

**CONTINUING AUTHORITIES PROJECT (CAP)
Federal Interest Determination**

- 1. Project:** Cumberland River, Metropolitan Nashville, TN; Section 205 Project.
P2 # 402561.
Congressional Delegation: Senators Alexander and Corker (TN); Representative Cooper (TN-5)
- 2. Authority:** Section 205 of the Flood Control Act of 1948, as amended.
- 3. Location:** Metropolitan Nashville – Davidson County is near the middle of Cumberland River Basin at Mile 192. Nashville, the state Capital of Tennessee, is in the north central part of the state.
- 4. Problem/Issue:** The Cumberland River Watershed has a long history of flood

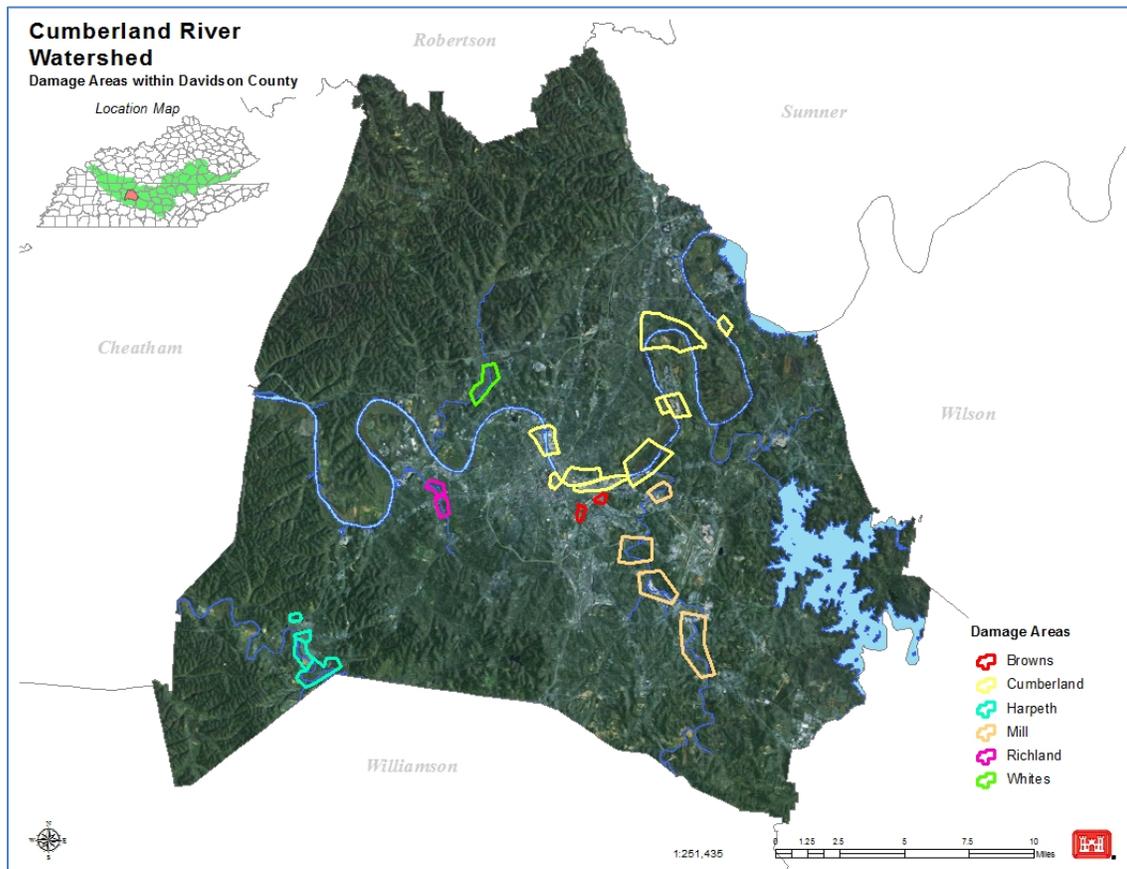


Figure 1: Location Map and Damage Areas within Nashville-Davidson County

damages and loss of life due to flooding. Major flooding with widespread impacts has

been seen in 1927, 1937, 1975, 1977, and 2010, thus typically occurring every few decades. Less widespread, more localized flooding also occurs throughout the basin in smaller watersheds. Flooding can be the result of widespread major rain events or small intense storms and thunderstorms. The most recent major flood occurred during May 2010. The flood followed a historic two-day rainfall with a statistical recurrence interval of greater than 1,000 years in the Harpeth River sub-watershed. Most of the rain fell in uncontrolled areas of the Cumberland River Watershed. Despite the existence of USACE and private flood protection projects, damages from the flooding are estimated to be in excess of \$2 billion in greater Nashville.

