

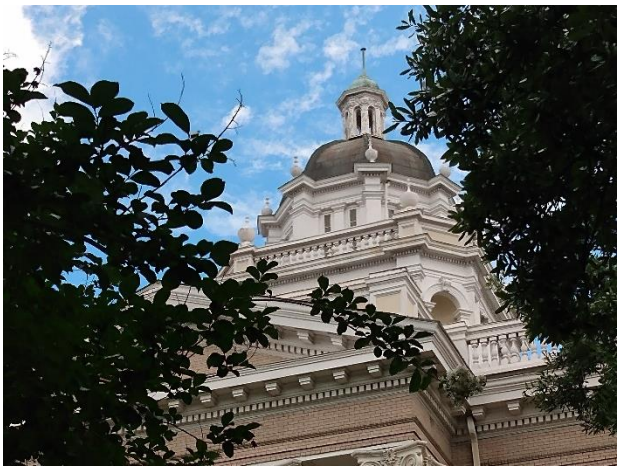


Lowndes County
Transportation Infrastructure
Vulnerability Assessment

Technical Memorandum

June 2021

SOUTHERN GEORGIA
REGIONAL COMMISSION

transport STUDIO

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Lowndes County Transportation Infrastructure Vulnerability Assessment

Prepared by

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On behalf of the Valdosta-Lowndes Metropolitan Planning Organization (VLMPO)

June 2021

This document is prepared in cooperation with the Georgia Department of Transportation and the Federal Highway Administration.

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Cover Page Photos (clockwise from upper left): Bemiss Road (SR 125) at Skipper Bridge Road; Shiloh Road at Franks Creek; Lowndes County Historic Courthouse; Withlacoochee River from Skipper Bridge Road

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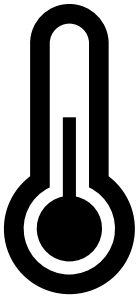
Table of Contents

List of Figures

List of Tables

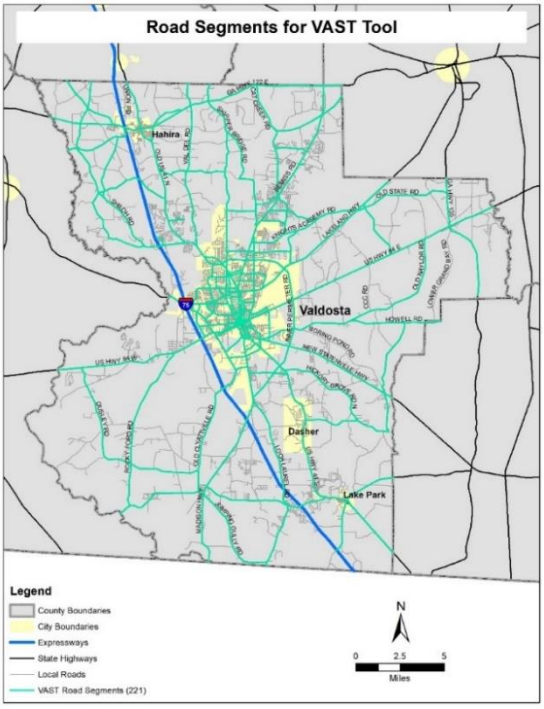
Executive Summary



Lowndes County is vulnerable to a broad range of natural hazards, including extreme heat and inland flooding associated with thunderstorms, tropical storms, and hurricanes. It is projected that global climate change patterns will increase both the frequency and duration of these types of events, threatening the function and viability of transportation assets. [1, 2]

The purpose of the Lowndes County Transportation Infrastructure Vulnerability Assessment is to identify transportation infrastructure within Lowndes County that may be susceptible to extreme weather events and develop high-level strategies, policies, and measures for the Southern Georgia Regional Commission (SGRC) and the Valdosta Lowndes Metropolitan Planning Organization (VLMPO) to address vulnerabilities. The recommendations developed as part of this study will inform the ongoing update of the Lowndes County Hazard Mitigation Plan and Greater Lowndes County Comprehensive Plan.

The project team evaluated over 220 roadway assets and 100 bridges as part of the Lowndes County Transportation Infrastructure Vulnerability Assessment to understand their exposure, sensitivity, and adaptive capacity to temperature and precipitation changes forecasted through the end of the 21st century. This was completed through the Federal Highway Administration's (FHWA) Vulnerability Scoring Assessment Tool (VAST).



VAST results indicate that throughout Lowndes County, there are 100 road segments which are expected to experience moderate to high temperature change vulnerability by the end of the 21st century and 15 road segments which are expected to experience moderate to high precipitation change vulnerability by the end of the 21st century. The top most vulnerable segments are located on principal arterials and major collectors including N. Valdosta Road (US 41/SR 7), Bemiss Road (SR 125), Inner Perimeter Road (US 41/SR 7), Gornto Road, Baytree Road, and N. St. Augustine Road (SR 133).

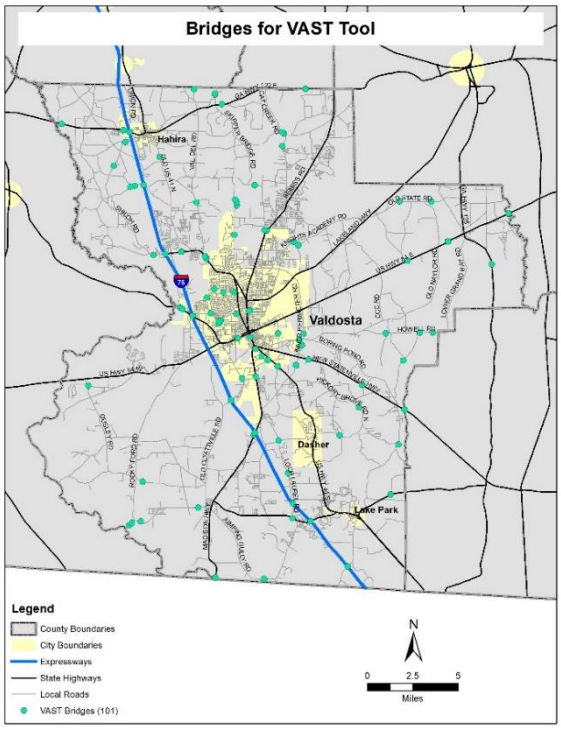
VAST results indicate that there are 48 bridges which are expected to experience moderate to high temperature change vulnerability and 21 bridges which are expected to experience moderate to high precipitation change vulnerability by the end of the 21st century. The top most vulnerable bridges are located

[1] Carter, L. et al. (2018). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, Chapter 19: Southeast, p. 743-808.
[2] NOAA (2021). NOAA Delivers New U.S. Climate Normals.

along principal arterials and major collectors including N. Valdosta Road (US 41/SR 7), Bemiss Road (SR 125), Inner Perimeter Road (US 41/SR 7), Madison Highway (SR 31), Gornto Road, Jerry Jones Drive, Baytree Road, and N. St. Augustine Road (SR 133). Some of these bridge facilities have over 15 miles of detour if they are closed due to damage from extreme weather events.

These facilities collectively represent critical links in the transportation network for Lowndes County and the Southern Georgia region. If any of these facilities fail, people could be prevented from accessing employment, shopping, or recreation, healthcare, or other critical services. Failure of critical facilities can slow economic output or cause injuries.

Based on results of the Vulnerability Assessment, the project team recommended strategies for the VLMPO and partner jurisdictions including systems planning, asset management, and stakeholder engagement.



ID	Action Strategy
	Systems Planning
SP-1	Incorporate Vulnerability Assessment scores into the VLMPO long-range transportation plan (LRTP) project evaluation criteria in order to help prioritize improvements for the most vulnerable assets.
SP-2	Incorporate improvements and mitigation, or more resilient design features, for repaired or replaced assets that utilize FHWA emergency relief (ER) funds.
SP-3	Identify vulnerable assets that may eligible for improvements through federal funding programs, and continue monitoring federal funding for programs targeted towards resilience or climate change.
SP-4	Developing measures to identify environmental justice populations that would be most adversely impacted by the loss of transportation services, and incorporate the findings into transportation planning processes.
SP-5	Explore opportunities to install green infrastructure on streets to mitigate risk in flood-prone areas.
SP-6	Utilize the VLMPO travel demand model to conduct a worst-case scenario analysis, assessing the impact to the surrounding transportation network if vulnerable roadway and bridges are taken out of service.
SP-7	Include local streets and bridges in a subsequent vulnerability assessment to help identify local communities that may lose access to critical services in the event of a roadway or bridge closure.
SP-8	Coordinate with railroad operators to identify vulnerabilities to the rail network and opportunities for VLMPO and railroad operators to collaborate to help mitigate the impacts of heavy precipitation and extreme heat.
SP-9	Utilize the VAST tool to explore the impacts of drought, wildfire and high winds on transportation infrastructure within Lowndes County through consultation with agencies such as USFWS, DNR, and USFS.
	Asset Management
AM-1	Conduct facility-level engineering assessments to identify specific improvements for the most vulnerable assets.
AM-2	During value-engineering, consider additional expenditures to design assets more resiliently for long-term service.
AM-3	Identify specific maintenance practices to help mitigate flood- and heat-related risks to assets.
AM-4	Complete a detailed assessments of roadside ditches, culverts, and driveway drain pipes to identify vulnerability and mitigation measures for roadside stormwater infrastructure within the public right-of-way (ROW).
	Stakeholder Engagement
SE-1	Consider instituting a standing taskforce or committee to coordinate resilience efforts across jurisdictions.
SE-2	Continue coordination among Lowndes County, the City of Valdosta, and GDOT to ensure that resilient materials are included in design and construction specifications.
SE-3	Collaborate with local and regional research partners, such as Valdosta State University, to conduct research on vulnerability and transportation resiliency to develop innovative mitigation strategies.

Overview and Project Scope

Lowndes County is vulnerable to a broad range of natural hazards, including floods, high wind, lightning, wildfire, extreme cold and extreme heat, drought, sinkholes, dam failure, and hail. The Lowndes County Hazard Mitigation Plan outlines the vulnerability of the county to each of these hazards.[3] It is projected that global climate change patterns will increase the frequency and duration of heavy rain and extreme heat events.[4, 5] In addition to the risks posed to life and property, these events disrupt the local transportation system, impairing mobility, impeding safe travel, and causing damage to transportation assets. The objective of this Vulnerability Assessment is to identify transportation infrastructure in Lowndes County that is most vulnerable to the impacts of extreme heat and inland flooding, and to develop high-level strategies, policies, and measures the Southern Georgia Regional Commission (SGRC) and the Valdosta-Lowndes Metropolitan Planning Organization (VLMPO) can undertake alongside municipal partners to help the transportation system become more resilient. The methodology follows the Federal Highway Administration (FHWA)'s Vulnerability Assessment and Adaptation Framework and draws upon two case studies in Ohio and Austin, Texas.

Lowndes County is served by a robust transportation network consisting of roads, bridges, and railroads that reach all areas of the county and provide vital connections to community facilities. In addition to I-75, which provides regional and interstate access, Lowndes County has approximately 178 miles of arterials, 252 miles of collectors, and 687 miles of local roadways. There are 217 bridges that facilitate travel over natural and manmade barriers, including streams/rivers, railroads, and other roadways.[6] Lowndes County is also served by four freight railroads. Two Class I railroads, CSX Transportation and Norfolk Southern, provide east-west and north-south access, respectively. Two shortline railroads, Valdosta Railway and CaterParrott Railnet, traverse Lowndes County in the north-south direction. Lowndes County's transportation system is shown in Figure 1 on the following page.

The 2016 Lowndes County Hazard Mitigation Plan discusses the effects of both flooding and extreme heat. From an extreme heat perspective, the plan states that high heat and humidity are prevalent in Lowndes County, particularly during the summer months. On average, temperatures escalate above 95°F approximately 45 days annually. High temperatures coupled with high humidity raise the heat index, increasing the risk of heat-related illnesses among people and infrastructure damage to roads, particularly those that have damaged pavement. Flooding is identified as the costliest and most repetitive hazard facing Lowndes County. Riverine flooding, attributed to water overflow from streams, creeks, and major channels such as the Withlacoochee River, has historically caused a tremendous amount of property damage and has closed and washed out roads and bridges.[7] These events typically occur during heavy precipitation over a period of hours or days and can be associated with a wide scale of storms ranging from localized storms or squall lines to tropical storms from the nearby Atlantic and Gulf Coasts. The low-lying areas adjacent to the network of rivers and streams are floodplains. As shown in Figure 2, the 100-year floodplain is the area with a 1% annual chance of flooding (Zones A and AE), while the 500-year floodplain has a 0.2% annual chance of flooding.[8]

[3] SGRC (2016). Lowndes County Mitigation Plan Update.
[4] Carter, L. et al. (2018). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, Chapter 19: Southeast, p. 743-808.
[5] NOAA (2021). NOAA Delivers New U.S. Climate Normals.
[6] SGRC (2020). Vision2045 – The Valdosta-Lowndes Metropolitan Transportation Plan, p. 19-20.
[7] SGRC (2016). Lowndes County Mitigation Plan Update, p. 16.
[8] While the definitions imply a level of certainty regarding the recurrence of flood events, these areas sometimes flood more frequently.

