


# Factor 3 – Soundness of Approach Exhibit E

**RESILIENT**  
  
**SHELBY**

**Shelby County, Tennessee**  
**Greenprint for Resilience**  
**National Disaster Resilience Competition**  
**Phase Two – October 27, 2015**  
[ExhibitEApproachShelbyCOTN.pdf](#)

## **EXHIBIT E: FACTOR 3 - SOUNDNESS OF APPROACH**

**a. Sound Approach Description.** After full evaluation of methods to address unmet recovery needs from the April 2011 storms and further resilience in the county and surrounding region, Shelby County has developed the Greenprint for Resilience Project. Each of the identified URN is directly related to the identified county-wide resilience imperative - to find ways to live with water and “make room for the river.” The Greenprint for Resilience Project is a comprehensive set of activities designed to protect Shelby County’s communities from natural hazards while increasing environmental, economic and social opportunity for all residents of the region, especially vulnerable communities. The primary intervention will create flood protection including development of new floodplains and create wetlands and detention areas to create more storage for floodwaters. The county will also offer to purchase properties of residents within repetitive flood zones to get them out of harm’s way. These activities will create additional greenway trails and enhanced recreation areas as well as areas for local food production. The county has selected three target areas that were hardest hit by the 2011 disasters along *Big Creek*, *Wolf River*, and *South Cypress Creek*. A fourth activity will create a *Regional Resilience Plan* over a three-year period to provide a means to tie these and other similar efforts to the GREENPRINT, developed with the support of a HUD Sustainable Communities Regional Planning Grant. The Greenprint for Resilience Project will establish replicable interventions that will be transferrable to other areas throughout the region.

The SCRC has partnered with a number of entities needed to increase its technical capacity to implement the activities within the project including a team of engineering and design firms to assist with developing the scope and conducting benefit cost analyses for each of

the proposed activities. The goals of the SCRC were to ensure that the design of the activities was not only cost effective but provide the highest resilience value (i.e. social, economic, environmental, etc.). Further, the aim of the Greenprint for Resilience is to demonstrate the opportunity to translate the GREENPRINT plan to a regional resilience framework in the three areas identified as “most critical” through the spatial data analysis methodology mentioned previously. With this in mind, the SCRC wanted to ensure resilience solutions within the proposed activities would be scalable and replicable throughout the region, following the GREENPRINT network.

Based on the concept of “*making room for the river*,” the Greenprint for Resilience Project will provide flood protection for areas that were flooded in the 2011 disaster, most of which are in LMI communities; address environmental degradation, particularly along stream channels damaged during the 2011 storms; create a long-term strategy for infrastructure resilience and protection from storm and flood damage; and create extensive co-benefits of recreation, transportation choice, community health, and economic and community revitalization (see [ProjectAreaMapFigure1](#)).

Shelby County will use the following metrics to track the effectiveness of the Activities within the Greenprint for Resilience Project.

VALUE	METRIC	METHOD TO EVALUATE OUTCOMES

Resiliency Value	Reduction of expected property damages due to future/repeat disasters	Comparison of property damages to past storms of similar intensity
Environmental Value	Water Quality – Reduced Stormwater runoff	Monitor new storm retention infrastructure during flood events
Social Value	Improved living environment	Perform bike and hiker counts on the new trails
Economic Revitalization	Increase in property value above normal inflation in the Activity Area	Monitor the sale prices of property in the area

***Activity 1: Big Creek Wetland and Recreation Area.*** This area is home to a high percentage of LMI households as well as the Naval Support Activity Mid-South, a key military asset and employer for the area. Preventing flooding in this community is critical. The 2011 storms caused at least \$5 million in damages and displaced community members. Using a flood control practice common to the Corps of Engineers, the primary activity will create a new floodplain by lowering an area along the creek to allow flood waters to flow into the floodplain while lowering water surface elevations. Lower water surface elevations will prevent future flooding in adjacent communities. If the floodplain had been constructed prior to the 2011 storms, the majority of flooding in the Millington area would not have occurred preventing more than \$4.5 million in losses. If this activity had been complete prior to the May 2010 floods, \$79 million of property damages would have been prevented.

This activity will also create sustainable natural wildlife areas, with native vegetation, wetlands, and other natural features. Other amenities will include development of walking trails, small-scale agriculture, ball fields, lakes, and camping areas to provide increased recreational and entrepreneurial opportunities. Sketches of the proposed floodplain development and public-use amenities are shown in Figures [Activity1BigCreekFigure1.3 through Activity1BigCreekFigure1.11](#).

While creating the new floodplain will require removal of trees to improve water conveyance, a tree canopy plan will be implemented to offset tree removal by four-to-one. Shelby County, the City of Millington, and other jurisdictions will work together to set aside approximately 500 acres for tree mitigation guided by a concept plan developed by Mississippi State University. Some of these areas will be utilized to provide an educational experience for school children from LMI areas. Tree mitigation areas will also provide a cooling effect by expanding the tree canopy to counter the increasing heat-island effect.

Construction of this activity will increase resilience by lowering expected water surface elevations during future floods that may occur in Millington. Lowering water surface elevations will reduce or eliminate flooding of homes, businesses and public buildings compared to what would occur presently in a flood event and will greatly decrease the amount of public and private funds necessary to recover from such disasters. In addition, nuisance flooding which may not cause extensive permanent damage, but could cause significant disruption of the use of public and private infrastructure will be reduced or eliminated. Flooding not completely eliminated by this activity will be greatly reduced in extent and duration.