In the May 2010 storm, 26 people lost their lives; 11 of those were in Nashville. During the flood, both Interstates 40 and 24, were impassable through Nashville due to floodwaters. Half of the city's water treatment capacity was lost for several weeks along with most of their sewage treatment capacity. Numerous bridges on secondary roads and railroads were either damaged or washed away. Figure 2 shows the devastation of the May 2010 event. The photo depicts the confluence of Brown's Creek with the Cumberland River just two miles upstream of downtown Nashville.



Figure 2: May 2010 Flood - Confluence of Brown's Creek and Cumberland River

5. Alternative Measures Considered: The Metro Nashville study will focus on the Cumberland River and Browns, Richland, and Whites Creeks. The city has recently completed a plan called the "Unified Flood Preparedness Plan" (UFPP) that evaluated a wide variety of measures to reduce flood damage throughout the county. LRN participated in the hydraulic and economic evaluations. The plan will serve as the basis for this feasibility analysis and be used for alternative screening. Using May 2010 Flood Supplemental and Nashville Flood Preparedness Planning Assistance to States (PAS) funding, LRN has completed updates of the hydrology and hydraulic of the Cumberland River and Browns, Richland, and Whites Creeks. The modeling has been sent to FEMA for their use in updating the Davidson County Flood Insurance Study. The Section 205 flood risk management (FRM) study will build on the wealth of data completed since the May 2010 flood.

The UFPP identified nine damage centers on the Cumberland River, two on Browns Creek, two on Richland Creek, and one on Whites Creek (see Figure 1). These damage centers will be evaluated to see whether additional centers are needed or whether the areas should be divided or expanded. In addition, the structure database developed for the UFPP will be updated and expanded to include public infrastructure and structures outside the UFPP damage centers. Figures 3 and 4 show May 2010 damaged areas in downtown Nashville. Elevation certificates will be used where they exist to establish first floor elevations (FfEs). Other FfEs will be estimated based on adjacent ground and visual observations. The alternatives evaluated in the UFPP provide a good screening for the damage centers. Both structural and nonstructural alternatives were considered.

The feasibility study will build upon these analyses and refine them further to include various levels of protection and additional project purposes. The alternative measures to be considered in the feasibility study include buyouts of the more frequently flooded homes (2-25 year floodplain) combined with recreational and ecosystem use. Flood proofing some residential and the more frequently flooded commercial properties may also prove to be justified. Other measures to be evaluated include channel and bridge modifications, floodwalls and levees, and detention. Flood Risk Management measures will also be developed in areas outside the UFPP damage centers.

6. Description of Recommended Plan: While several measures have been identified as having positive impacts on the management of flood risk, the recommended plan will be defined in the full feasibility phase. Table 1 includes the UFPP analyses of alternatives for the Cumberland River and Table 2 displays the UFPP analyses for Browns, Richland, and Whites Creeks. Note that the nonstructural measures were an evaluation of everything in the 100 year floodplain and were not optimized. With optimization many of the nonstructural measures could be justified. After several rounds of alternative screening, a final set of alternatives will be combined to maximize National Economic Development (NED) benefits. Although the NED plan must be identified, a Locally Preferred Plan can also be identified and become the recommended plan.