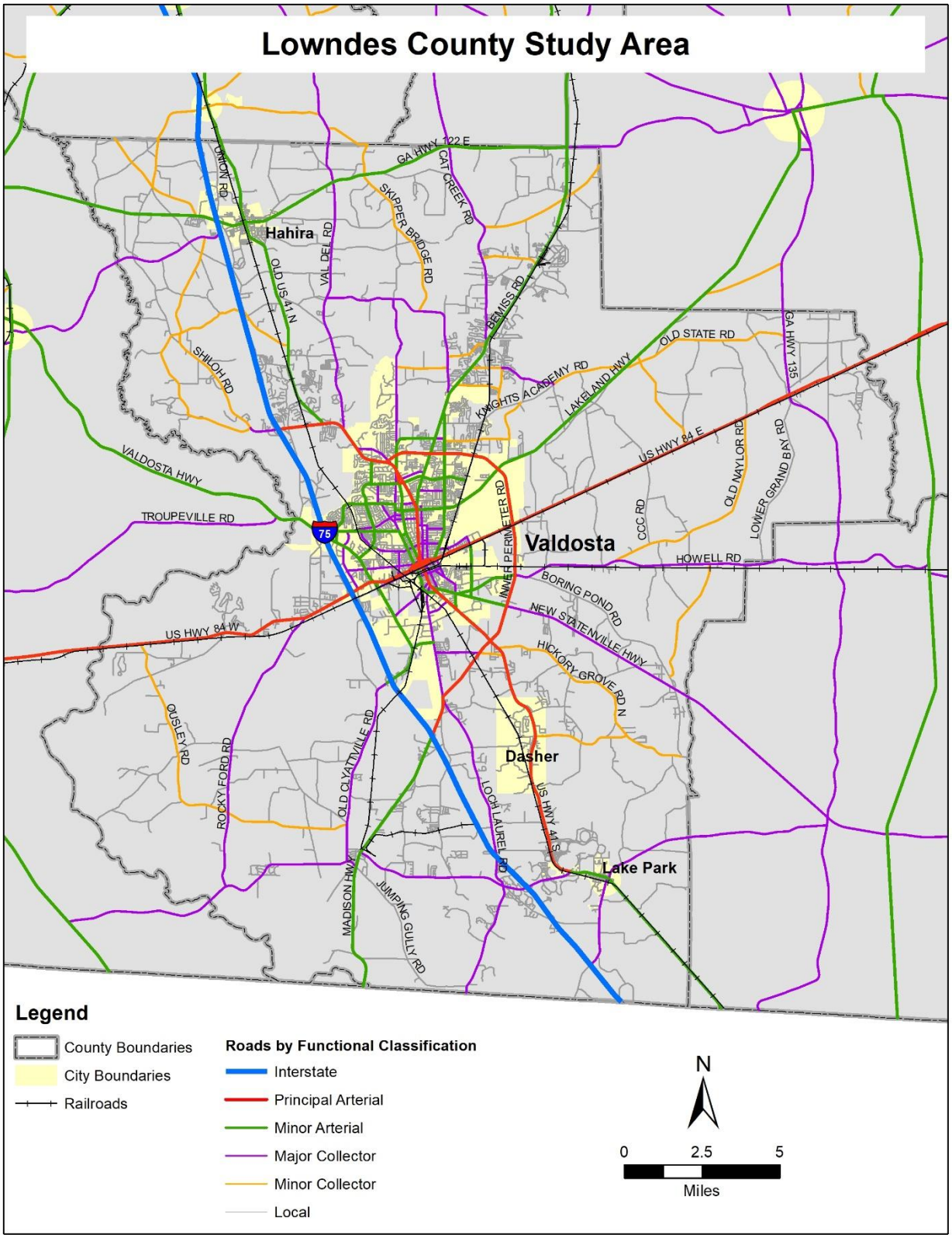


FIGURE 1: LOWNDES COUNTY STUDY AREA
SOURCE: SGRC

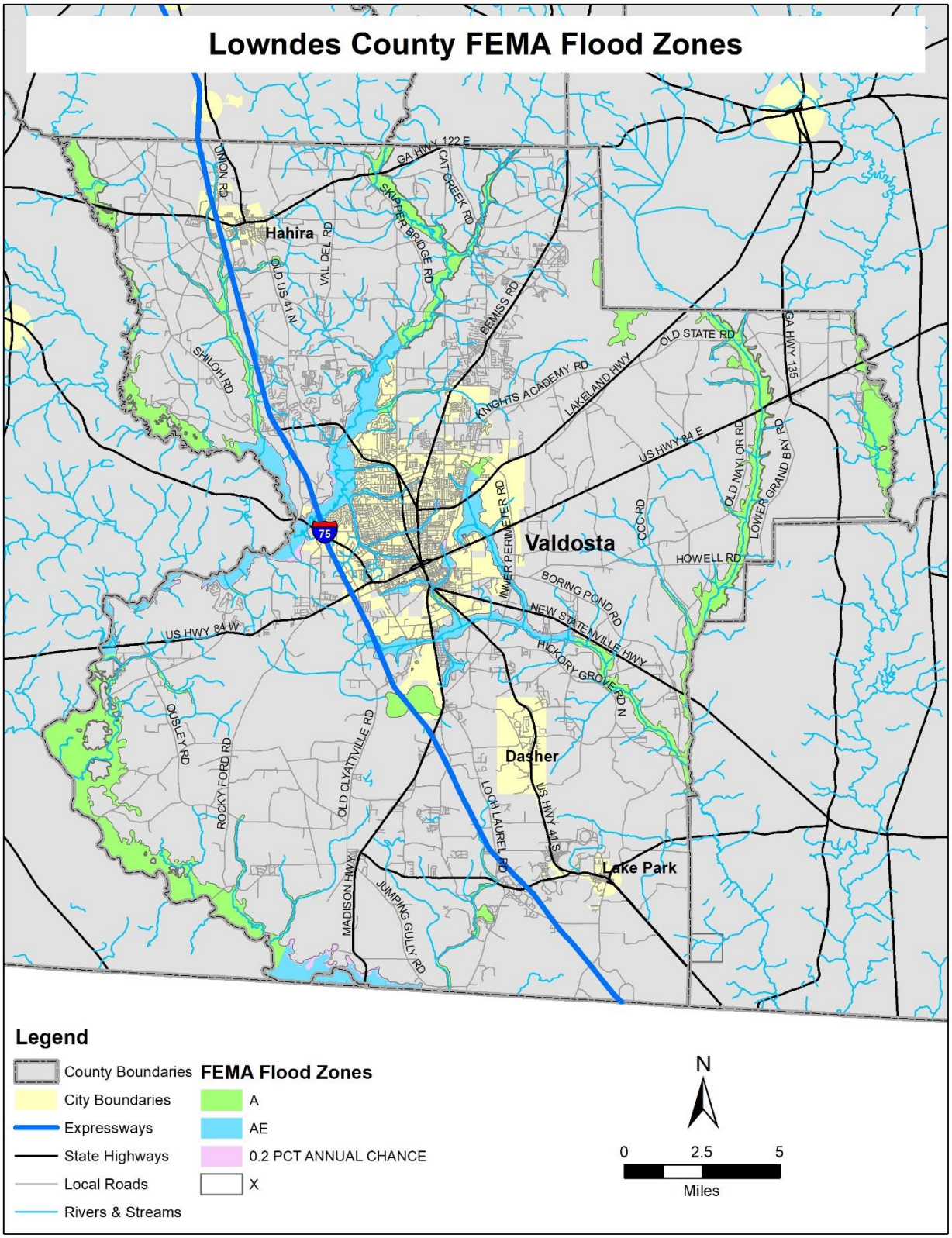


FIGURE 2: LOWNDES COUNTY FEMA FLOOD ZONES
SOURCE: FEMA

Heavy Rain Events

Lowndes County has experienced several flood events in the past decade with notable events occurring in 2009, 2013, and 2018.

The most substantial flooding event occurred in April 2009 and was caused by heavy rain throughout southern Georgia, including within Lowndes County between March 27 and April 3, 2009. Of Georgia's 159 counties, 69 counties, including Lowndes, were declared disaster areas because of flooding which resulted in $60 million in damage to roads, culverts, and bridges. Rainfall totaled 12 inches in some locations throughout southern Georgia and several stream gauges operated by the U.S. Geological Survey eclipsed the 500-year flood level.[9] In Lowndes County, several roads were closed due to flooding, including Gornto Road at Sugar Creek shown in Figure 3.[10] Additionally, the City of Valdosta's Withlacoochee Wastewater Treatment Plant was also significantly damaged by flood waters, hindering service to approximately 70 percent of City of Valdosta residents and businesses.[11]

FIGURE 3: WATER OVERTOPPING ALONG GORNTO ROAD AT SUGAR CREEK DURING APRIL 2009 FLOODING EVENT
SOURCE: VALDOSTA DAILY TIMES

FIGURE 4: PART OF OLD LAKE ROAD COLLAPSED DUE TO FLOOD WATERS IN DECEMBER 2018
SOURCE: VALDOSTA DAILY TIMES

A February 2013 flooding event led to the same wastewater treatment plant suffering damage as well as 13 roads and bridges closing, including US 84/SR 38. At the time of the flooding, the City of Valdosta estimated an average of 5 million to 6 million gallons of untreated sewage discharged daily into the Withlacoochee River until the flood waters receded and the plant was capable of resuming operations.[12] A third significant flooding event in December 2018 resulted from approximately ten inches of rain in a two-day period.[13] Flash flood waters caused Old Lake Park Road south of Valdosta to structurally fail and formed a six-foot gap in the asphalt pavement. This is shown in Figure 4. Other local roads in the vicinity were closed due to the flooding.[14]

[9] USGS (2010). Historic Flooding in Georgia, 2009.
[10] Fulton, M. (2009). Fleeing the Flooding. *Valdosta Daily Times.*
[11] City of Valdosta (2021). Regional Flooding.
[12] Associated Press (2013). Valdosta Treatment Plant Floods. *GPB.*
[13] Bassette, R. (2018). Lowndes Co. road collapses from flooding. *WALB.*
[14] Richards, T. (2018). Flash flooding hits Lowndes. *Valdosta Daily Times*.

Tropical Cyclones

FIGURE 5: CREWS CLEAR DOWNED TREES FOLLOWING HURRICANE IRMA IN SEPTEMBER 2017
SOURCE: VALDOSTA DAILY TIMES

While Lowndes County is not directly on a coastline, it is within close proximity to both the Atlantic and Gulf Coasts making it susceptible to inland flooding resulting from hurricanes and tropical storms. The project team examined geospatial data documenting damage from multiple tropical cyclones, including Hurricane Alison (1995), Hurricane Jeanne (2004), Hurricane Dennis (2005), Hurricane Irene (2011), Hurricane Irma (2017), and Hurricane Michael (2018). Data documented includes road closures, flood locations, downed trees and power lines, traffic signal outages, and shelter locations. Most damage sustained in Lowndes County was due to either flooding or high winds resulting in downed trees (see Figure 5), damaged property, agricultural crop loss, or temporary road closures.[15]

SGRC kept a geospatial inventory of points in Lowndes County where flooding occurred during these events, and this data was utilized to create a composite of relative flood frequency dating back to April 2009. The result of this analysis was incorporated as part of the Vulnerability Assessment and is shown in Figure 6 on page 6.

[15] Nolin, J. (2017). State Recovers from Irma. Valdosta Daily Times.

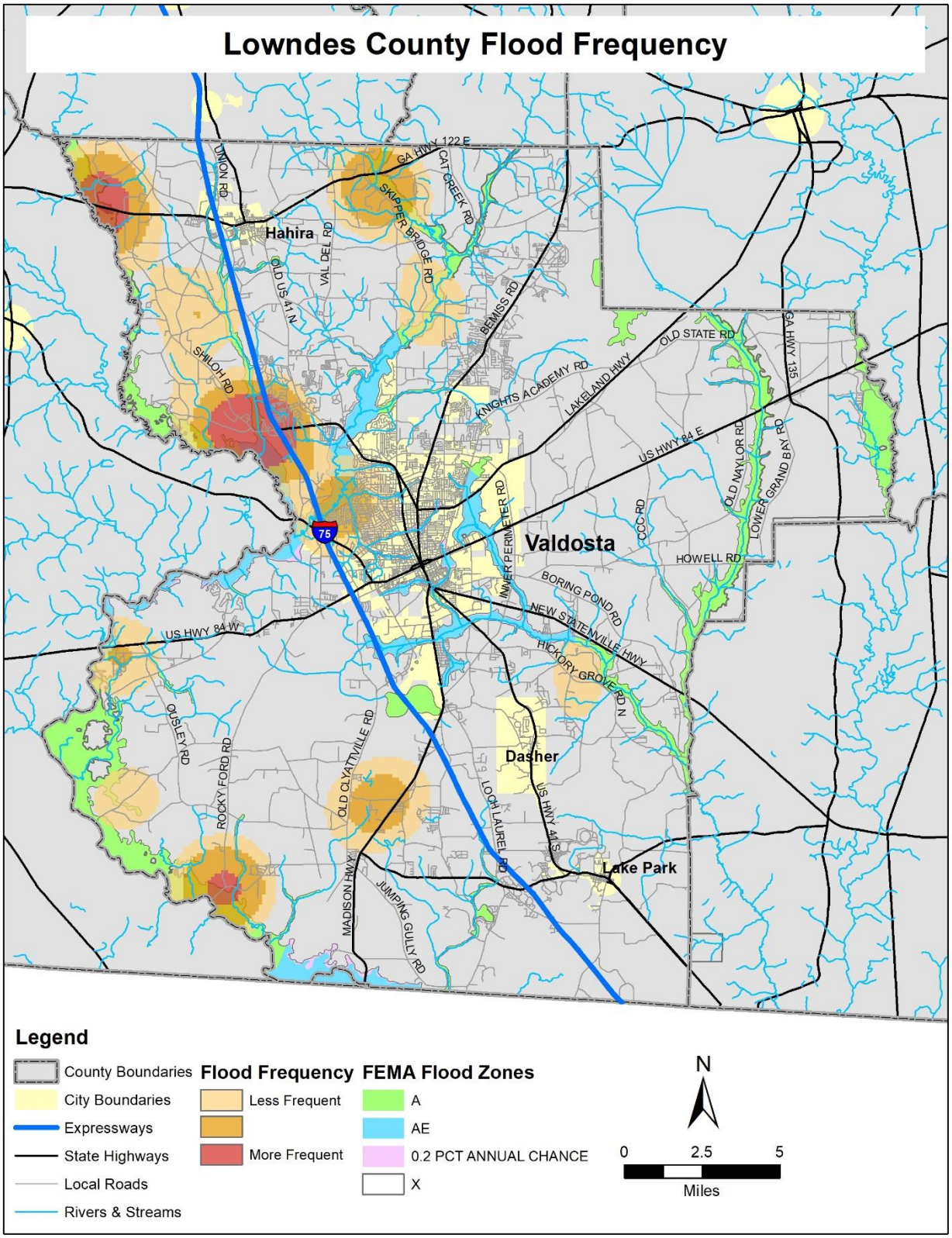


FIGURE 6: LOWNDES COUNTY FLOOD FREQUENCY
SOURCE: SGRC

Climate Trends

This section details anticipated climate trends in the Southeast United States, including Valdosta and Lowndes County, with respect to temperature and precipitation, which are both expected to increase in by the end of the 21st century.

Fourth National Climate Assessment – Southeast (2018)

The Fourth National Climate Assessment (NCA4) was released in 2018 under the administrative leadership of the National Oceanic and Atmospheric Administration (NOAA) to help inform decision-makers, utility and natural resource managers, public health officials, emergency planners, and other stakeholders by providing a thorough examination of the effects of climate change on the United States.

The most recent set of climate projections developed by the international scientific community is classified under four Representative Concentration Pathways, or RCPs. The NCA4 as well as this Vulnerability Assessment, focus on a high-emissions scenario called RCP8.5 that is associated with more warming and higher population growth and carbon intensity.[16]

The publication consists of two volumes and details how climate change is expected to change the national economy, environment, and public health. The first volume details climate change's natural- and human-induced trends and makes projections to the end of the 21st century regarding precipitation, temperature, and sea-level rise. The second volume outlines impacts, risks, and adaptation within the United States by region, including the Southeast. Below is a high-level summary of findings within the Southeast with respect to temperature and precipitation that helped shape the project team's understanding of these extreme weather events as well as the methodology for this Vulnerability Assessment.

TEMPERATURE

With respect to temperature, the NCA4 projects that the Southeast will experience warming over the course of the 21st century, with intensity increasing in the coming decades.[17] Observed warming since the mid-20th century has been uneven in the Southeast region, with average daily minimum temperatures increasing three times faster than average daily maximum temperatures. According to the report, 61 percent of major Southeast cities are exhibiting some aspects of worsening heat waves, which is a higher percentage than any other region of the country.[18] Cities in the Southeast are also experiencing more frequent and longer summer heat waves.[19] Variability and change in the annual number of hot days is shown in Figure 7. The bar chart shows average number of days above 95°F by decade over the region for the years 1900 through 2016. The accompanying map shows percent change in number of days above 95°F between 1950 and 2016 for individual weather stations. Average summer temperatures during the most recent ten years have been the warmest on record. On average, there have been fewer number of days above 95°F since the 1960s, but the number of days above 95°F has risen between the 2000s and the 2010s. Areas west of Lowndes County have experienced a decrease in the number of days above 95°F while areas east of Lowndes County towards the Atlantic Coast have experienced an increase the number of days above 95°F between 1950 and 2016.

[16] U.S. Global Change Research Program (2018). Fourth National Climate Assessment – Guide to this Report.
[17] Carter, L. et al. (2018). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, Chapter 19: Southeast, p. 743-808.
[18] Ibid, p. 747.
[19] Ibid, p. 752.