The concept behind the Big Creek activity can be incorporated into an integrated approach to flooding problems in other areas. The model provides more room for a swelling stream during extreme storm events resulting in resilient, environmentally compatible solutions in the same space as recreational amenities for residents to use when the area is not flooded. This concept can be replicated in areas where flooding persists along a waterway and undeveloped land adjacent to the stream can be managed to increase flood flow capacity. Hydraulic studies can be performed to appropriately scale the extent of the work required to overcome the flooding problem resulting in a cost-effective investment of public funds. For example, the solutions proposed for Big Creek can be replicated along Fletcher Creek in suburban Bartlett at a much smaller scale. This intervention would have prevented damage to a nursery and nearby road flooding in the 2011 disaster, but since recovered.

Total cost for ***Activity 1: Big Creek Wetland and Recreation Area*** is \$44,691,518. The activity cost includes direct leverage of \$10,000,000 from local sources. The total NDRC request for Activity 1 is \$34,691,518.

***Activity 2: Wolf River Wetland Restoration and Greenway.*** The Wolf River Greenway will establish open space and infrastructure elements to help make Shelby County more resilient in future disasters and floods. The average household income in the neighborhoods surrounding Rodney Baber Park is approximately 48% below the national average of \$50,157, while the residents surrounding Kennedy Park are roughly 40% to 50% below the national average thus distinguishing it as LMI according to data collected by the 2010 Census Geographies. Vulnerabilities in the community include infrastructure, recreational spaces, residential properties and roads that fall within the FEMA 100 and 500 year floodplains.

A primary concern in Rodney Baber Park is mechanical and electrical infrastructure damaged during the 2011 disasters and at risk in future floods. After the 2011 disasters, several homes incurred losses and remained damaged and unrepaired. Neighborhoods in the area are LMI where the estimated cost to repair and maintain properties over time can exceed the market value of homes. Orchi Road, between Highland Street and Jackson Avenue, demonstrated stormwater overtopping during the 2011 floods inundating six residences on the south side of Orchi. Three of the homes have not been adequately repaired. In addition, abandonment of low-valued, damaged properties has led to blighted conditions in the Orchi Road neighborhood.

A majority of the land in this activity area consists of floodplain wetlands and bottomland hardwood forests critical for reducing the risk and severity of flooding in downstream communities by providing areas to retain floodwater. The four subactivities identified for the Wolf River include wetlands, detention areas and elevating land, are replicable and scalable throughout riparian areas of Shelby County and the region, particularly as greenway connections are built out consistent with GREENPRINT implementation.

***Wolf River Greenway:*** Tying together the below activities of Rodney Baber Park, Kennedy Park, Orchi Road, and surrounding communities is the Wolf River Greenway. The Wolf River Greenway essentially functions as the spine of the regional GREENPRINT network, running approximately 36 miles from the Mississippi River through Memphis, Germantown, and Collierville in Shelby County and into Fayette County. A large portion of the regional population will be connected to natural areas such as Shelby Farms Park, job centers, retail, schools, and communities through the Wolf River Greenway. Once complete, roughly 100,000 people will live within a 10 minute walk of the greenway. Wolf River Conservancy and ALTA Planning and

Design published a document in 2014 that addressed several benefits the proposed trail would. It was determined that the overall Regional Wolf River Greenway would generate approximately 2,000,000 additional cycling and walking trips and over 500,000 more hours of fitness<sup>3</sup>. With increased physical exercise and activity, the Wolf River Conservancy projects approximately \$1,467,000 in annual healthcare cost savings for the entire trail. In addition, approximately 57% more people will meet the CDC recommended hours of physical activity as a result of the Wolf River Greenway.

The Wolf River Conservancy published a report that projected approximately \$2,000,000 in tourism spending per year with \$261,000 tax revenue, \$2,700,000 in property tax revenue, and about \$129,000,000 in estimated total property value growth once the entire Greenway is completed. In addition, \$45,000,000 construction related dollars with just under 500 permanent and temporary jobs will be generated in the building process.

In 2010, over 93% of commuters in the Mid-South used a personal vehicle, while the remaining 7% used public transit, walked or biked. The statistics in the LMI neighborhoods surrounding the activity areas are drastically different from the overall region. The percentage of homes without a personal vehicle vary wildly from 4% to 66% within a one mile radius of each subactivity, but most of the areas are in the 30 to 40% range as shown on [Activity2WolfRiverFigure 2.14](#). Therefore, both Rodney Baber and Kennedy Parks will not only serve as a destination for commuters, but will encourage the public to consider other means of transportation by providing a safe route to school and to jobs for commuters, with direct connections to the Wolf River Greenway and enhanced access to transit shelter facilities. In conjunction with the Wolf River Conservancy's plans to improve N. Highland Street from Orchi



Road to Chelsea Avenue, it will provide a direct path for the neighborhood and adjacent Jackson Avenue neighborhoods to access the Greenway.

