated level of damage to roadway for each RI and time needed for necessary repairs. Estimated number of one-way traffic trips per day was obtained from the North Carolina Department of Transportation Annual Average Daily Traffic Mapping Application. A screenshot was provided that supports the input. Detour time and distance were not included in the supporting documentation but appear reasonable based on a detour using a road with an equivalent level of service (minor arterial) and a publicly available mapping tool. Loss of function for a fire station was included in the BCA owing to roadway loss of function resulting in increased emergency response times, but no direct damage or loss of function to the fire station is expected to result from flooding. Subapplicant estimated additional detour distance of 0.3 mile from Fire Station #3, which is reasonable but included the entire population served by the fire station of 25,045, which is not reasonable because the fire station is not experiencing total loss of service and roadway loss of service only increases response time for a portion of the fire station service area. Fire Station #3 includes Emergency Medical Services (EMS). The BCA tool generated an economic loss per day of loss of function of $16,092 and the roadway loss of function was the basis for the number of impact days for the fire station loss of function.
Before-Mitigation Damages	The before-mitigation damages include the roadway loss of function and loss of service for the fire station described above. Additional cost for roadway repairs estimated at $550,000 for the 25-year event, $1,100,000 for the 50-year event, and $2,200,000 for the 100-year event. Cost for repair of the 100-year event based on the project's cost estimate and the 25-year and 50-year events were estimated as a proportional share of the cost of total cost, which appears reasonable. Residential building damages, contents damages, and displacement costs for each RI were calculated externally using the inputs described in the previous section and entered into the BCA tool based on the USACE riverine damage curves.
After-Mitigation Damages	The after-mitigation damages were based on expected residual risk for events greater than the 50-year event. Roadway loss of function for the 100-year event assumed to be 90 impacts days and $1,100,000 in damages. Loss of function for the fire station also assumed to be 90 impact days during the 100-year event based on duration of impact from roadway loss of function. Residential damages are reduced in the 25-, 50-, and 100-year events based on WSEs from H&H model and damage calculation methodology described in previous section.

Additional Benefits

Input	Documentation	Evaluation
Social Benefits	Census data	The number of residents and workers per household are consistent with the project description and supporting documentation.
Environmental Benefits	BCA methodology technical memorandum	The project used 487,500 square feet of riparian. The total project area and percentage of land use of the project area 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
Initial Project Cost	$14,474,149	Added $2,200,001 to the initial project cost to account for culvert replacement and road resurfacing based on the estimated cost for road replacement in the 100-year event and to correct the $1 discrepancy from the budget and the initial project cost in the subapplicant's BCA.
Loss of Function – Critical Facility (Fire Station)	Mitigation action removed from reanalysis BCA	The number of residents within the fire station's service area that would be impacted by the roadway loss of function could not be determined during reanalysis.
Residential Damages	Damages removed from reanalysis BCA	Building size, BRV, and displacement costs used in damage calculations could not be verified. Subapplicant provided results of calculations but not the actual calculations; therefore, no revisions could be made to inputs during reanalysis.

The subapplication qualified for the Alternative Cost-Effectiveness Methodology, as noted in the "Alternative Cost-Effectiveness Methodology for Fiscal Year 2022 BRIC and FMA Application Cycle" Memorandum; this methodology was used in the reanalysis BCA. The project primarily benefits an area at the census tract level with a Social Vulnerability Index (SVI) score greater than or equal to 0.6, based on Centers for Disease Control and Prevention (CDC) data.

The BCR generated at the 7% discount rate was 0.89, and the BCR generated at the 3% discount rate was 1.38. The total benefits associated with this project (at a 3% discount rate), $20,291,418, are greater than the total project cost of $14,709,354, producing a BCR of 1.38.

Based on the documentation provided, the project is cost-effective. However, the full project cost needs to be verified for cost-effectiveness to be confirmed. The following condition was identified:

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

- Refinement of the BCA

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:

- Amend the proposed schedule to include essential scope of work elements, such as culvert replacement and road surface replacement.
- Verify that the cost estimate reflects the full cost to implement the project.
- Verify that the cost estimate matches the supporting documentation. If they do not match, amend the cost estimate to match the supporting documentation.
- Cost estimate should not be submitted as a lump sum. Amend the cost estimate to contain sufficiently detailed information. Refer to HMA Guidance, Part IV, Section H.1. for guidance on creating a cost estimate.
- 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).

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

- Hydrologic and hydraulic data/modeling and/or other relevant technical data
- 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 BCA
- Additional documentation needed 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.