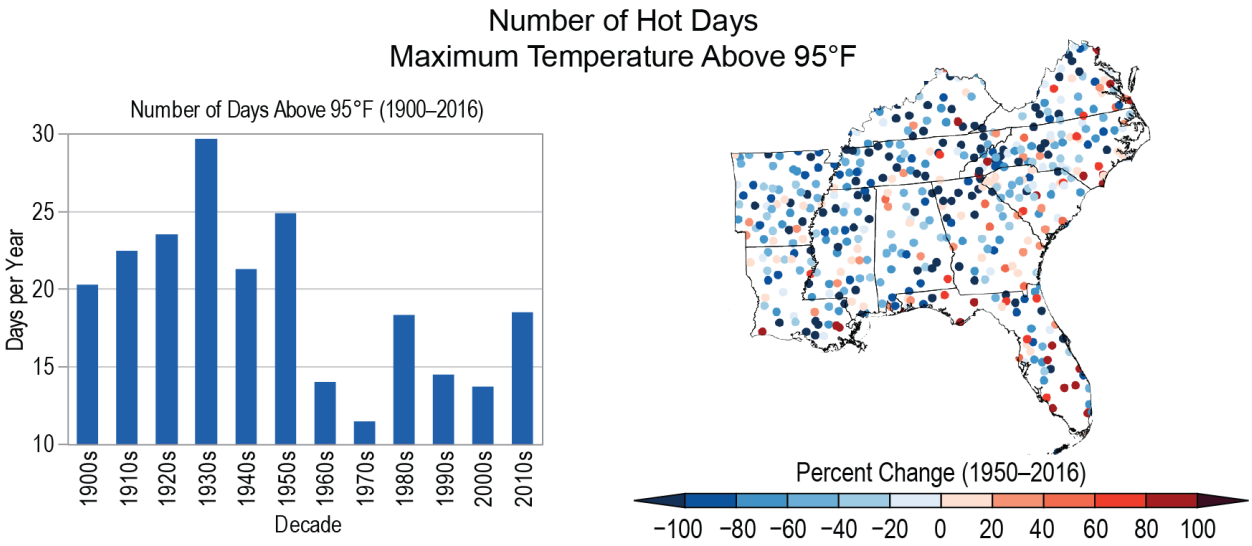


FIGURE 7: NUMBER OF HOT DAYS (MAXIMUM TEMPERATURE ABOVE 95°F) (SOURCES: NCA4, NOAA NCEI, AND CICS-NC)

PRECIPITATION

The number of extreme rainfall events is increasing throughout most of the Southeast, including southern Georgia and Lowndes County. This is shown in Figure 8 with the 1990s, 2000s, and 2010s experiencing historic highs in the number of days with more than three inches of precipitation compared to prior decades. The figure shows that more than 70% of precipitation recording locations show upward trends since 1950.[20] Larger increases are simulated by the late 21st century under the higher emissions scenario (RCP8.5), which is more consistent with the nation's current consumption of fossil fuels.

Furthermore, extreme rainfall events are correlated to an increase in inland and coastal flooding. By the end of the 21st century, under a higher emissions and population growth scenario (RCP8.5), projections indicate approximately double the number of heavy rainfall events (2-day precipitation events with a 5-year return period, or the time interval in which a similar event is expected to occur again) and a 21% increase in the amount of rain falling on the heaviest precipitation days (days with a 20-year return period).[21] This is impacting transportation and stormwater infrastructure that has not been designed to accommodate the forecasted increase in precipitation by straining assets and making them more vulnerable to failure. Specific impacts are discussed in further detail under the Climate Stressors section of this technical memorandum.

[20] Ibid, p. 751.
[21] Ibid, p. 762-763.

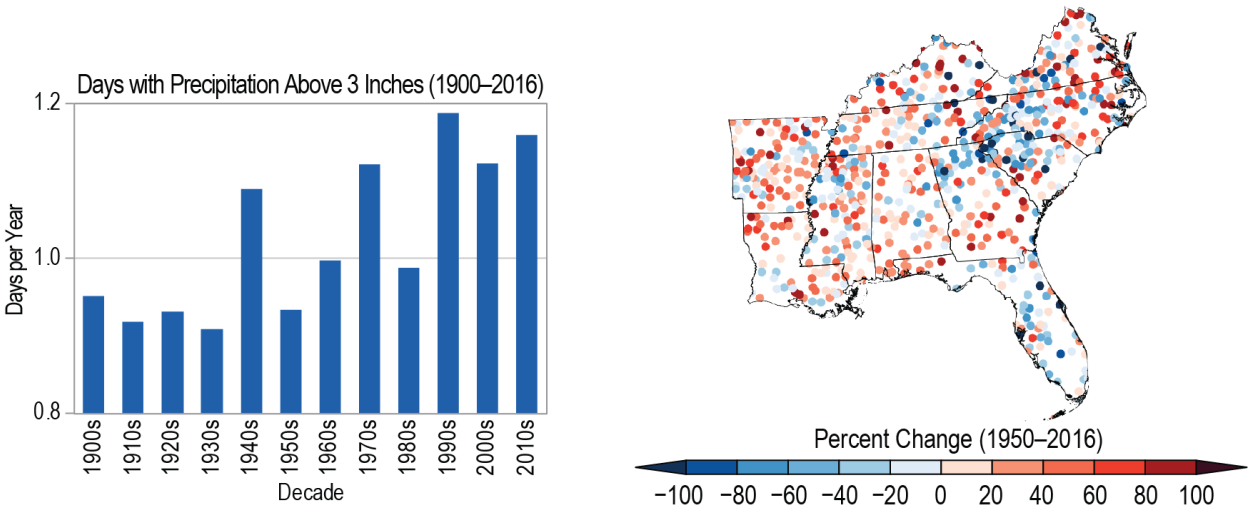


FIGURE 8: NUMBER OF DAYS WITH PRECIPITATION ABOVE THREE INCHES (SOURCES: NCA4, NOAA NCEI, AND CICS-NC)

2020 Climate Normals (2021)

In April 2021, NOAA released new U.S. Climate Normals for the time period between 1991 and 2020 to the public. NOAA releases climate normals every decade for temperature and precipitation to allow leaders, businesses, and other stakeholders to gain perspective on today's weather patterns in relation to 30-year averages and to make informed climate-related decisions. The climate normals show that the United States is experiencing warmer and wetter weather patterns compared to the prior normals released in 2011 covering 1981 to 2010. On the following page, Figure 9 shows change in annual mean temperature change while Figure 10 shows change in annual precipitation between the two normal periods.[22] These figures show that Georgia and the South in particular are moving towards a warmer and wetter climate.

[22] NOAA (2021). NOAA Delivers New U.S. Climate Normals.

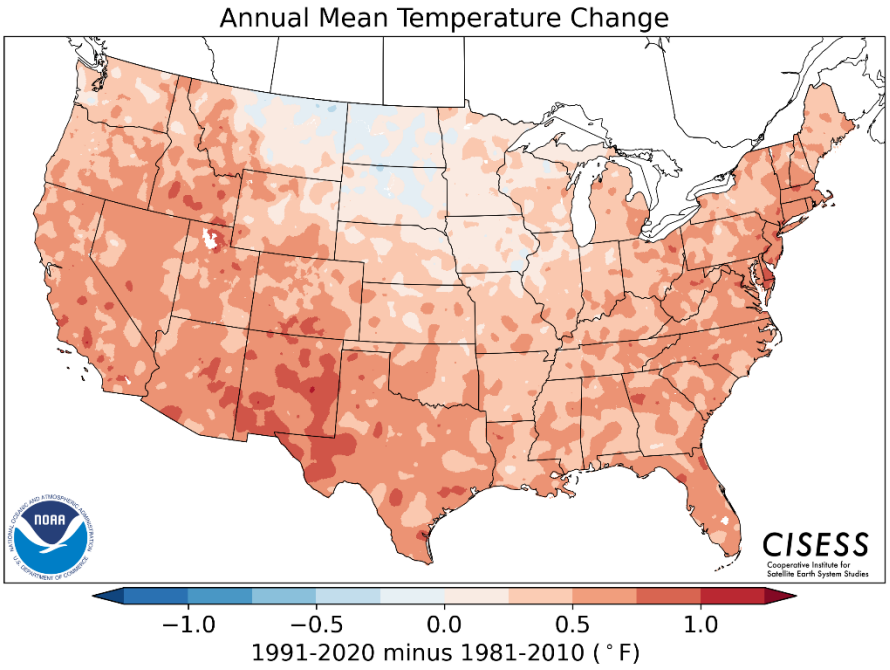


FIGURE 9: AVERAGE ANNUAL TEMPERATURE CHANGE FROM THE 1981–2010 U.S. CLIMATE NORMALS TO THE NEWEST DATA IN THE 1991–2020 NORMALS, RELEASED BY NOAA, MAY 2021
SOURCE: NOAA; CISESS

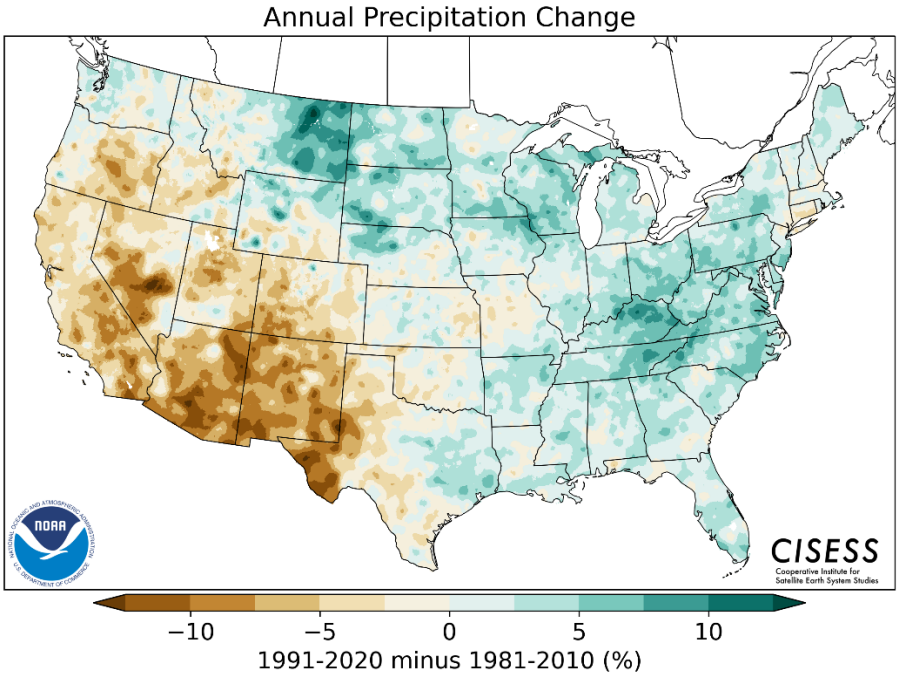


FIGURE 10: ANNUAL U.S. PRECIPITATION CHANGES BY PERCENTAGE FROM THE 1981–2010 U.S. CLIMATE NORMALS TO THE NEWEST DATA IN THE 1991–2020 NORMALS, RELEASED BY NOAA, MAY 2021.
SOURCE: NOAA, CISESS

CMIP Climate Models

To gain a better understanding of localized data and model outputs, the project team consulted data from the Coupled Model Intercomparison Project 5 (CMIP5). CMIP began in 1995 by collecting output from model "control runs," in which climate change is held constant.[23] CMIP5 incorporates coupled atmosphere-ocean general circulation models that allow for climate simulations as well as adjustments to changes in climate forcing, such as increasing atmospheric carbon dioxide.[24] CMIP5 model data is grouped by emissions scenarios ranging from RCP2.6 to RCP8.5, with RCP2.6 simulating lower carbon dioxide emissions and a lower population growth rate and RCP8.5 simulating higher carbon dioxide emissions and population through the end of the 21st century. The project team downloaded and processed data from the U.S. Bureau of Reclamation's Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections (DCHP) website for grids corresponding to Lowndes County to analyze and downscale outputs for variation across the county for measures related to temperature and precipitation change.[25] The team analyzed two scenarios:

- Baseline Projections: based on observed data for the period between 1950 to 2005
- Future Projections: based on future model predictions for the period between 2050 and 2099

For each projection scenario, measures analyzed by the project team included the following:

- Average Annual Mean Temperature
- Average Annual Maximum Temperature
- Average Number of Days per Year above 95°F
- Average Total Annual Precipitation
- Average Number of Baseline "Very Heavy" Precipitation Events per Year

Overall, each measure had higher values in the future projection period than the baseline projection period. The next section details the output for Lowndes County.

RESULTS FOR VALDOSTA AND LOWNDES COUNTY

The CMIP5 data corresponds to models under the RCP8.5 (higher emissions) scenario and includes data for precipitation and temperature around Lowndes County on a grid-by-grid basis (see Figure 11). Each grid is 1/8 degree latitude by 1/8 degree longitude. This data was collected to determine the degree of variation across Lowndes County. In summary, the projections on the following page show that Lowndes County is expected to experience heavier and more frequent rainfall and to have a warmer summer climate with more days above 95°F in the future.

[23] World Climate Research Programme (2020). Coupled Model Intercomparison Project 5 (CMIP5).
[24] Ibid.
[25] U.S. Bureau of Reclamation (2021). Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections.

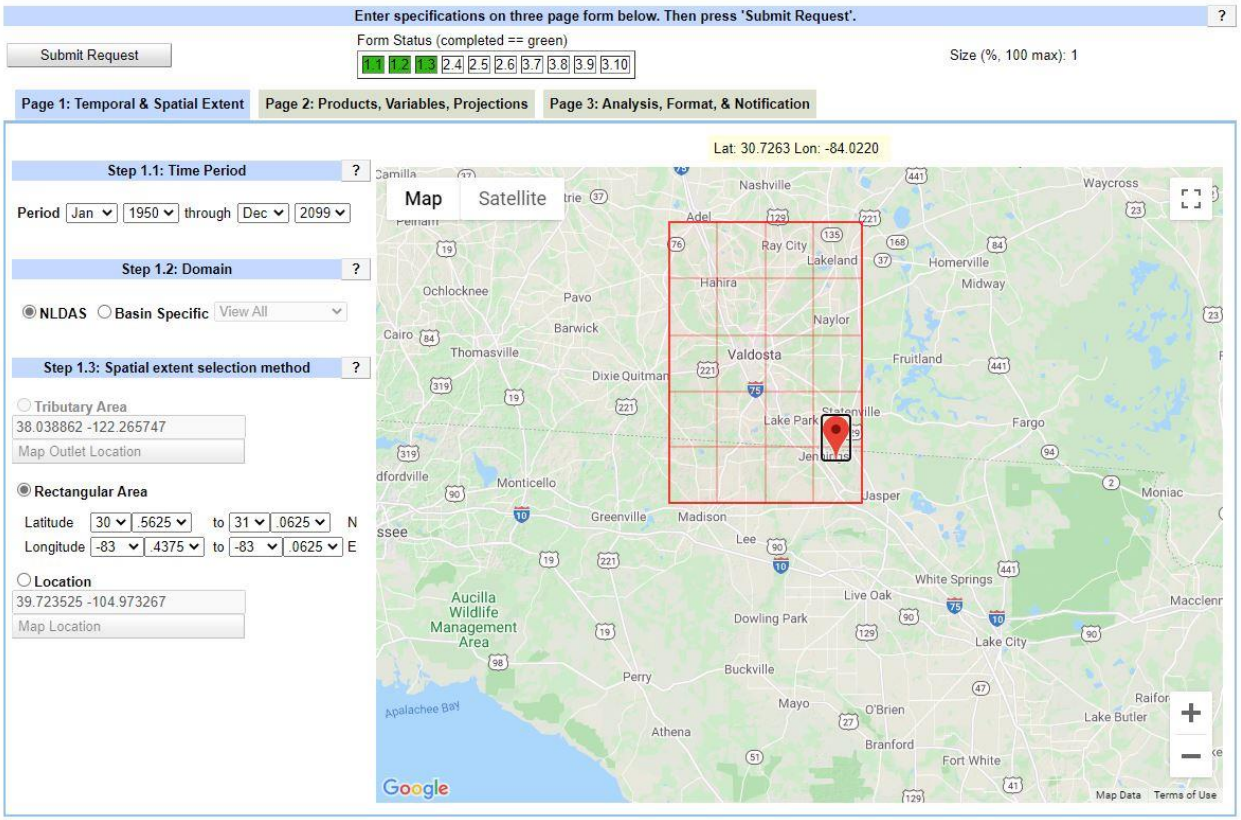


FIGURE 11: CMIP GRIDS FOR LOWNDES COUNTY
SOURCE: U.S. BUREAU OF RECLAMATION

For grids across Lowndes County, the average annual mean temperature for the baseline projection ranges from 66.52°F to 67.53°F and an average of 66.97°F. This increases for the future projection period with ranges from 73.28°F to 74.44°F and an average of 73.77°F. The average annual maximum temperature ranges in the baseline projection ranges from 78.98°F to 79.77°F and an overall average of 79.29°F. This increases in the future projection period, from 85.80°F to 86.74°F and an overall average of 86.17°F. The average number of days per year above 95°F in the baseline projection period ranges from 13.88 days to 17.02 days with an average of 15.45 days. This significantly increases in the future projection period with a range from 110.35 days to 115.94 days and an average of 112.87 days.