***Rodney Baber Park:*** Rodney Baber Park has a community baseball park with eight (8) baseball diamonds. During the 2011 disasters, the area was entirely inundated by floodwaters that destroyed the electrical infrastructure. The primary purpose of activity in this park is to resolve and address the damaged electrical facilities on the park property. The flooding occurred because the facility elevation was lower than the river elevation. As a solution, the approximately 56 acres site will be raised above the floodplain to ensure resilience from future floods. This will include relocation of mechanical and electrical equipment above the flood elevation to prevent future flood damage. A terraced landscape approach will allow water to rise one level at a time, dissipating the initial inundation surge while excavation east of the site will add flood storage capacity and increase stormwater detention. Proposed wetlands will also collect stormwater and provide further storage capacity for flood water to infiltrate the ground or evaporate. Implementing green alternatives such as rain barrels and rainwater storage cisterns at the proposed pavilion for reuse around community gardens could prevent further stormwater runoff and serve to harvest rainwater for irrigation. In the future, bioswales and permeable pavers could be used in to reduce and filter stormwater runoff.

Following the infill, the proposed concept plan for Rodney Baber Park will consist of soccer fields, a baseball diamond, a fishing lake, a public pavilion with festival grounds, trails, a new wetland area, preservation of existing wetlands, and other recreational facilities. The site will be terraced and tie into the existing grades along adjacent TVA transmission line right-of-

way. The concept plan clearly identifies these amenities, and designates which ones are included in this Phase 2 grant application and which ones are identified for future projects.

***John F. Kennedy Park:*** The primary goal of activities at Kennedy Park is to reduce flooding downstream of the park in areas along the Wolf River with URN from the 2011 disasters. In order to accomplish this and promote resilience along the river, the expansion and addition of wetlands will provide areas for detention and serve as a water quality buffer before water subsides. Lowering the elevation of the ground surface in existing soccer fields will create a depressed area to act as detention during flood events. Fill material used to elevate portions of Rodney Baber Park will be acquired from Kennedy Park. The borrow area in Kennedy Park will be converted to soccer fields that can serve as a detention basin during flood events.

In addition to alleviating unmet need on-site, Rodney Baber Park and Kennedy Park improvements will benefit the surrounding community and function as destinations for LMI communities along the Wolf River Greenway, becoming a multi-use activity center for an array of interests and educational purposes. Each aspect was strategically incorporated into the overall design with careful thought attributed to projected co-benefits, such as quality of life and health of the community. For example, the festival grounds will promote social cohesion by providing an alternative venue for events within the city and community while attracting individuals from different demographic areas and socioeconomic backgrounds for a common purpose. The added park amenities will offer a sense of community ownership within the area as well as provide further beautification to a neighborhood fighting to reduce blight.

In addition to furnishing the area with a community park promoting recreation and vibrancy, the park will provide connections to the Wolf River Greenway via a bike lane along

McLean Avenue, a proposed on-street bike lane on James Road, and potential trails throughout the park and within the green space along TVA right-of-way.

***Orchi Road:*** Orchi Road is a pivotal local connector between the low-income Hispanic community south of the road and other key economic epicenters within the region. This corridor is a key demonstration project for the GREENPRINT complete streets network by connecting communities through to jobs and other economic activity in nearby areas. During the 2011 disasters, stormwater overtopped Orchi Road from the north side flooding 20 homes on Orchi and Kendrick Street. Records indicate that only 6 of the homes on Orchi Road recorded a claim, and of those, 3 are still identified as having unmet recovery needs. In addition, 5 homes were flooded on the north side of Orchi Road. The proposed activity entails elevating a section of the road approximately six feet to prevent future overtopping in similar storm events. A land parcel owned by Shelby County north of Orchi Road will be utilized to create a wetland pond to serve as a detention facility to prevent future residential flooding by storing stormwater that was overtopping the roadway. Excavated material will provide fill for elevating the road. Orchi Road will be reconstructed as a Complete Street with bicycle facilities along the north side of the road to provide a direct connection between the surrounding LMI neighborhoods and the Wolf River Greenway via protected bike lanes on Highland St., a key GREENPRINT on-road connector.

Total cost for ***Activity 2: Wolf River Wetland Restoration and Greenway*** is \$56,828,564. The activity cost includes direct leverage of \$35,000,000 from local sources. The total NDRC request for Activity 2 is \$21,828,564.

***Activity 3: South Cypress Creek Watershed and Neighborhood Redevelopment.*** The design philosophy for this project is based around the key concept of “Making Room for the

River” through a series of open space and infrastructure activities that will help make the greater Memphis area more resilient in future disaster and flooding events. The powerful Mississippi River and its tributaries provide recreational, economic, and community building opportunities, but also puts communities at risk during natural disasters. This activity focuses on helping communities address unmet recovery needs from 2011 and weather future storms better than in prior flooding events. Rather than create a wall between people and water, this activity embraces the water, increases awareness of risk, and steps down that risk with a series of wetlands to buffer against flooding and accommodate storm water. Memphis faces public health challenges with rates of diabetes and obesity among the highest in the nation; access to high quality green spaces and a robust trail system can help alleviate some of those problems and generate stronger social cohesion and improved attitudes towards physical activity.

The South Cypress Creek activity seeks to strengthen community and social cohesion by establishing community programs and repurposing vacant lots, accomplishing goals articulated by the community related to community and economic development, retail services and social programs, and access to fresh, healthy foods. The proposed vacant lot program will be a comprehensive, scalable, and replicable program for reusing vacant lots for community benefit to remove blight and help knit together the physical environment of the community in order to increase property value and provide benefits from flood mitigation to food production and retail. Shelby County has partnered with Memphis Center for Food and Faith and University of Tennessee Agricultural Extension to build capacity for urban agriculture and improved food access. The program will also identify suitable lots to create room for housing relocation to areas

that are high and dry. Shelby County will work with residents to make sure any community members displaced by 2011 flooding or voluntary buyouts have housing alternatives.