Figure 3: Downtown Damages May 2010

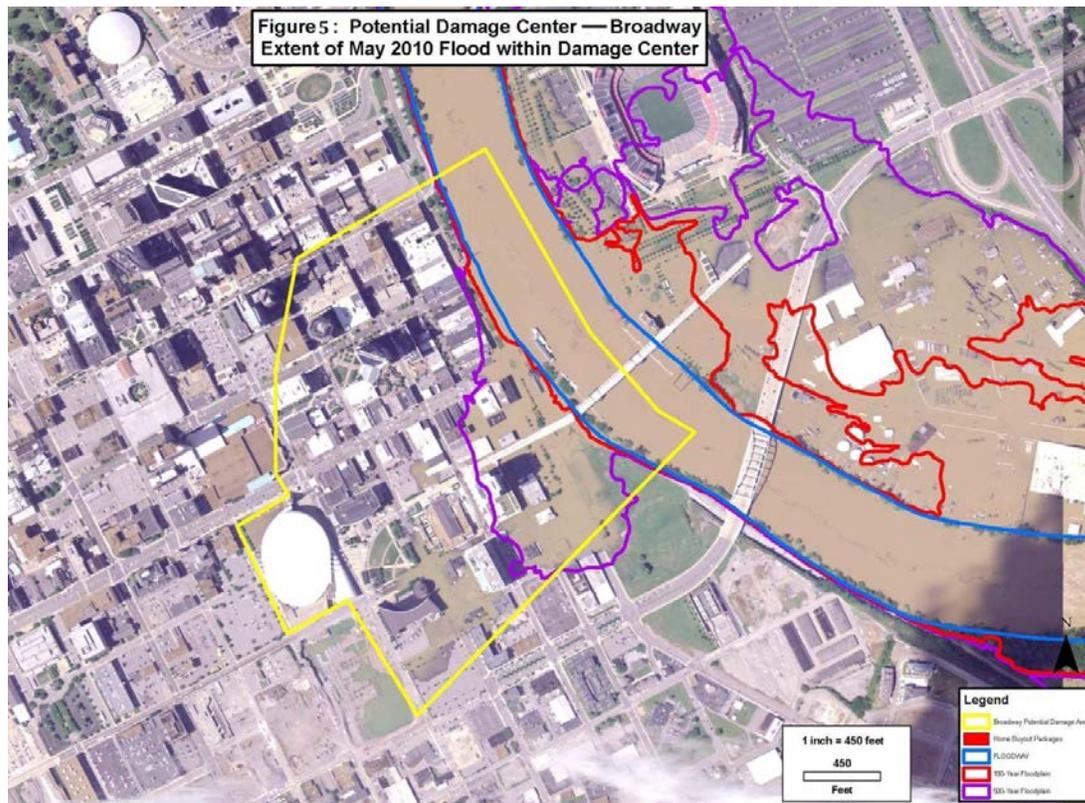


Figure 4: Downtown Damage Center - May 2010 Flood Inundation

Metro Unified Flood Preparedness Analysis						
\$'s = FY 2012						
	Existing Conditions Expected Annual Damages	Annual Residual Damages	Expected Annual Benefits	Total Project Costs	Annual Costs	Benefit-Cost-Ratio
Cumberland River						
Damage Center 1	104,613					
Floodproofing	1,241	0	1,241	828,700	38,576	0.03
Damage Center 2	459,023					
Floodproofing A	459,023	0	459,023	6,972,000	324,548	1.41
Floodproofing B	459,023	0	459,023	6,655,817	309,830	1.48
Levee/Argyle Ave.	459,023	459,005	18	4,037,868	187,964	0.00
Acquisition/Buyout A	9,245	0	9,245	325,523	15,153	0.61
Acquisition/Buyout B	9,245	0	9,245	1,963,235	91,389	0.10
Damage Center 3	378,984					
Floodproofing	1,223	0	1,223	736,401	34,280	0.04
Levee/Opryland Area	378,984	960	378,024	50,418,733	2,347,002	0.16
Damage Center 4	57,322					
Floodproofing	57,322	14379	42,943	5,533,374	257,580	0.17
Acquisition/Buyout	3,959	0	3,959	2,090,653	97,320	0.04
Damage Center 5	88,729					
Levee/South of River	88,279	57,260	31,019	21,689,993	1,009,674	0.03
Levee/Lisa Lane	10,032	0	10,032	1,287,600	59,938	0.17
Floodproofing	16,672	0	16,672	3,254,152	151,481	0.11
Floodproofing/Industrial	21,526	0	21,526	21,689,000	1,009,627	0.02
Acquisition/Buyout	13,530	0	13,530	3,362,726	156,536	0.09
Damage Center 6	326,456					
Levee/Floodwall With Buyout	326,456	4,035	322,421	92,137,910	4,289,038	0.08
Levee/Floodwall No Buyout	326,456	0	326,456	107,029,904	4,982,263	0.07
Acquisition/Buyout	288,497	0	288,497	179,370,864	8,349,750	0.03
Floodproofing A	220,906	0	220,906	1,661,725	77,354	2.86
Floodproofing B	220,906	0	220,906	3,323,451	154,707	1.43
Damage Center 7	110,829					
Acquisition/Buyout	75,395	0	75,395	76,966,853	3,582,822	0.02
Industrial Floodproofing	62,762	0	62,762	1,263,113	58,798	1.07
Residential Floodproofing	2,224	0	2,224	467,343	21,755	0.10
Damage Center 8	38,511					
Removable Levee/Floodwall	38,511	0	38,511	87,134,047	4,056,107	0.01
Inflatable Barrier	38,511	0	38,511	82,818,877	3,855,235	0.01
Floodproofing A	38,511	0	38,511	26,533,749	1,235,151	0.03
Floodproofing B	38,511	0	38,511	53,067,499	2,470,303	0.02
Damage Center 9	201,443					
Cowan Levee/Floodwall	201,443	0	201,443	39,625,898	1,844,593	0.11
Cement Plant Levee/ Floodproofing	201,443	0	201,443	34,485,886	1,605,325	0.13
Industrial Floodproofing	65,164	0	65,164	592,224	27,568	2.36
Acquisition/Buyout	177,282	0	177,282	183,296,447	8,532,486	0.02