With respect to precipitation, the average total annual precipitation is expected to increase by approximately an inch throughout Lowndes County. For the baseline projection period, annual precipitation values range from 49.24 inches to 51.85 inches, with an average of 50.30 inches. This increases for the future projection period, with values ranging from 49.98 inches to 52.99 inches and an average of 51.12 inches. The average number of "very heavy" precipitation events per year is also expected to increase between the two periods: a range of 10.22 to 10.89 events and overall average of 10.65 events per year for the baseline projection, compared to a range of 11.15 to 12.21 events, with an average of 11.78 events per year for the future projection period.

Vulnerability Assessment and Adaptation Framework

The Federal Highway Administration (FHWA) developed the Vulnerability Assessment and Adaptation Framework as a guide for agencies, including state departments of transportation (DOTs) and metropolitan planning organizations (MPOs), to evaluate the vulnerability of their transportation assets to climate stressors such as extreme heat and flooding. In turn, this helps agencies develop strategies, policies, and measures to increase the resilience of the most vulnerable assets. The latest edition of the framework was released by FHWA in 2017.[26]

The primary tasks involved in a vulnerability assessment following this framework are as follows and are graphically depicted in Figure 12.

1. Articulate the study objectives and define the scope of the study.
2. Compile data on the transportation assets.
3. Obtain climate data for area of study.
4. Assess the vulnerability of the assets.
5. Develop adaptation measures.
6. Integrate the findings and recommendations into agencies' practices and processes.
7. Monitor climate stressors, track adaptation measures, and periodically re-evaluate.

The Vulnerability Assessment Scoring Tool (VAST) section of this technical memorandum discusses each of these aspects of the assessment. Additionally, two case studies in Ohio and Austin, Texas explore how this framework was used by local jurisdictions to conduct their own vulnerability assessments.

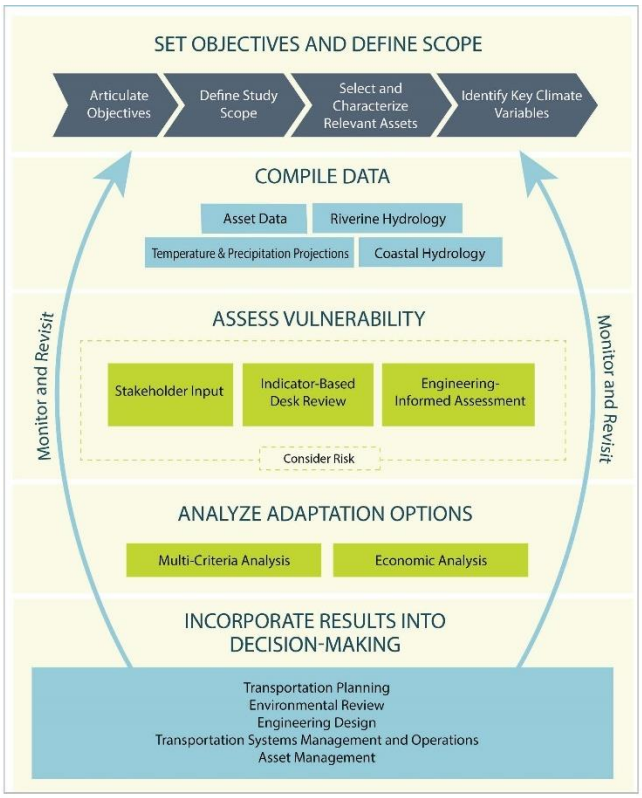


FIGURE 12: FHWA VULNERABILITY AND ADAPTATION FRAMEWORK
SOURCE: FHWA

Climate Stressors

The project team consulted the USDOT's Transportation Climate Change Sensitivity Matrix developed for Phase 2 of the U.S. Department of Transportation's Gulf Coast project to understand infrastructure sensitivity to temperature and precipitation changes. The matrix documents the sensitivity of transportation modes and sub-modes to four climate variables, including heavy precipitation and heat events.[27]

[26] FHWA (2017). Vulnerability Assessment and Adaptation Framework, Third Edition.
[27] USDOT (2014). Transportation Climate Change Sensitivity Matrix.

Below are key findings of the effects of extreme temperature and heavy precipitation/inland flooding on roads and bridges:

- Extreme Temperature
  - Human health and safety risk as well as possible engine/ equipment heat stress begins at approximately 85°F and becomes more critical at 105-110°F.[28]
  - Transportation infrastructure becomes more vulnerable when the heat index (combined temperature and relative humidity) is expected to be at least 105°F for 3 hours or more. Effects include, but are not limited to, thermal expansion of pavement and rutting.[29] An example is shown in Figure 13.[30]
- Precipitation/Inland Flooding
  - Heavy precipitation events can cause debris accumulation, sedimentation, erosion, scour, piping, and conduit structural damage. An example is shown in Figure 14.[31]

FIGURE 13: PORTION OF I-79 IN WEST VIRGINIA BUCKLED DUE TO EXTREME HEAT AND HUMIDITY IN 2018
SOURCE: WCHS (CHARLESTON, WV)

FIGURE 14: SR 112 IN WILCOX COUNTY, GA WASHED OUT DUE TO HEAVY PRECIPITATION IN MARCH 2020
SOURCE: GDOT

For the purposes of the Lowndes County Transportation Infrastructure Vulnerability Assessment, the project team focused on assets which SGRC and the VLMPO as well as other stakeholders have responsibility for maintenance and oversight. In the case of Lowndes County, these assets are predominantly roadways and bridges. For roadways and bridges, pavement and material thresholds vary based on pavement and structure design. Pavement binders, for example, may start to experience sensitivity as temperature increases and lead to pavement rutting, cracking, and other structural deficiencies.

[28] OFCM (Office of the Federal Coordinator for Meteorological Services and Supporting Research) (2002). Weather Information for Surface Transportation: National Needs Assessment Report (No. FCM-R18-2002). *U.S. Department of Commerce / National Oceanic and Atmospheric Administration.*
[29] Peterson, T.C., M. McGuirk, T.G. Houston, A.H. Horvitz, and M.F. Wehner (2008). Climate variability and change with implications for transportation. Transportation Research Board.
[30] Taylor, A. (2018). I-79 reopens after repairs made from road buckle caused by heat, humidity. *WCHS.*
[31] Birmingham, N. (2020). From the Water's Edge: Rebuilding State Route 112 Washout in Southwest Georgia. *GDOT Extra Mile Blog.*

Case Studies

In order to inform the methodology for the Lowndes County Transportation Infrastructure Vulnerability Assessment, the project team reviewed similar vulnerability studies completed by two peer agencies – Capital Area Metropolitan Council (CAMPO) in Austin, Texas and the Ohio Department of Transportation (ODOT). The following case studies summarize how each agency utilized FHWA's Vulnerability Assessment and Adaptation Framework and Vulnerability Assessment Scoring Tool (VAST) to evaluate (or assess) the vulnerability of critical transportation assets to extreme temperature and precipitation. These summaries describe how each agency delineated critical assets, which climate stressors were used and how they were quantified, and the resulting recommendations, policies, and outcomes of each effort. The case studies have provided guidance and serve as best practices for the development of the Lowndes County Transportation Infrastructure Vulnerability Assessment.

Capital Area MPO, Austin, TX

The Capital Area Metropolitan Planning Organization (CAMPO) is the federally designated MPO for the Austin, Texas area. In 2015, CAMPO, in partnership with the City of Austin Office of Sustainability, applied for and received a grant from FHWA to assess the vulnerability of the region's transportation system to climate change and extreme weather. The result of this effort was the Central Texas Extreme Weather and Climate Change Vulnerability Assessment of Regional Transportation Infrastructure.[32] Completed alongside the region's long-range transportation plan update, this robust vulnerability assessment informed the policies, strategies, and project recommendations for the region's policies and infrastructure.

The assets evaluated for this vulnerability assessment include roadways and bridges within the MPO. The climate-related stressors considered are flooding, drought, extreme heat, wildfire, and extreme cold (icing). Indicators for each of these climate stressors are shown in Figure 15.

Stressor	Indicator
Flooding[1]	Modeled available freeboard for future rain event; or
	Vertical proximity to the 100-year floodplain; or
	Demonstrated past exposure (anecdotal)
Drought	Projected change in average summer soil moisture
	Projected change in number of dry days per year
Extreme Heat	Projected change in number of days per year ≥ 100° F
	Projected change in average seven-day maximum temperature
Wildfire	Wildfire Threat (TxWRAP)
	Projected change in average summer soil moisture
Extreme Cold (icing)	Projected change in number of "ice days" (days with both freezing temperatures and non-trace precipitation) per year

FIGURE 15: CAMPO CLIMATE STRESSORS AND INDICATORS

[32] Capital Area MPO (2015). Central Texas Extreme Weather and Climate Change Vulnerability Assessment of Regional Transportation Infrastructure.

The project consultant team utilized a hybrid approach and conducted a data-driven "desktop" analysis that was supplemented by stakeholder input to delineate critical assets and identify vulnerabilities. CAMPO consulted the City of Austin and the Texas Department of Transportation (TxDOT) to help identify critical facilities that connect people to jobs and services, support special events, provide access to emergency services, and support the local and regional economies. These are facilities that, if taken out of service, would significantly disrupt mobility and have other negative impacts on quality of life in the area. Based on these criteria, nine roadway segments were delineated as critical facilities.

To measure the exposure of these assets to future climate conditions, the team utilized the Weather Research and Forecasting (WRF) regional climate model to simulate future conditions for several locations in central Texas, including Austin. The team developed a series of possible future climate scenarios to analyze the performance of the transportation system under different potential future conditions, reflecting the variability associated with climate projections. The selection of climate variables corresponded to stressors and design thresholds identified as part of stakeholder discussions. The climate scenarios indicated that average annual temperatures in central Texas were projected to rise by about 2.7°F by 2050. Precipitation forecasts for central Texas were more variable due to the localized nature of rain events.

Exposure: *measures whether an asset experiences direct impacts from climate change*

Sensitivity: *measures how the asset fares when exposed to a climate variable*

Adaptive capacity: *measures the asset's ability to cope with climate variability or longer-term climate change*

The exposure indicators chosen for the vulnerability analysis included:

- Flood exposure indicators
  - Demonstrated anecdotal past exposure
  - Vertical proximity to the 100-year floodplain
  - Modeled potential for a future rain event
- Extreme heat exposure indicators
  - Projected change in number of days above 100°F
  - Projected change in the average seven-day maximum temperature

The team consulted with stakeholders to help define sensitivity and adaptive capacity indicators with thresholds. Flood sensitivity thresholds were based on TxDOT design policy and included proximity to 25- and 100-year flood zones, structure type, and roadway functional classification. Extreme heat thresholds were based upon the ability of the asphalt pavement binders to withstand extreme heat (100°F) for an extended period of time. Sensitivity and adaptive capacity indicators are shown in Table 1 on the following page.

TABLE 1: CAMPO SENSITIVITY AND ADAPTIVE CAPACITY INDICATORS

Infrastructure Type	Sensitivity	Adaptive Capacity
Highway	Flood 1. 24-hour precipitation design threshold 2. Scour critical status (bridges) 3. Average inundation velocity 4. Post-wildfire conditions due to reduced vegetation 5. Extreme Heat 6. Pavement binder 7. Truck traffic volume	1. Asset criticality (based on stakeholder input) 2. Part of an evacuation route 3. Functional classification 4. AADT 5. Truck traffic volume 6. Detour length
Rail	1. Flood 2. Rail flood sensitivity ratings 3. Extreme Heat 4. Rail neutral temperature 5. Freight traffic volume	1. Asset criticality (based on stakeholder input) 2. Average daily ridership

The team developed preliminary risk ratings for each critical asset based on the exposure, sensitivity, and adaptive capacity indicators. For each of the nine critical assets, the team developed a grid-based risk matrix for each climate stressor based upon the exposure, sensitivity, and adaptive capacity scores. The matrix was a qualitative tool to separately consider the likelihood and consequence of exposure for each climate stressor, and compare these measures among different climate stressors. For example, a highway segment may be projected to be highly exposed to extreme heat, but based on the characteristics such as the pavement binder and volume of traffic, the consequence of the exposure may be low. That same highway segment may be located within a floodplain, having a high likelihood of exposure to flood events, and serve as an evacuation route, resulting in a high consequence of exposure. This methodology produced varying degrees of risk rating for each asset by climate stressor, ranging from “none” to “high.”

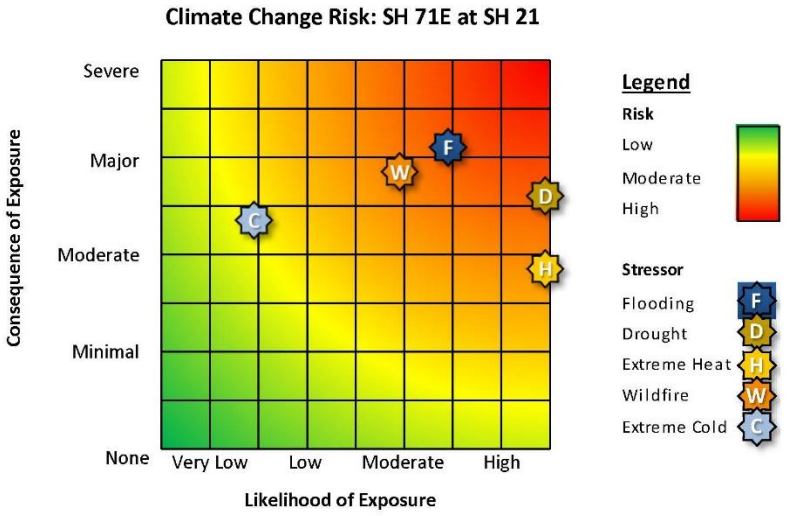


FIGURE 16: CAMPO EXAMPLE RISK MATRIX

ID	Asset	Flooding	Drought	Heat	Wildfire	Extreme Cold
2	MetroRail Red Line at Boggy Creek	Moderate-High	Inconclusive	Moderate	None	Low-Moderate
3	SH 71E at SH 21	High	Moderate-High	Low-Moderate	Moderate-High	Low-Moderate
4	I-35 at Onion Creek Parkway	Low	None	None	Moderate-High	Low-Moderate
5	US 290W/SH 71 - Y at Oak Hill	Moderate	Moderate	None	High	Low
6	Loop 360/RM 2222	Moderate	Moderate	None	High	Low-Moderate
7	FM 1431 at Brushy Creek/Spanish Oak Creek	None	Moderate	Low	Moderate-High	Low
8	US 281 and SH 29 Intersection	Moderate-High	Low	Low	Moderate	Low
9	US 183 north of Lockhart	Low-Moderate	High	Low-Moderate	Moderate-High	Low-Moderate
10	SH 80 (San Marcos Highway) at the Blanco River	Moderate	Low	Low	Moderate	Low

FIGURE 17: CAMPO RISK RATING SUMMARY

The CAMPO report outlines next steps and adaptation strategies for the critical assets. For assets vulnerable to high heat, recommendations include ongoing monitoring of temperatures and pavement conditions to better understand the impact of extreme heat on roadways. Other strategies presented include considering installation of rail temperature monitors, increasing the rail neutral temperature, and implementing similar measures to mitigate impact to vulnerable railways. For assets vulnerable to flooding, the report recommends that as a next step, the MPO should conduct more in-depth study of high-risk assets to consider measures such as elevating the assets or increasing drainage capacity.