The vacant lot program in the South Cypress Creek area will reuse vacant lots for community benefit that can be scaled to other areas of the county and region. Currently, the Land Bank holds title to over 6,500 vacant properties, the majority of which are in the City of Memphis where approximately 47 percent of land is vacant, according to a 2012 study by HUD. There is a great need in the South Cypress Creek and across the county for viable solutions to return vacant lots into community and commercial use. The county has already begun examining where these projects can be replicated and scaled in the region. The South Cypress Creek activity, focusing on unmet housing recovery needs in a LMI area of Memphis, can be adapted for the West Memphis neighborhoods facing URN from the same disasters.

In order to reduce isolation within the neighborhood and encourage alternate commuting patterns and access to jobs with trail and bike lane infrastructure, this activity proposes the development of the Mitchell Road key on-road connector of the GREENPRINT, six miles of new bike lanes that will connect neighborhoods to T.O. Fuller State Park and job centers like the Memphis International Airport, FedEx, Pidgeon Industrial Park, Port of Memphis, and President's Island. Neighborhood isolation is reduced by opening up access to Roosevelt Park with new trails better connecting the neighborhood to Mitchell High School, Ford Road Elementary School, and Mitchell Community Center. This activity is also expected to increase visitation to T.O. Fuller State Park by 500 non-resident visitors per year and generate nearly \$350,000 in additional tourist spending over the next 25 years.

Stream restoration will restore ecological connectivity along Cypress Creek. Restoration work will expand stormwater capacity in order to protect the important Mitchell Road connector from closing in a flood event, as it did in 2011, as well as creating a flood resilient neighborhood. Collectively, these treatments will provide substantial storage and detention of peak flows, reducing the flood stage and associated properties at risk of flooding. Additionally, the South Cypress Creek area provides important habitats for many plants and animals. The proposed project adds 121.2 acres of habitat and mitigates emissions through addition of 7,429 trees and green space. It will also protect existing open space areas by creating a *usable* park and trail atmosphere in the place of wooded areas today that are often used as dumping grounds and can serve as havens for criminal activity.

Without the proposed project activity in the South Cypress Creek area, a 100 year flood event would be estimated to cause \$2.2 million dollars of property damage and, if trends continue along the same trajectory since the 2011 flooding, that damage will result in additional vacant properties. Those residents with no other relocation options will be especially vulnerable to worsened living conditions following a flood event. Without this project, in each subsequent flood event, the damages and their associated costs will continue to accrue.

Total cost for ***Activity 3: South Cypress Creek Watershed and Neighborhood Redevelopment*** is \$12,020,653. The activity cost includes direct leverage of \$1,600,000 from local sources. The total NDRC request for Activity 3 is \$10,420,653.

***Activity 4: Regional Resilience Plan.*** Shelby County proposes a planning activity to develop a Regional Resilience Plan to provide a means to tie Greenprint for Resilience project and other similar efforts to the GREENPRINT. The Regional Resilience Plan will identify future

regional activities that increase resilience in the MID-URN target area of Shelby County to shocks caused by severe storms and flooding. The plan will also consider recommendations to make Shelby County more resilient to other types of climate risk, such as heavy wind, severe snow and ice, extreme heat or cold, and drought.

One of first steps in the regional planning effort is the development of a HEC-RAS model of the Loosahatchie, Wolf, and Nonconnah drainage basins, including their major tributaries extending in adjoining counties and states (Tipton County, TN, Fayette County, TN, DeSoto County, MS). This model would provide information on the effect a wetland or retainage basin upstream would have on the potential flooding in the lower portions of the drainage basin. This model will be invaluable in leveraging the development of future green space and wetlands with the long term effect of reducing flooding in the areas with the most vulnerable populations. The model will also include creation of methodology to predict cost of future flood events, including influence of a changing climate. By incorporating prediction of rainfall in a given area, the HEC-RAS model can be used as a tool to provide a map of the potential areas which are most subject to flooding prior to storm events. This will allow the county to recommend future projects that can serve to minimize the effect of severe storms and flood and maximize the ability to recover.

The process also includes community engagement, development of recommendations for resilience projects, design scenario development, implementation and finance strategies, and final plan development. MSCOS will reconvene eight working groups of partners, modeled after the GREENPRINT planning process, for two years to ensure the plan addresses interrelated strategic directions identified in the GREENPRINT plan.

Total cost for **Activity 4: Regional Resilience Plan** is \$2,100,000. The total NDRC request for Activity 4 is \$2,100,000.

Shelby County evaluated numerous conceptual designs during the planning of the project. For **Big Creek**, four alternatives were considered. Alternatives 1-3 analyzed the benefit of different physical interventions including temporary floodwater detention sites, enhanced structural protection and high flow diversion. It was determined the selected alternative to increase the channel flow capacity was best suited for this area. For **Wolf River**, balancing the amount of material added to the floodplain with material removal was a large component of the design. One concept was to raise the majority of Rodney Baber Park out of the floodplain, but the project required too much fill material and property acquisition. Another alternative was phasing recreational amenities of the project. The design team also looked at creating pocket wetlands along the Wolf River, but minimal available government or public lands were identified that were not already covered in vegetation and trees. It was determined the identified storage areas would not impact the water surface elevation in the adjacent areas in a significant way, nor would the removal of existing environmental features justify the impacts. Preliminary conceptual designs also included improvements at Douglass Park, located west of Highland Street adjacent to the Orchi Road subactivity. Improvements to the park and installing connections to the GREENPRINT were planned, but after discussions with the City Parks staff it was eliminated. It has since been determined WRC plans to include improvements to Douglass Park in their Highland Street improvement project. For **South Cypress Creek**, the project team explored several options for increasing resiliency in the community. Alternative configurations for grading and protection measures were evaluated, including locations of protections, overall magnitude of



buyout program, with special consideration undertaken to possible community disruption for displaced property owners explored through neighborhood outreach to property owners.