Table 1: Cumberland River Potential Nashville FRM measures

Creek/Alternative	Total Annual Benefits	Total Project Costs	Annual Costs Including O&M	BCR
\$'s = 1,000's				
Browns Creek				
Damage Center 1 - Buyout	623.82	1,3688	637.18	14.76
Damage Center 2 - Buyout	54.08	376.7	17.78	3.04
Damage Center 2 - Elevation/Floodproofing	489.06	1,212.32	56.43	8.67
Richland Creek				
Damage Center 2 - Buyout	115.32	3,360	169.01	0.68
Whites Creek				
Damage Center 2 - Elevation/Flood Proofing	614.92	18,178	846.19	0.73

Table 2: Tributaries Potential Nashville FRM measures

7. Views of Sponsor: The City of Nashville submitted a Letter of Intent on April 25, 2013 and supports further evaluation of flood risk management projects through the completion of a detailed project report. The sponsor and other local stakeholders are very interested in identifying measures for reducing flood damages and have invested greatly in flood risk management efforts following the epic May 2010 flood.

8. Statement of Estimated Cost: This cost estimate will be refined during the development of the Project Management Plan (PMP) and negotiation of the Feasibility Cost-Share Agreement (FCSA). The estimated study cost is \$1.6 million. This study is intended to provide multi-purpose solutions to both FRM. The Cost Sharing amount is the total cash contribution required from Metro Nashville for the duration of the study.

Table 3: Initial Statement of Estimated Cost

Task	Flood Risk Management \$1,000
Hydrology & Hydraulics	450
Plan Formulation	300
Economics	100
Environmental/Archeology	150
Geotech	50
Design	30
Real Estate	70
Cost estimating	150
HTRW	50
Contingencies	250
Total Study Cost	1600
Cost Share amount	800

9. Views of Federal, State and Regional Agencies: Limited coordination was conducted during the Cumberland River 905(b) study. Views were expressed as follows:

- a. Reduce risks of flooding to human life and property.
- b. Protect fish and wildlife, especially those that are federally listed and their habitat.
- c. Ensure clean and reliable water supply for the region.
- d. Identify ways to manage the river system to meet the changing needs of the region.

10. Status of Environmental Statutes Compliance: Scoping was conducted during the Cumberland River 905(b) study to evaluate water resources within the entire basin. Additional agency coordination and detailed NEPA evaluation will be conducted during the feasibility study.

11. Significant Effects: No significant environmental effects are known at this time; potential impacts would be identified during the NEPA compliance process.

12. Implementation Schedule: Assumption of best case scenario on funds available.

- a. Execute FCSA: 30 May 2013
- b. Submit Decision Document: 30 June 2015
- c. Initiate Design & Implementation phase: 30 Oct 2015
- d. Award Construction Contract for One or More Alternatives: 1 Apr 2017
- e. Project Completion: 30 Aug 2020

13. Supplemental Information:

- a. Cumberland River Recon Report: Approved 24 August 2012
- b. Cumberland and Duck River Basins: May 2010 Flood Report: Approved 14 February 2012.
- c. Unified Flood Preparedness Plan: 13 January 2013

14. District Recommendation:

Due to the severe and repeated flood damages experienced in the Nashville area, including 11 fatalities and over \$2 billion in direct economic damages in the May 2010 flood event, it is appropriate to immediately move forward with a feasibility study to address flood risk management in the state capital, Nashville, Tennessee.

The recommendations contained herein reflect the information available at this time and current USACE policy. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works program.

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