The report also highlights lessons learned and outlines potential next steps toward enhancing the resilience of the Austin region's transportation infrastructure. The recommendations include expanding the scope of collaboration, incorporating extreme weather considerations in the 2040 long-range transportation plan, expanding the VAST tool to additional City and County roads, and evaluating adaptation options. The 2040 CAMPO long-range transportation plan (LRTP) incorporated findings from this effort as a planning consideration alongside issues such as system preservation, freight movement, and environmental justice.[33] Suggested approaches for the MPO to further resiliency in transportation planning include advancing best practices in mitigating the effects of highly plastic soil on area roadways, evaluating minor arterials and other minor roads for localized flooding risks and developing applicable mitigation strategies, and collaborating with local and regional research partners.[34] Additionally, an action plan item calls for increasing resilience to extreme weather by evaluating the adequacy of potential wildfire and flood evacuation routes, identifying opportunities to increase system redundancy and alternate routes, and advancing best practices in addressing drought-related impacts on the transportation system. The updated 2045 CAMPO LRTP was completed in 2020 and continues to build upon the vulnerability assessment.[35]

Ohio DOT

The Ohio Department of Transportation (ODOT) completed an Infrastructure Resiliency Plan in 2016 to assess the vulnerability of transportation infrastructure to climate change and extreme weather events. For this effort, ODOT utilized VAST to rank the vulnerability of transportation assets based on threat levels.[36]

ODOT consulted numerous stakeholders within the agency as well as MPOs across the state. Within ODOT, stakeholders included the Office of Tech Services, Office of Systems Planning and the Office of Statewide Planning, which provided data inventories and insights on materials design and long-range planning processes. The ODOT District maintenance staff helped to identify recurring hazards to transportation assets and areas of particular concern across the state. ODOT design staff helped to identify the sensitivity of infrastructure and adaptive solutions for addressing sensitivities. MPOs across the state were included in the stakeholder process to incorporate their own asset management and climate resiliency projects.

The Infrastructure Resiliency Plan references a variety of sources of climate forecasting research and models as well as expert testimony. ODOT examined projected climate data from the Intergovernmental Panel on Climate Change's (IPCC) Couple Model Intercomparison Project (CMIP3) and referenced other sources such as the National Climate Assessment and the Ohio River Basin Climate Change Project, developed by the National Oceanic and Atmospheric Agency. The four key climate effects outlined in the report include the following:

- Increasing average temperatures
- Increasing heavy storm events
- Increasing frequency and duration of droughts
- Declining Lake Erie water levels

[33] Capital Area MPO (2015). CAMPO 2040 Regional Transportation Plan, p. 143-148.
[34] Ibid, p. 147-148.
[35] Capital Area MPO (2020). CAMPO 2045 Regional Transportation Plan, p. 24-25.
[36] Ohio Department of Transportation (2016). Ohio DOT Infrastructure Resiliency Plan.

The plan presents a list of potential impacts of climate change from each of these long-term climate trends. The report highlighted that projected increases in average temperatures would have multiple negative impacts to Ohio's transportation system including compromised pavement integrity, power failures, sagging bridges, buckling railroads, and disruption in construction project schedules.[37] Likewise, the forecasted increase in the frequency of precipitation events in Ohio could potentially lead to slope erosion and slope runoff, roadway flooding, increased potholes, washed out culverts and damaged bridges, and overcapacity of stormwater systems.

The Infrastructure Resiliency Plan includes examined bridges, culverts, and highways in the state, assessing the sensitivity, exposure, and adaptive capacity of each type of asset, and consequences of climate-related impacts. ODOT identified bridges and culverts along state routes, compiled from the National Bridge Inventory (NBI) and Ohio Bridge Inventory. The highway dataset was filtered to include only those highway segments that have at least a 0.25-mile contiguous section with the FEMA 100-year flood plain. It was also filtered to exclude highway segments that were already analyzed as part of a previously completed bridges and culverts analysis to eliminate duplication of results.

A total of 1,195 assets were evaluated based on indicators for exposure, sensitivity, and adaptive capacity, considering numerous factors, such as proximity to wetlands, pavement condition, traffic volume, and whether the assets provide access to critical facilities (defined as regional hospitals and medical centers). For each asset, a score was assigned for each indicator; these were then averaged and weighted to produce a score for each component (exposure, sensitivity, and adaptive capacity). The resulting component scores were averaged and summed to calculate a vulnerability score for the asset (see Figure 18).

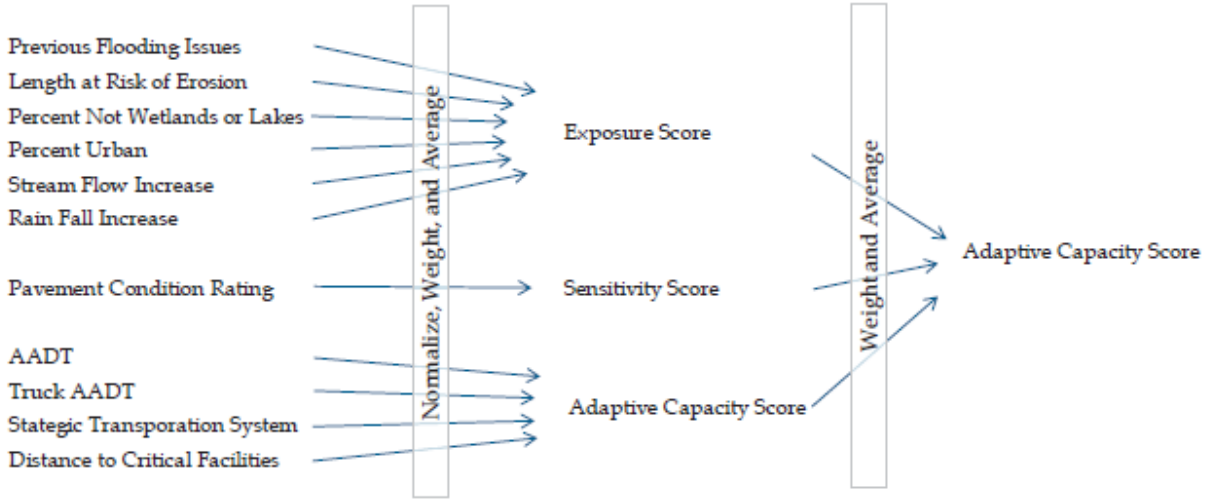


FIGURE 18: ODOT'S VAST VULNERABILITY SCORING APPROACH

This analysis produced an inventory of critical transportation facilities that were ranked according to the degree of vulnerability and importance to Ohio's overall transportation system. Within the list, ODOT highlighted the ten most vulnerable bridges, 20 most vulnerable culverts, and 20 most vulnerable highway segments in the state. The study considered short-term (2015 to 2050) and long-term (2050 to 2099) impacts to critical infrastructure. The plan recommends ongoing monitoring of top ranked

[37] Ohio Department of Transportation (2018). Access Ohio 2045 – System Resiliency White Paper, p. 9.

vulnerable assets, improved data collection for weather-related incidents that impact transportation infrastructure, ongoing VAST analyses to refine and prioritize improvements to critical facilities, and interagency coordination within ODOT (Emergency Transportation Operations, Asset Management, and District Offices) and with external partners such as the National Weather Service.

The findings from this effort were incorporated into the system performance report[38] for ODOT's long-range transportation plan, which was completed in December 2020.[39] The vulnerability analysis is one of the scenario planning approaches that consider a wide array of potential futures for Ohio's transportation network, and it aligns with the state's commitment to "proactively address transportation safety, security and environmental risks."[40]

Stakeholder Coordination

During the course of the Lowndes County Transportation Infrastructure Vulnerability Assessment, the project team consulted with stakeholders to inquire about known vulnerabilities to transportation infrastructure, to share findings of the Vulnerability Assessment, and to share draft recommendations and solicit feedback on findings and recommendations. The primary stakeholders consisted of the Emergency Management Agency Director for Lowndes County; the City Engineer, City of Valdosta; the County Engineer, Lowndes County; and the GDOT District 4 Engineer. Stakeholder coordination was conducted virtually and scheduled in consultation with SGRC.

FIGURE 19: SHILOH ROAD AT FRANKS CREEK
SOURCE: GRESHAM SMITH

Stakeholder Interview Session

At a stakeholder interview session on May 5, 2021, the project team consulted with stakeholders about known vulnerabilities to transportation infrastructure, such as bridges that are often overtopped during intense rainfalls or roadways that susceptible to damage by extreme temperatures. The roads and bridges where city and county engineers noted recurring problems were recorded in geospatial format, and this feedback informed identification of critical transportation assets for the Vulnerability Assessment. The discussion primarily on flooding rather than temperature, as there was a greater historical record of flooding events within the county.

The stakeholders discussed several flood-prone roads and bridges, including Shiloh Road at Franks Creek (see Figure 19), Jumping Gully Road at Jumping Gully Creek, Morven Road at the Little River, and the three bridges along Clyattville-Nankin Road at the Withlacoochee River.

GDOT Coordination

To gain a better understanding of how roadways are designed to account for temperatures which are warmer than average, the project team reached out to the GDOT Office of Materials and Testing. The project team and GDOT discussed pavement binders, their selection based on route type, average

[38] Ibid.
[39] Ohio Department of Transportation (2020). Access Ohio 2045 – Ohio's Transportation Plan.
[40] Ibid, p. 31.

annual daily traffic (AADT), and truck percentages, and their durability with respect to heat waves. The project team referenced GDOT Standard Specifications for Construction of Transportation Systems to establish pavement binder thresholds which were used for the temperature component of the Vulnerability Assessment.[41]

Technical Advisory Committee (TAC)

On June 2, 2021, the project team presented preliminary findings of the Vulnerability Assessment scoring process and collected feedback on draft recommendations to the VLMPO Technical Advisory Committee (TAC), which includes the Valdosta City Engineer, Lowndes County Engineer, and GDOT District 4 Engineer. The TAC directed questions to the project team regarding the preliminary findings and recommendations. To conclude this stakeholder engagement effort, and the project team refined recommendations as presented in this technical memorandum.

[41] GDOT (2021). Standard Specifications for Construction of Transportation Systems.

Vulnerability Assessment Scoring Tool

The primary objective of this task is to evaluate the vulnerability of critical transportation assets within Lowndes County through an indicator-based vulnerability screening. The project team accomplished this by utilizing the US DOT Vulnerability Assessment Scoring Tool (VAST).[42] VAST is a spreadsheet-based tool that provides a framework for DOTs and MPOs to conduct vulnerability assessments of select transportation assets within their network. The tool involves collecting CMIP5 data for information on projected climate change. The next step is to select climate stressors - in this case, temperature change and precipitation change. Next, indicators are chosen for each climate stressor to quantify the level of exposure, sensitivity, and adaptive capacity for critical transportation assets. Exposure, sensitivity, and adaptive capacity are the three components of vulnerability as established in the case studies and in the FHWA Vulnerability Assessment and Adaptation Framework, and these components were largely supported within this Vulnerability Assessment through existing datasets provided by SGRC, GDOT, and USGS, among other agencies. Once raw data is entered into the spreadsheet tool, the data is weighted and scored based on relevant thresholds and whether any indicators carry more or less significance than others. The output of this process is an inventory of critical assets with an exposure scoring schema with a range of values reflecting sensitivity and adaptive capacity of the asset to the climate stressor.

Data Collection

The project team worked with SGRC's Valdosta Lowndes Regional (VALOR) GIS staff to acquire, analyze, and map geospatial data for the Vulnerability Assessment. Data included transportation infrastructure and relevant attributes (i.e., functional classification and level of service), critical facilities, contour lines, elevation profiles, and jurisdictional boundaries within Lowndes County. In addition to data collected from within SGRC, the project team also consulted other datasets such as the National Landcover Database's (NLCD) Impervious Surface raster layer, FEMA flood zones, USDOT's National Bridge Inventory, and GDOT's Traffic Analysis and Data Application (TADA) to collect data to fulfill the exposure, sensitivity, and adaptive capacity components of VAST.

As previously discussed under the Climate Trends section of this technical memorandum, the project team consulted CMIP5 data to fulfill the exposure component of the VAST tool. Two scenarios were analyzed including:

- Baseline Projections (based on observed data for the period between 1950 to 2005)
- Future Projections (based on future model predictions for the period between 2050 and 2099)

Measures analyzed by the project team included the following:

- Average Annual Mean Temperature
- Average Annual Maximum Temperature
- Average Number of Days per Year above 95°F
- Average Total Annual Precipitation
- Average Number of Baseline "Very Heavy" Precipitation Events per Year

[42] FHWA (2015). Vulnerability Assessment Scoring Tool.

Assets for VAST

SGRC GIS staff provided a spatial inventory of transportation assets in Lowndes County, including all relevant attributes. The project team utilized this data to identify critical components of the transportation network, including roadways and bridges with a focus on assets that would be eligible for federal funding for improvements. The project team delineated assets with logical termini to run through the VAST tool. As part of this process, the project team took into account characteristics such as functional classification, traffic counts, or access to critical facilities such as hospitals, schools, governmental services, and public works facilities such as wastewater treatment plants and lift stations.

Ultimately, the project team analyzed all collector and arterial streets within Lowndes County and bridge facilities which carry collector or arterial streets. The project team analyzed 221 road segments (see Figure 20) and 101 bridges through the VAST tool (see Figure 21). Lists of these assets are shown in Appendix A for roadways and Appendix B for bridges.