This proposal thoroughly describes how Greenprint for Resilience activities will benefit vulnerable populations. Shelby County has a commitment to including Section 3 residents in economic opportunities. The Department of Housing will continue to coordinate with the Department of Equal Opportunity Compliance (EOC) and Department of Purchasing to recruit Section 3 business concerns. All bid notices issued by the SCHD will continue to encourage Section 3 participation. All contracts drafted by SCHD will continue to include the Section 3 language to encourage contractors to further comply with Section 3 requirements. The county will seek participation from Section 3 concerns and their subcontractors in awards made through these activities. Additionally, Shelby County will affirmatively market to Section 3 residents any training associated with farming/food production as part of the activities.

Shelby County realized the imperative of working with top talent to ensure project feasibility and effective design, and thus procured three engineering and design firms to assist in activity development. The documentation provided in [\(Attachment E\)](#) demonstrates the extent and detail of engineering and design work that has been completed through Phase 2. Pending award, the process for initiating these activities will begin, with the initial phase requiring extensive permitting given the proximity of waterways. The scope of work and timeline associated with each activity is based upon the professional judgement of highly talented engineering and design professionals, who each possess extensive acumen in design and implementation of similar feasible projects.

Consultation and coordination with regional partners is summarized in Attachment D ([AttachDConsultSumShelbyCOTN.pdf](#)). Shelby County has taken considerable steps to involve as many distinct voices and partners as possible throughout this process. SCRC has emphasized consultation and coordination on multiple levels including project development, target area selection and activity development, outreach and engagement, leverage and partnerships, and enhancing understanding of resilience throughout the community.

The engineering and design firms each conducted extensive GIS analysis, and produced highly illustrative visuals and renderings of the three activity areas. These combined maps and visuals can be found here: ([Attachment E](#)).

**b. Benefit-Cost Analysis.** In order to provide feasible and high-quality engineering and design and to conduct thorough and accurate benefit-cost analyses for the proposed activities, the SCRC procured three consulting teams identified in Factor 1: Sasaki, Kimley-Horn, and Barge, Waggoner, Sumner & Cannon. This was done to ensure that each of the three activities on its own was cost-effective, and further to provide further assurance of cost-effectiveness across the entire project to both the community and the United States, in accordance with HUD guidelines. The three firms utilized both traditional engineering BCA computation methodology, combined with the expanded and enhanced BCA framework identified in the NOFA under Appendix H. This enhanced framework incorporated traditional quantitative measures, and also incorporated qualitative factors typically not included in BCA calculations. The result of this effort is a robust and extensive compilation of data which yields a combined BCR of **3.29** across the project.

The table below presents the totals for each of the activity areas for benefit and life cycle costs, with the individual activity BCR similarly indicated. The complete BCA computation

framework and associated narrative is provided in Attachment F, found here ([Attachment F: Factor 2 – Benefit/Cost Analysis](#)). It is important to note that the ‘Life Cycle Costs’ includes total project costs and soft costs (contingency, admin, etc.), the sum of which includes the portion being requested of HUD through the NDRC as well as direct leverage. For example, the NDRC share requested for the Wolf River Greenway activity is \$21.8 million, while direct leverage of \$35 million is being contributed for additional portions of the activity. The funding breakdown of NDRC requests and leverage commitments for each activity can be found in the Sources and Uses document within the Leverage Documentation in Attachment B ([AttachBLeverageDocShelbyCOTN.pdf](#)).

<b>Project Activity Title</b>	<b>Total Benefit</b>	<b>Life Cycle Costs</b>	<b>BCR</b>
<b>Big Creek</b>	\$194,000,227	\$52,126,205	3.72
<b>Wolf River Greenway</b>	\$202,300,874	\$56,828,564	3.55
<b>South Cypress Creek</b>	\$14,836,855	\$12,020,653	1.23
<b>Regional Resilience Plan</b>	++	\$2,100,000	--
<b>Administrative</b>	++	\$2,071,222	--
<b>Design Life (yr)</b>	25 years	Total Project Costs	Project BCR
<b>Discount Rate (%)</b>	7%	\$125,146,644	3.29

The table below indicates sub-values which combined equal the total benefit listed in the table above. These four core benefit areas include: Resilience Value, Environmental Value,

Community Development, and Economic Revitalization. Each of the engineering and design firms conducted analysis and calculations for each of these four benefit areas, utilizing available data from county staff, homeowner input, and emergency response personnel. This is outlined in detail with additional qualitative analysis in the supporting narrative in [Attachment F: Factor 2 – Benefit/Cost Analysis](#). The ‘Economic Revitalization’ set of benefits includes increased property values (and taxes), talent retention and acquisition, attraction of business, increased spending and tourism, and reductions in vehicle operating costs. The ‘Resilience Value’ for each of the activities accounts for factors that equate to “avoided future damages” such as reductions in property damage, displacement, and loss of service. The ‘Environmental Value’ accounts for ecological and environmental benefits like air quality, reductions in vehicle emissions, green open space, riparian areas, and additional trees to reduce heat islands. ‘Community Development’ accounts for benefits including reduction in human suffering, health benefits, social/community cohesion, reductions in medical costs and productivity losses. These four core benefit areas are outlined in the table below for each of the activity areas, with supporting documentation provided in [Attachment F](#).