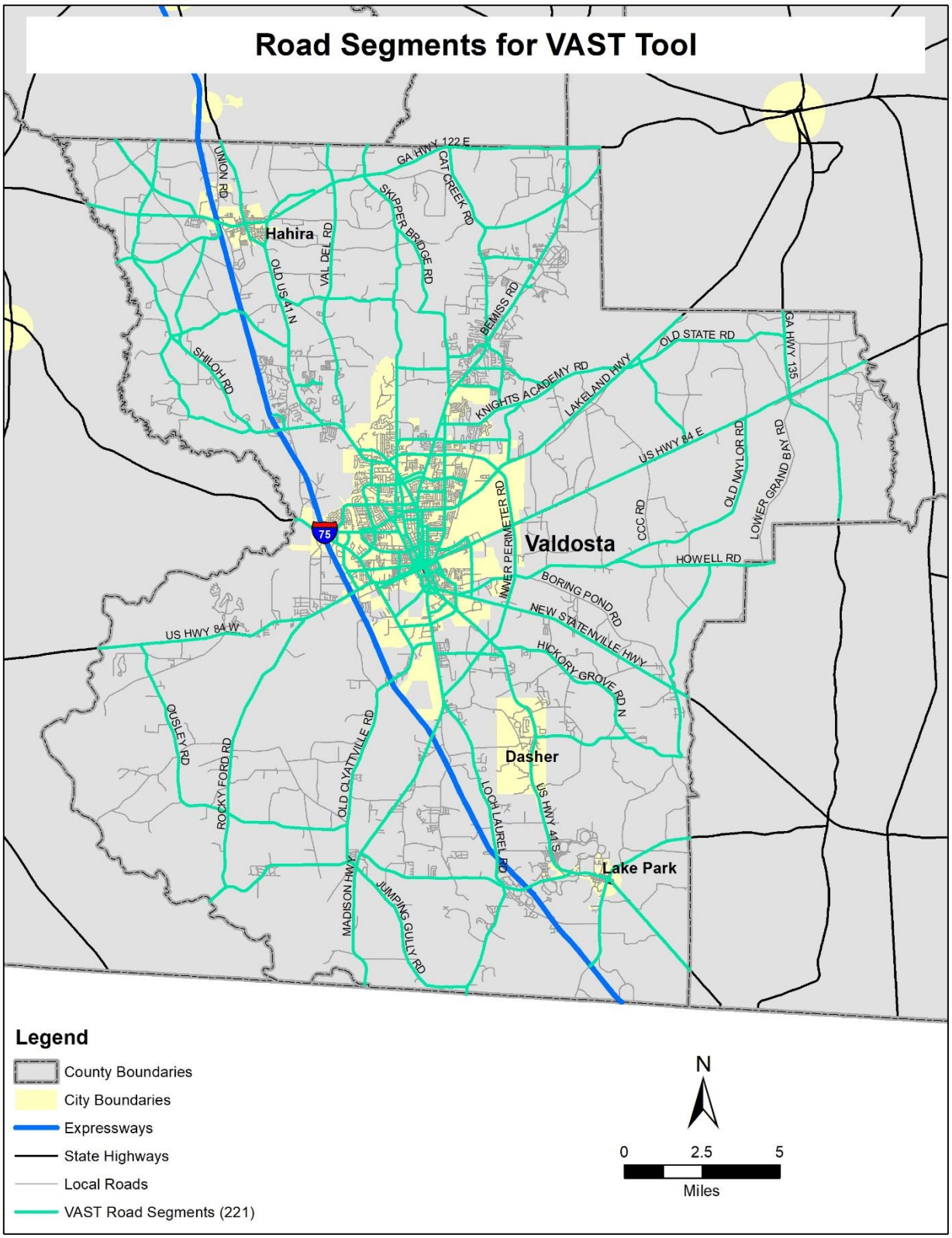


FIGURE 20: ROAD SEGMENTS FOR VAST TOOL

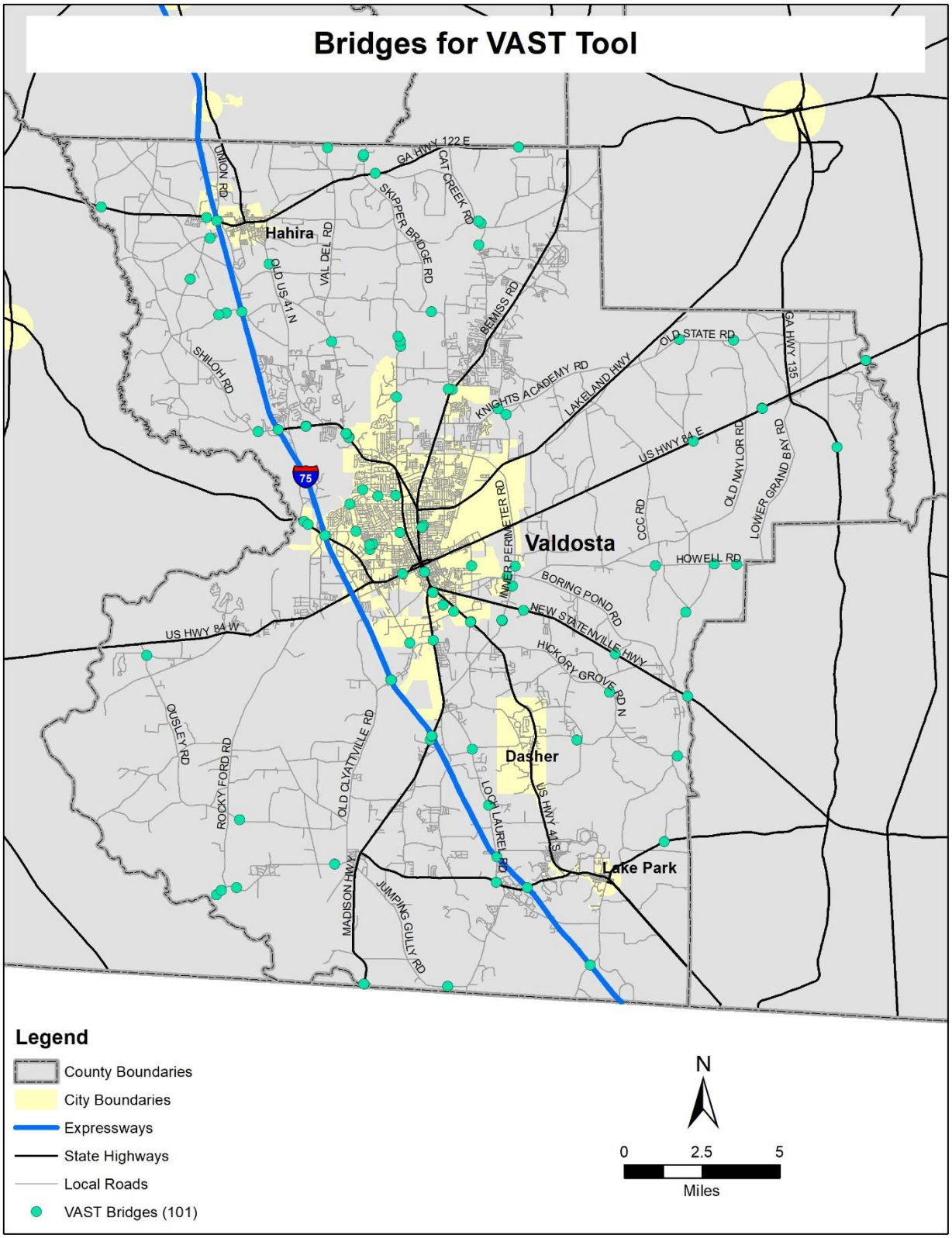


FIGURE 21: BRIDGES FOR VAST TOOL

Indicators

VAST is an indicator-based screening tool that examines three components of critical assets – exposure, sensitivity, and adaptive capacity – to assess the assets' vulnerability. Each component of vulnerability has their own distinct indicators for each type of transportation asset. Table 2 shows the indicators which the project team utilized to evaluate roads while Table 3 shows indicators utilized to evaluate bridges. An overview of indicators for roadway and bridge assets is shown in Appendix C.

TABLE 2: EXPOSURE, SENSITIVITY, AND ADAPTIVE CAPACITY INDICATORS FOR ROADS

Roadway Assets		
Exposure	**Sensitivity**	**Adaptive Capacity**
Change in Number of Days Above 95° F	Temperature Threshold in Pavement Binder	Functional Classification
Change in Annual Max Temperature	Truck Route	Evacuation Route
Highest 7-Day Average Summer High Temperature	Flood-Prone Asset (both by Stakeholders & GIS)	Access to Critical Areas (within ½ mile)
Location Within 100-Year Flood Zone	% Impervious Surface	Average Annual Daily Traffic (AADT)
Location Within 500-Year Flood Zone		Base (2015)/Future (2045) LOS
Change in Annual Total Precipitation		

TABLE 3: EXPOSURE, SENSITIVITY, AND ADAPTIVE CAPACITY INDICATORS FOR BRIDGES

Bridge Assets		
Exposure	**Sensitivity**	**Adaptive Capacity**
Change in Number of Days Above 95° F	Temperature Threshold in Pavement Binder	Functional Classification
Change in Annual Max Temperature	Truck Route	Evacuation Route
Highest 7-Day Average Summer High Temperature	Flood-Prone Asset (both by Stakeholders & GIS)	Access to Critical Areas (within ½ mile)
Location Within 100-Year Flood Zone	% Impervious Surface	Base (2015)/Future (2045) LOS
Location Within 500-Year Flood Zone	Bridge Age & Condition	Replacement Cost
Change in Annual Total Precipitation	Scour Rating	Detour Length
	Channel Condition	
	Overtopping Frequency	

EXPOSURE

The exposure component of the VAST tool measures the degree to which an asset is exposed to extreme weather events based on climate projections. The Lowndes County Transportation Infrastructure Vulnerability Assessment relies on CMIP5 data pulled for grids corresponding to Lowndes County for the exposure component of the analysis. For each asset, the closest grid point to each asset was utilized to assign projected precipitation values for each indicator. The project team utilized a countywide average for temperature since there was less geographic variability across the county compared to precipitation measures. The following measures were ultimately used for each road and bridge asset:

- Temperature
  - Change in Number of Days Above 95° F
  - Change in Average Annual Max Temperature
  - Highest 7-Day Average Summer High Temperature
- Precipitation
  - Location Within 100-Year Flood Zone
  - Location Within 500-Year Flood Zone
  - Change in Annual Total Precipitation

SENSITIVITY

The sensitivity component examines the degree of damage that a road or bridge would experience if exposed to temperature or precipitation. Two indicators were used to measure sensitivity of roads and bridges to extreme heat. The first is whether or not the road segment/bridge is part of a truck route per the Vision2045 Metropolitan Transportation Plan.[43] Truck routes are included as a sensitivity indicator to account for the effect on the ability to move and deliver goods to locations within Lowndes County. The second is the temperature threshold in pavement binders, which was based on if the roadway was above or below 25,000 AADT.

Three indicators were used to measure the sensitivity of roads and bridges to heavy precipitation. These include whether the road segment or bridge was identified as a flood-prone asset during the stakeholder interview session; whether the road segment or bridge has experienced past flood events (as shown in Figure 6Figure 6: Lowndes County Flood Frequency); and the percentage impervious surface based on the most recent version of the National Land Cover Database released in 2016.

For bridges, five additional indicators from the National Bridge Inventory (NBI) were used to evaluate sensitivity to heavy precipitation – bridge age, bridge condition, scour rating, overtopping frequency, and channel condition. Further detail is provided in Appendix C.

ADAPTIVE CAPACITY

The adaptive capacity of a critical transportation asset refers to its ability to adjust to changing climate conditions and moderate potential damage to the overall system. For roadways and bridges, adaptive capacity was examined through functional classification, whether a road/bridge is part of an evacuation route, whether a road/bridge is within a ½-mile buffer of a critical facility, average annual daily traffic (AADT), and base year (2015) and future year (2045) level-of-service (LOS).[44]

[43] SGRC (2020). Vision2045 – The Valdosta-Lowndes Metropolitan Transportation Plan, Figure 11.
[44] LOS was based volume-to-capacity ratios calculated through the statewide travel demand model run completed as part of the Vision2045 Metropolitan Transportation Plan to calculate level-of-service (LOS).

For bridges, two additional adaptive capacity indicators from the NBI dataset were examined – replacement cost and detour length. Replacement cost relates the bridge to the availability of financial resources to address damage to a bridge while detour length factors in the amount of delay experienced due to either damage or closure to a bridge facility.

Results

This section of the technical memorandum summarizes the results of the VAST scoring tool based on the type of critical infrastructure, the climate stressor and the projection period. Baseline projections are based on observed data between 1950 and 2005 while future projection periods are based on projected values between 2050 and 2099. Vulnerability is presented on a scale of zero to four, with four being the most vulnerable. These scores measure how vulnerable an asset is to changes in temperature and to changes in precipitation. Low exposure correlates to a score of 1 to 2, moderate exposure correlates to a score of 2 to 3, and high exposure correlates to a score above 3.

ROADS

Figure 22 summarizes road vulnerability between the baseline and future projection periods for both temperature and precipitation changes. The figure shows that 121 road segments are not exposed to extreme temperature for the baseline projections while there are 17 road assets highly exposed to extreme temperature in the future. For precipitation, there is a slight increase in the number of road segments with low and moderate exposure between the baseline and future projections.

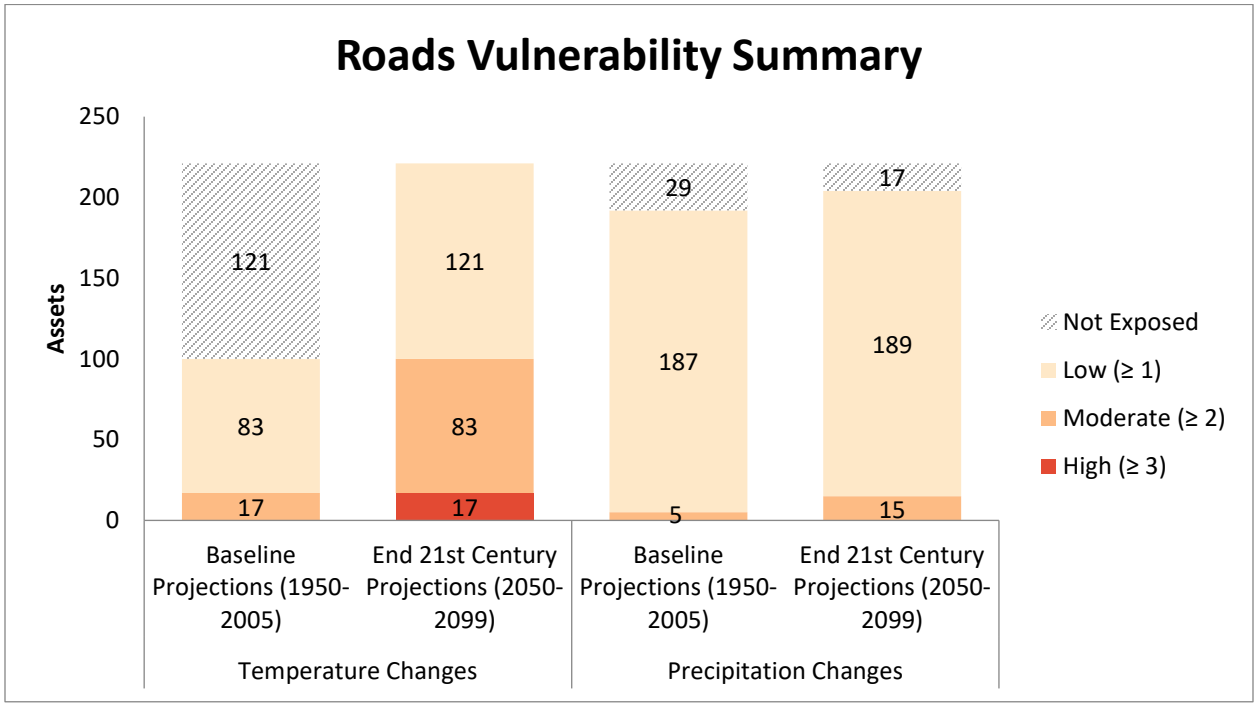


FIGURE 22: ROADS VULNERABILITY SUMMARY

Temperature

Baseline Projections

The top ten vulnerable road segments to temperature changes based on baseline projections are shown in Table 4 and mapped in Figure 23. Each of these segments are principal arterials with scores ranging from 2.3 to 2.6, indicating moderate vulnerability to temperature change. Roads with multiple appearances in the table include North Valdosta Road (US 41/SR 7) and Bemiss Road (SR 125), which are both critical to accessing I-75 and Moody AFB, respectively.