<b>Project Activity Title</b>	<b>Resilience Value</b>	<b>Environmental Value</b>	<b>Community Development</b>	<b>Economic Revitalization</b>
<b>Big Creek</b>	\$53,271,883	\$138,920,516	\$1,461,717	\$346,111
<b>Wolf River Greenway</b>	\$600,773	\$115,265,785	\$19,286,369	\$67,147,946
<b>South Cypress Creek</b>	\$445,097	\$11,195,714	\$1,664,828	\$1,531,216

**c. Scaling/scoping.** Shelby County and its partners believe that the geographic locations and scale of the projects as developed in this application are the most prudent and appropriate for increasing resilience in areas affected by the 2011 storms. However, Shelby County analyzed a scaled approach that both looked to how increased funding could enhance the project's purpose as well as how to scale the project down without losing resilience interventions.

In the scaled up model, the county identified opportunities for scaling the South Cypress Creek area through including: \$2 million for a new bridge on Mitchell Road, \$1 million for infill housing in the form of seven multi-family units, and \$3.1 million to create four linear miles of additional GREENPRINT trails to further integrate the community into the master plan. In the Big Creek area, future phases of the activity include: a solar farm(s) to increase power redundancy and reduce emissions from coal sources. Along Wolf River Greenway, the Rodney Baber Park and Kennedy Park activities comprises a large earth moving initiative to create stormwater detention and lower surface water elevation of the Wolf River during peak events. The parks will include amenities to serve the LMI community. Future scaling features will include community gardens, picnic areas, solar lighting, skate parks, and multi-use trails connected with the Wolf River Greenway.

In keeping with NOFA requirements, Shelby County also analyzed a 15 percent reduction in project costs which largely removed the socio-economic programming in the project. While the BCA developed in the scaled down scenario is slightly higher at 3.64 rather than 3.29, the impact on the quality of the overall project is significant. Residents throughout the engagement process made it clear to the county the importance of the social and economic

programming developed for the project. More information about the 15 percent reduction can be found in [Attachment F: Factor 2 – Benefit/Cost Analysis](#).

Project Activity Title	Total Benefit	Life Cycle Costs	BCR
Big Creek	\$194,000,228	\$44,260,658	4.38
Wolf River Greenway	\$202,300,873	\$54,610,709	3.70
South Cypress Creek	\$14,836,855	\$9,800,725	1.51
Regional Resilience Plan	++	\$2,100,000	--
Administrative	++	\$2,071,222	--
Design Life (yr)	25 years	Total Project Costs	Combined BCR
Discount Rate (%)	7%	\$112,843,314	3.64

**d. Program Schedule.** Pending a HUD determination of award, Shelby County is prepared to begin implementation immediately. The process for the Regional Resilience Plan will begin at once. For flood protection and wetlands restoration, environmental review and permitting process may take 6.5 months to complete, given that the activities are located along waterways. Shelby County has included a waiver request for a phased grant agreement in [AttachGWaiversShelbyCOTN.pdf](#). Below is a high level summary of the project schedule. A detailed project schedule which outlines grant obligation dates, design and engineering, permitting, procurement and project completion is available [ExhibitEProjectScheduleShelbyCOTN.pdf](#).

<b>Task by Activity</b>	<b>Start Date</b>	<b>Finish Date</b>
<b>Notice of Award</b>	15-Jan-16	
<b>Approval by County Commission</b>	1-Feb-16	1-Mar-16
<b>Contract Signed by HUD</b>	1-Mar-16	1-Apr-16
<b>Activity Area 1: Big Creek Floodway</b>	May-16	Sep-19
Floodway and Overbank	May-16	Sep-19
Final design overbank and recreational facilities	Oct-16	Sep-19
<b>Activity Area 2: Wolf River Greenway</b>		
Greenway trails	Jan-17	Oct-18
Parks and Complete Street	May-16	Sep-19
<b>Activity Area 3: South Cypress Creek</b>		
Residential Property Acquisitions	May-16	Jun-17
Infrastructure (Bike and trails)	1-May-16	1-Mar-18
Flood Mitigation and Park Improvements	1-Apr-16	1-Aug-19
Program Implementation	1-Oct-16	1-Jul-17
<b>Activity 4: Regional Resilience Plan</b>		
Hydraulic Modeling and Data Collection	1-May-16	1-Apr-17
Program Management and Master Planning	Jan-17	Dec-18

**e. Budget**

<b>Project Number</b>	<b>Activity Number</b>	<b>Project/Activity Title</b>	<b>Responsible Organization</b>	<b>Project Budget</b>	<b>Activity Budget</b>
		Overall CDBG-NDR Budget		\$71,111,957	
1-01		Administration		\$2,071,222	
	1-01-AD	Administration	Shelby County		
1-02		Planning		\$2,100,000	
	1-02-PL	Resilience Plan	Shelby County		
1-03		Public Facilities & Improvements		\$62,539,157	
	1-03-LMA	Development of wetlands	Public Works		\$6,796,241
	1-03-UN	Development of wetlands	Public Works		\$3,501,084
	1-04-LMA	Flood protection infrastructure	Public Works		\$21,405,578
	1-04-UN	Flood protection infrastructure	Public Works		\$11,027,116