TABLE 4: TOP 10 ROAD SEGMENTS VULNERABLE TO TEMPERATURE CHANGES – BASELINE PROJECTIONS (1950-2005)

ID	Name	Score
137	N VALDOSTA RD (From N Oak St Ext to Country Club Rd)	2.6
139	N VALDOSTA RD (From Country Club Rd to Old US 41)	2.6
194	US HWY 41 S (From Echols County Line to SR 376)	2.5
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	2.5
10	BEMISS RD (From Knights Academy Rd to Skipper Bridge Rd)	2.4
9	BEMISS RD (From Inner Perimeter Rd (US 41/SR 7) to Knights Academy Rd)	2.4
14	BEMISS RD (From Davidson Rd/Moody AFB South Entrance to Radar Site Rd/Moody AFB Main Entrance)	2.4
15	BEMISS RD (From Radar Site Rd/Moody AFB Main Entrance to New Bethel Rd)	2.4
81	INNER PERIMETER RD (From N Valdosta Rd (US 41/SR 7) to N Oak St Ext)	2.4
11	BEMISS RD (From Skipper Bridge Rd to Studstill Rd)	2.3

Note: Those roadways shown in red are vulnerable to both temperature and precipitation changes.

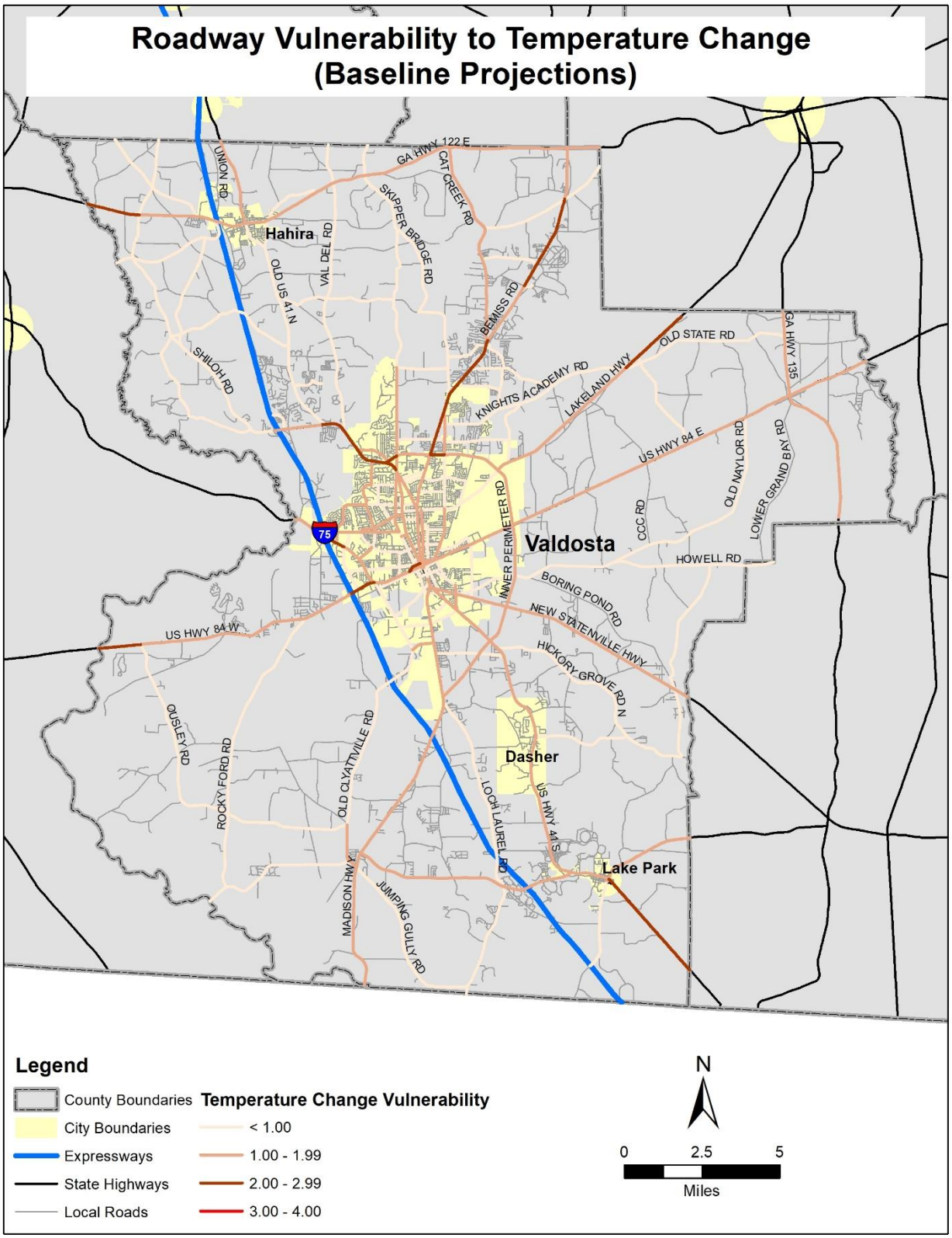


FIGURE 23: ROADWAY VULNERABILITY TO TEMPERATURE CHANGE (BASELINE PROJECTIONS)

Future Projections

The top ten vulnerable road segments to temperature changes based on future projections are shown in Table 5 and are mapped in Figure 24. The rankings include the same roadway facilities as those for the baseline projections, with the scores changing to reflect higher exposure (score of 3 or greater) towards the end of the 21st century. These roadways are in the top ten in both projections primarily because they are principal or minor arterials within Lowndes County that are projected to carry higher traffic volumes and operate at decreasing level-of-service (LOS) in the future.

TABLE 5: TOP 10 ROAD SEGMENTS VULNERABLE TO TEMPERATURE CHANGES – FUTURE PROJECTIONS (2050-2099)

ID	Name	Score
137	N VALDOSTA RD (From N Oak St Ext to Country Club Rd)	3.6
139	N VALDOSTA RD (From Country Club Rd to Old US 41)	3.6
194	US HWY 41 S (From Echols County Line to SR 376)	3.5
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	3.5
10	BEMISS RD (From Knights Academy Rd to Skipper Bridge Rd)	3.4
9	BEMISS RD (From Inner Perimeter Rd (US 41/SR 7) to Knights Academy Rd)	3.4
14	BEMISS RD (From Davidson Rd/Moody AFB South Entrance to Radar Site Rd/Moody AFB Main Entrance)	3.4
15	BEMISS RD (From Radar Site Rd/Moody AFB Main Entrance to New Bethel Rd)	3.4
81	INNER PERIMETER RD (From N Valdosta Rd (US 41/SR 7) to N Oak St Ext)	3.4
11	BEMISS RD (From Skipper Bridge Rd to Studstill Rd)	3.3

Note: Those roadways shown in red are vulnerable to both temperature and precipitation changes.

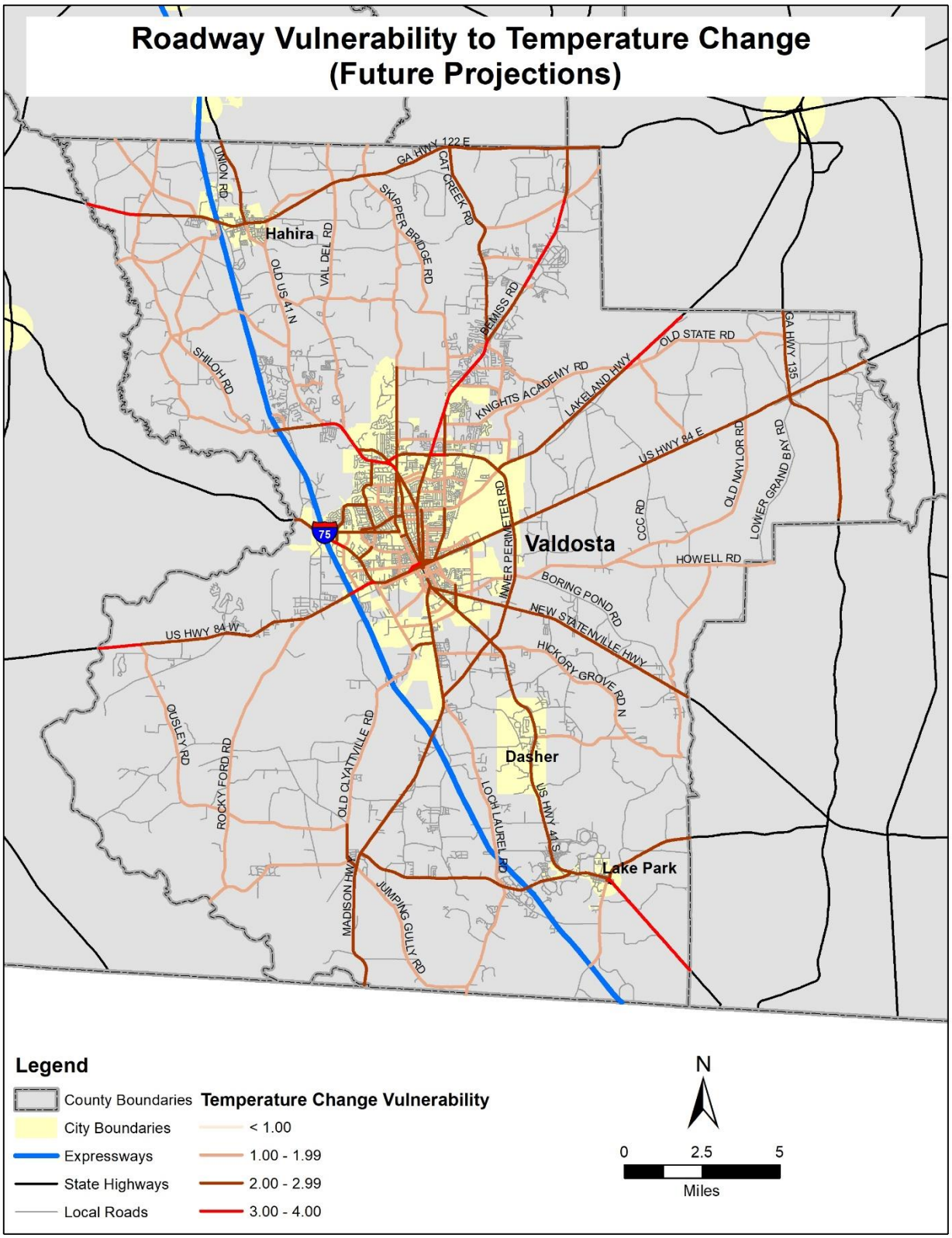


FIGURE 24: ROADWAY VULNERABILITY TO TEMPERATURE CHANGE (FUTURE PROJECTIONS)

Precipitation

Baseline Projections

The top ten vulnerable road segments to changes in precipitation based on baseline projections are shown in Table 6 and are mapped in Figure 25. The road segments below have scores ranging from 1.9 to 2.5, indicating that seven of these roads have moderate vulnerability to precipitation change for the baseline projections. Several of these roads include crossings with rivers or creeks that are prone to flooding or have experienced flooding in the past. An example of this is the Gornto Road segment (ranked second), which includes the flood-prone bridge at Sugar Creek.

TABLE 6: TOP 10 ROAD SEGMENTS VULNERABLE TO PRECIPITATION CHANGES – BASELINE PROJECTIONS (1950-2005)

ID	Name	Score
135	N ST AUGUSTINE RD (From I-75 to Little River/Brooks County Line)	2.5
67	GORNTO RD (From NS RR Crossing to Jerry Jones Dr)	2.4
117	N ASHLEY ST (From E Magnolia St to Bemiss Rd)	2.3
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	2.2
152	OLD CLYATTVILLE RD (From Airport Rd to Old Clyattville Rd)	2.0
114	MORVEN RD (From Little River/Brooks County Line to SR 122)	2.0
86	JAYCEE SHACK RD (From E Park Ave to Northside Dr)	2.0
178	S PATTERSON ST (From Gil Harbin Industrial Blvd to James Beck Overpass)	1.9
180	SHILOH RD (From I-75 to Miller Bridge Rd)	1.9
2	BAYTREE RD (From Gornto Rd to NS RR Crossing)	1.9

Note: Those roadways shown in red are vulnerable to both temperature and precipitation changes.

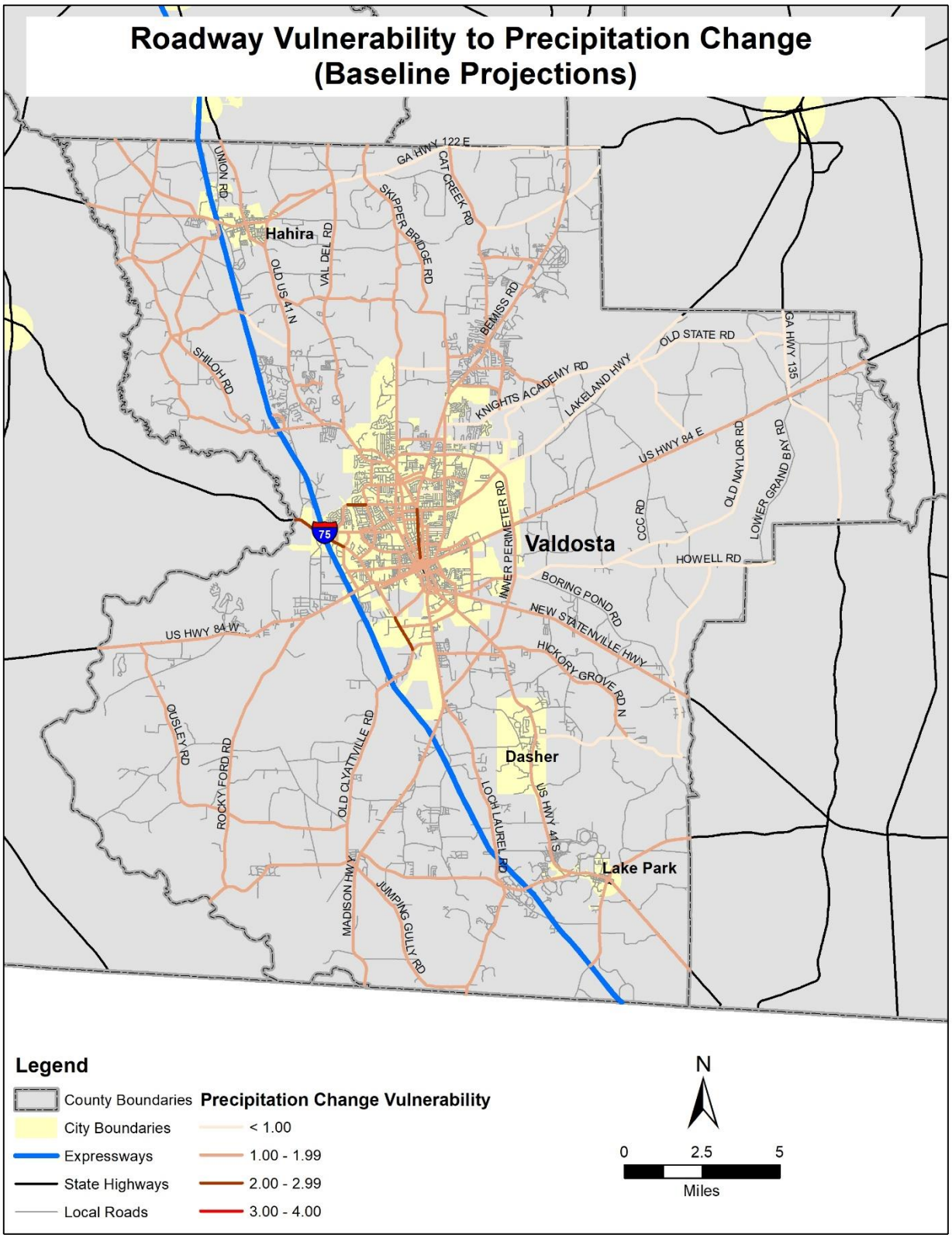


FIGURE 25: ROADWAY VULNERABILITY TO PRECIPITATION CHANGE (BASELINE PROJECTIONS)

Future Projections

The top ten vulnerable road segments to changes in precipitation based on future projections are shown in Table 7 and mapped in Figure 26. The road segments below are largely the same as in the baseline projection period, with the exception of N. St. Augustine Road (SR 133) between Lankford Drive and Norman Drive. Each of these roadways has moderate exposure to precipitation for the future projection period. Old Clyattville Road (ID 152) is not included as part of the top ten vulnerable road segments within the future projection period because of lower sensitivity and adaptive capacity ratings compared to other assets in the preceding and below tables.