	1-05-LMA	Greenspace for stormwater management and recreation	Public Works		\$9,967,243
	1-05-UN	Greenspace for stormwater management and recreation	Public Works		\$5,134,641
	1-06-LMA	Complete streets improvements	Public Works		\$1,956,024
	1-06-UN	Complete streets improvements	Public Works		\$1,007,648
	1-07-LMA	Land acquisition	Public Works		\$1,150,770
	1-07-UN	Land acquisition	Public Works		\$592,821
1-04		Economic Development		\$50,000	
	1-08-LMC	Small Business and Workforce Development	Shelby County		\$50,000

1-05		Housing		\$3,926,578	
	1-09-LMH	Flood buyouts	Shelby County		\$2,014,078
	1-10-LMH	Replacement Housing	Shelby County		\$1,262,250
	1-10-UN	Replacement Housing	Shelby County		\$650,250
1-06		Public Services		\$425,000	
	1-18-LMC	Vacant Lot Program	Shelby County		\$200,000
	1-20-LMC	Community Gardens	Shelby County		\$200,000
	1-21-LMC	Public Safety	Shelby County		\$25,000

The Sources and Uses Statement (inclusive of all funding) can be found in the Leverage Document in Attachment B. ([AttachBLeverageDocShelbyCOTN.pdf](#))

Together with the county, the engineering teams completed an analysis of the project area and the activities determined to provide the greatest resiliency to the three Activity areas and to the county as a whole. Flood protection activities used best industry standards as well as experience of DPW in implementing similar projects. Land acquisition and buyouts were

analyzed based on appraised property values, costs of demolition and replacement housing. The firms and county sought best practices in developing proposed programs such as the community gardens, healthy produce retail and neighborhood watch. DPW, DPD, MCSOS and other county agencies informed the budget process from experience implementing similar activities to the ones proposed. Once an overall budget was developed, it was determined which activities had existing leverage and the needed NDR funding the project would require.

Supporting activities were determined by analyzing efforts that had linkage to the project. Most notably, the implementation of the GREENPRINT has been in process since 2014. As the foundational plan to the Greenprint for Resilience Project, existing and future activities were analyzed for their connectivity to the goals of the proposed project.

**f. Consistency with Other Planning Documents.** For the Phase 2 application, the City of Memphis DHCD and the SCHD have each provided a signed form HUD-2991 “Certification of Consistency with the Consolidated Plan.” In addition, the MSCOS has submitted a letter certifying the consistency of the Phase 2 application with the regional sustainability plan (GREENPRINT). MSCOS served as the lead agency for Shelby County in developing the regional sustainability plan and administrator John Zeanah serves as the County’s point of contact for preferred sustainability status (PSS). These forms can be found in [Attachment D](#). Shelby County’s Hazard Mitigation Plan ([ShelbyCountyMitigationDraft2016.pdf](#)) is being updated to be completed in November 2015. The plan’s draft references the Greenprint for Resilience as an area for plan alignment, along with multiple economic development and transportation plans.

### Greenprint for Resilience Project Schedule

Task by Activity	Start Date	Duration Days	Finish Date
Notice of Award	15-Jan-16		
Approval by County Commission	1-Feb-16	30	1-Mar-16
Contract Signed by HUD	1-Mar-16	30	1-Apr-16
<b>Activity Area 1: Big Creek Floodway</b>	May-16		Sep-19
Grant funds obligated	1-May-16		
Design and engineering	15-Apr-16	120	15-Aug-16
Environmental permitting	1-Jun-16	180	1-Dec-16
Property appraisals and buyouts	15-Jun-16	180	30-Nov-16
Final design clearing & grubbing	1-Sep-16	60	1-Nov-16
Grant funds obligated	1-Jan-17		
Construction bidding and approvals	5-Nov-16	90	1-Feb-17
Construction	1-Mar-17	300	1-Dec-17
Project closeout	1-Dec-17	60	1-Feb-17
Final design overbank and recreational facilities	1-Oct-16	240	1-Jun-17
Grant funds obligated	1-Sep-17		
Construction bidding and approvals	15-Jun-17	90	15-Sep-17
Construction	1-Oct-17	630	1-Jul-19
Project closeout	1-Jul-19	60	1-Sep-19
<b>Activity Area 2: Wolf River Greenway</b>			
Greenway trails	Jan-17		Oct-18
Grant funds obligated	1-Jan-17		
Construction bidding and approvals	1-Jun-16	90	15-Jan-17
Construction	1-Feb-17	600	1-Aug-18
Project closeout	1-Aug-18	60	1-Oct-18
Parks and Complete Street	May-16		Sep-19
Grant funds obligated	1-May-16		
Design contract	15-Apr-16	30	15-May-16
Preliminary engineering	15-May-16	150	15-Oct-16
Public Involvement	15-May-16	180	15-Nov-16
Environmental Permits	15-Jul-16	180	15-Jan-17
Property appraisals and buyouts	15-Jul-16	120	15-Nov-16
Final design earthwork & Orchi Street	1-Nov-16	120	1-Mar-17
City Review and Approval	1-Mar-17	60	1-May-17
Final Construction Drawings	1-May-17	30	1-Jun-17
Grant funds obligated	1-Jan-17		
Construction Bidding	1-Jun-17	30	1-Jul-17
Contract approvals	15-Jul-17	60	15-Sep-17
Construction	1-Oct-17	360	1-Oct-18
Project closeout	1-Oct-18	60	1-Dec-18
Final design Parks and Recreational Facilities	1-Nov-16	180	1-May-17
City Review and Approval	1-May-17	60	1-Jul-17
Final Construction Drawings	1-Jul-17	30	1-Aug-17
Grant funds Obligated	1-Sep-17		
Construction bidding and approvals	1-Aug-17	30	15-Nov-17
Construction	1-Dec-17	570	1-Jul-19
Project closeout	1-Jul-19	60	1-Sep-19

### Greenprint for Resilience Project Schedule

<b>Activity Area 3: South Cypress Creek</b>			
Grant funds obligated	1-May-16		
Design contract	15-Apr-16	30	15-May-16
Public Involvement	1-Jul-16		1-Aug-17
Preliminary engineering	15-May-16		1-Aug-16
Residential Property Acquisitions	May-16		Jun-17
Grant funds obligated	1-May-16		
Appraisals	1-Jun-16	90	1-Sep-16
Acquisitions	15-Jul-16	120	15-Nov-16
Demolition contract Documents	15-Nov-16	60	15-Jan-17
Bidding	15-Jan-17	30	15-Feb-17
Award Demolition Contract	15-Feb-17	60	15-Apr-17
Demolition	1-May-17	45	15-Jun-17
Brush Clearing in Area	1-May-17	30	1-Jun-17
Infrastructure (Bike and trails)	1-May-16		1-Mar-18
Surveying, design, engineering and environmental	15-May-16	330	1-Oct-16
City Review and Approval	1-Oct-16	60	1-Dec-16
Final Construction Drawings	1-Dec-16	30	1-Jan-17
Grant funds obligated	1-Jan-17		
Construction bidding and approvals	1-Jan-17	90	1-Apr-17
Construction	15-Apr-17	300	1-Feb-18
Project closeout	1-Feb-18	60	1-Mar-18
Flood Mitigation and Park Improvements	1-Apr-16		1-Aug-19
Surveying	15-May-16	60	15-Jul-16
Preliminary engineering	15-Jun-16	120	15-Oct-16
Environmental Permitting	15-Sep-16	240	15-May-17
Final design	1-Nov-16	180	1-May-17
City Review and Approval	1-May-17	60	1-Jul-17
Final Construction Drawings	1-Jul-17	30	1-Aug-17
Grant Funds Obligated	1-Sep-17		
Bidding	1-Aug-17	30	1-Sep-17
Construction	15-Nov-17	570	15-Jun-19
Project closeout	15-Jun-19	60	15-Aug-19
Program Implementation	1-Oct-16		1-Jul-17
Launch Vacant Lot Program	15-Oct-16	30	15-Nov-16
Launch Neighborhood Watch	15-Oct-16	30	15-Nov-16
Launch healthy food retail	1-Aug-17	30	1-Sep-17
Prepare and launch community gardens program	15-May-16	60	1-Jul-17
<b>Regional Resilience Plan</b>			
Hydraulic Modeling	1-May-16		1-Apr-17
Grant funds obligated	15-May-16		
Develop Hydralic Models of Rivers	1-Jul-16	400	6-Aug-16
Data Collection	1-Jul-16	270	1-Apr-17
Program Management and Master Planning	Jan-17		Dec-18
Grant funds obligated	1-Jan-17		
Develop Draft Plan	1-Mar-17	400	6-Apr-18
Publish Final Plan	1-Oct-18	60	1-Dec-18

Five months prior to the plan's expiration date, Shelby County Emergency Management will submit the revised plan to the Tennessee Emergency Management Agency for preliminary review. Upon approval by the state, TEMA will submit the updated plan to FEMA for review.

Once Shelby County has attained the designation of the plan's approval pending adoption, each jurisdiction will adopt the plan through a resolution within a year.

### **Incorporation into Planning Mechanisms**

By incorporating the Shelby County Hazard Mitigation Plan into other planning documents and mechanisms, information contained in the mitigation plan can help fill-in missing gaps in existing documents, can contribute to already existing mitigation-based projects, and can create a strengthened stance of mitigation implementation and awareness within the county and its jurisdictions.

Some of the mechanisms that the Shelby County Hazard Mitigation Plan could be incorporated into include:

- Shelby County BEOP
- Shelby County School District Plan
- Shelby County Highway Department Plan
- Tennessee Three Star Economic Development Plan
- Greenprint for Resilience
- Metropolitan Planning Organization
- Local CCOP/COG Plans
- Seismic Studies
- Shelby County Health Department Mass Casualty (Heat) Plan
- Port of Memphis Emergency Operations Plans
- Railroad Bridge Study
- City of Memphis Fire Response/First Responder Plans

The process of incorporating the hazard mitigation plan into other plans will begin during the other plan's update cycles. Shelby County Emergency Management will first review the plans side-by-side, and where deemed necessary, Emergency Management will make notes on how mitigation concepts and actions can be incorporated into the other plans. These recommendations will be submitted to the lead agencies of the other planning mechanisms for them to place relevant information within the documents.

Additionally, in the past few years information from the original Shelby County Hazard Mitigation Plan has been incorporated into the County's