TABLE 7: TOP 10 ROAD SEGMENTS VULNERABLE TO PRECIPITATION CHANGES – FUTURE PROJECTIONS (2050-2099)

Precipitation Changes		
ID	**Name**	**Score**
135	N ST AUGUSTINE RD (From I-75 to Little River/Brooks County Line)	2.6
67	GORNTO RD (From NS RR Crossing to Jerry Jones Dr)	2.6
117	N ASHLEY ST (From E Magnolia St to Bemiss Rd)	2.4
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	2.3
114	MORVEN RD (From Little River/Brooks County Line to SR 122)	2.2
180	SHILOH RD (From I-75 to Miller Bridge Rd)	2.2
86	JAYCEE SHACK RD (From E Park Ave to Northside Dr)	2.1
178	S PATTERSON ST (From Gil Harbin Industrial Blvd to James Beck Overpass)	2.1
2	BAYTREE RD (From Gornto Rd to NS RR Crossing)	2.0
133	N ST AUGUSTINE RD (From Lankford Dr to Norman Dr)	2.0

Note: Those roadways shown in red are vulnerable to both temperature and precipitation changes.

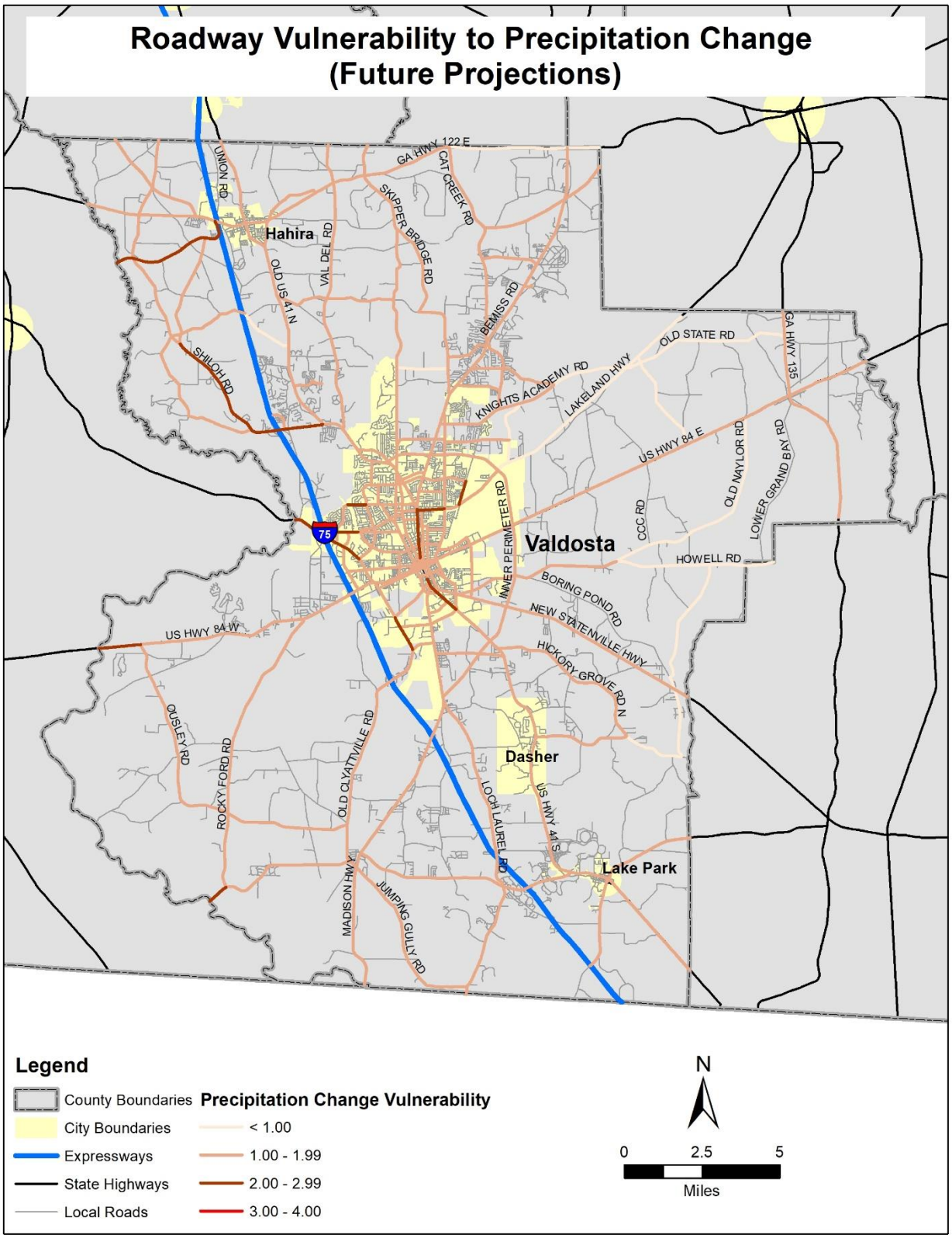


FIGURE 26: ROADWAY VULNERABILITY TO PRECIPITATION CHANGE (FUTURE PROJECTIONS)

BRIDGES

Figure 27 shows bridge vulnerability to temperature and precipitation changes for both baseline and future projection periods. It shows that 53 bridges are not exposed to temperature changes in the baseline projections while 7 bridge assets are anticipated to be highly exposed to extreme temperature in the future. For precipitation, there is an increase in the number of bridges with low and moderate exposure between the baseline and future projections. The number of bridges with low exposure increases from 57 bridges to 73 bridges, while the number of bridges with moderate exposure increases from 16 bridges to 21 bridges.

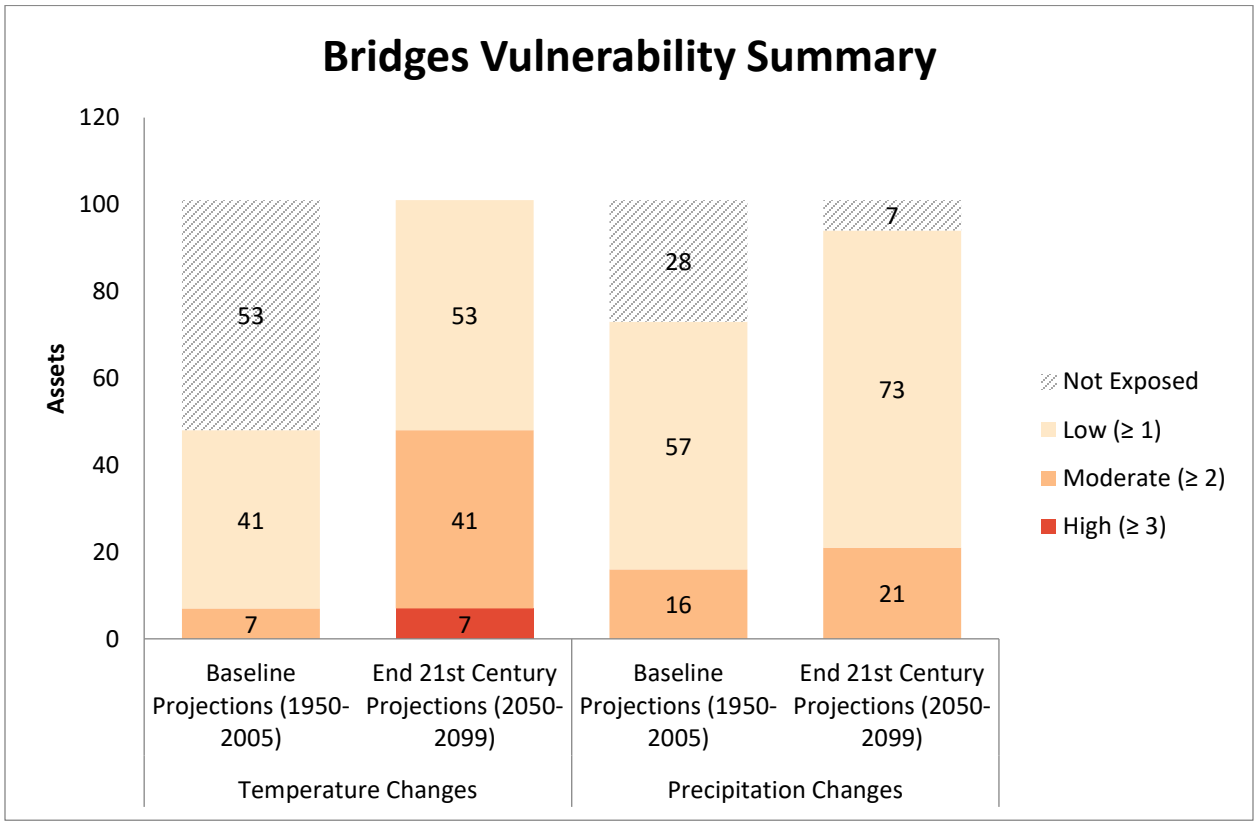


FIGURE 27: BRIDGES VULNERABILITY SUMMARY

Temperature

Baseline Projections

The top ten bridges vulnerable to temperature changes based on baseline projections are shown Table 8 and mapped in Figure 28. Multiple bridges are located along North Valdosta Road (US 41/SR 7), including all bridges at the Withlacoochee River and the Withlacoochee River overflow floodplain. Other notable bridges susceptible to temperature change include the overpass on W. Hill Avenue (US 84/SR 38) over the Norfolk Southern railroad, Madison Highway (SR 31) at I-75 (Exit 11) which is currently slated for replacement, and SR 133 at the Withlacoochee River overflow floodplain. Each of the bridges has moderate vulnerability to temperature change, with the exception of Madison Highway (SR 31) at I-75 (Exit 11) and SR 133 at the Withlacoochee River overflow floodplain. Bridges listed in red are vulnerable to both temperature and precipitation change, as they are ranked within the top ten most vulnerable for both climate stressors.

TABLE 8: TOP 10 BRIDGES VULNERABLE TO TEMPERATURE CHANGES – BASELINE PROJECTIONS (1950-2005)

ID	Name	Score
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	2.4
18500040	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER O/F	2.4
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	2.4
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	2.4
18500290	BEMISS RD (SR 125) @ CHERRY CREEK	2.3
18550930	N VALDOSTA RD (US 41/SR 7) @ I-75 (EXIT 22)	2.1
18550920	W MAIN ST (SR 122) @ I-75 (EXIT 29)	2.0
18550870	W HILL AVE (US 84/SR 38) @ NORFOLK SOUTHERN RAILROAD	1.9
18500120	MADISON HWY (SR 31) - (NBL) @ I-75 (EXIT 11)	1.8
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	1.8

Note: Those bridges shown in red are vulnerable to both temperature and precipitation changes.

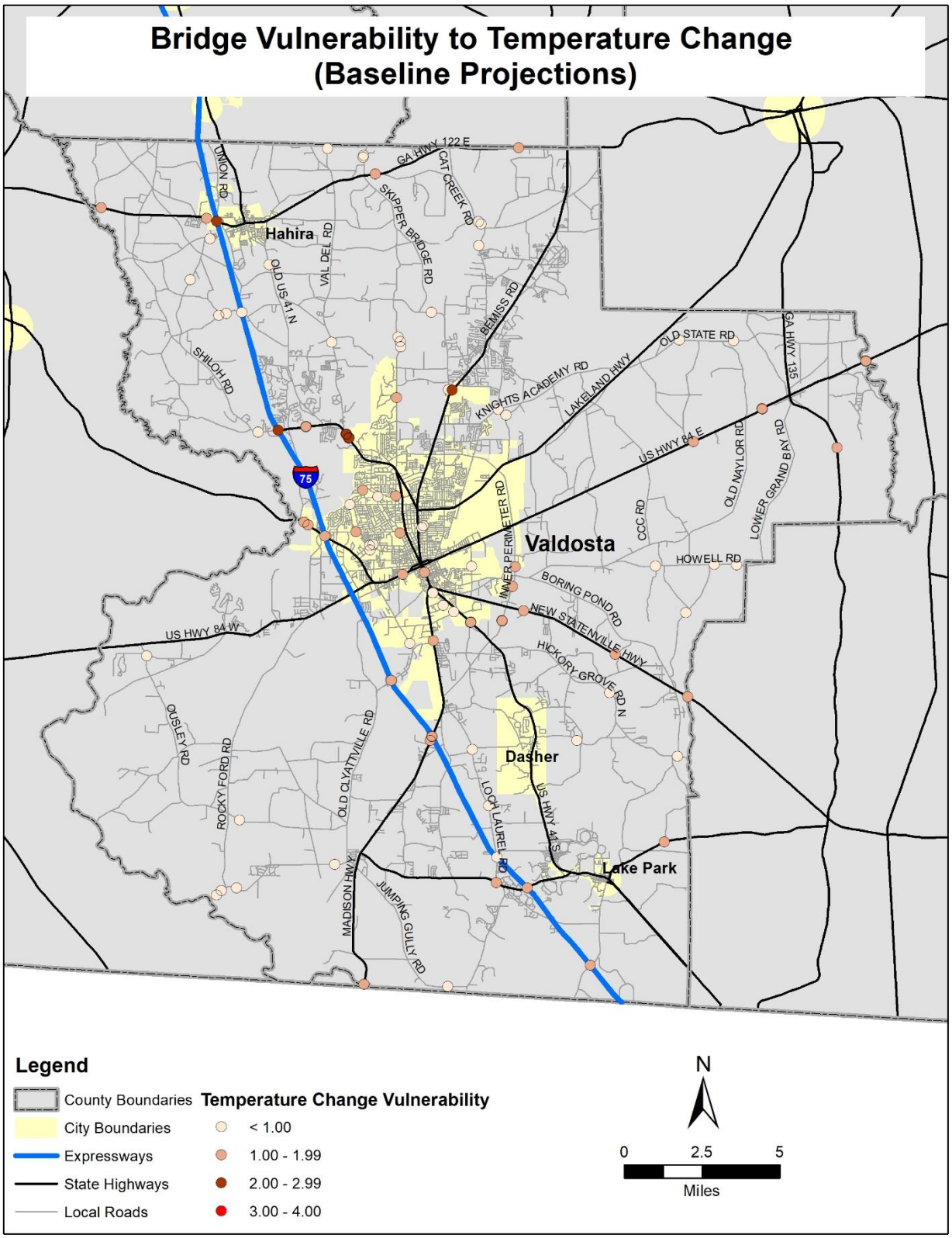


FIGURE 28: BRIDGE VULNERABILITY TO TEMPERATURE CHANGE (BASELINE PROJECTIONS)

Future Projections

The top ten road segments vulnerable to temperature changes based on future projections are shown in Table 9 and mapped in Figure 29. These bridges closely echo those from the baseline projections, with scores changing to reflect more moderate to high vulnerability to temperature change.

TABLE 9: TOP 10 BRIDGES VULNERABLE TO TEMPERATURE CHANGES – FUTURE PROJECTIONS (2050-2099)

ID	Name	Score
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	3.4
18500040	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER O/F	3.4
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	3.4
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	3.4
18500290	BEMISS RD (SR 125) @ CHERRY CREEK	3.3
18550930	N VALDOSTA RD (US 41/SR 7) @ I-75 (EXIT 22)	3.1
18550920	W MAIN ST (SR 122) @ I-75 (EXIT 29)	3.0
18550870	W HILL AVE (US 84/SR 38) @ NORFOLK SOUTHERN RAILROAD	2.9
18500120	MADISON HWY (SR 31) - (NBL) @ I-75 (EXIT 11)	2.8
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	2.8

Note: Those bridges shown in red are vulnerable to both temperature and precipitation changes.

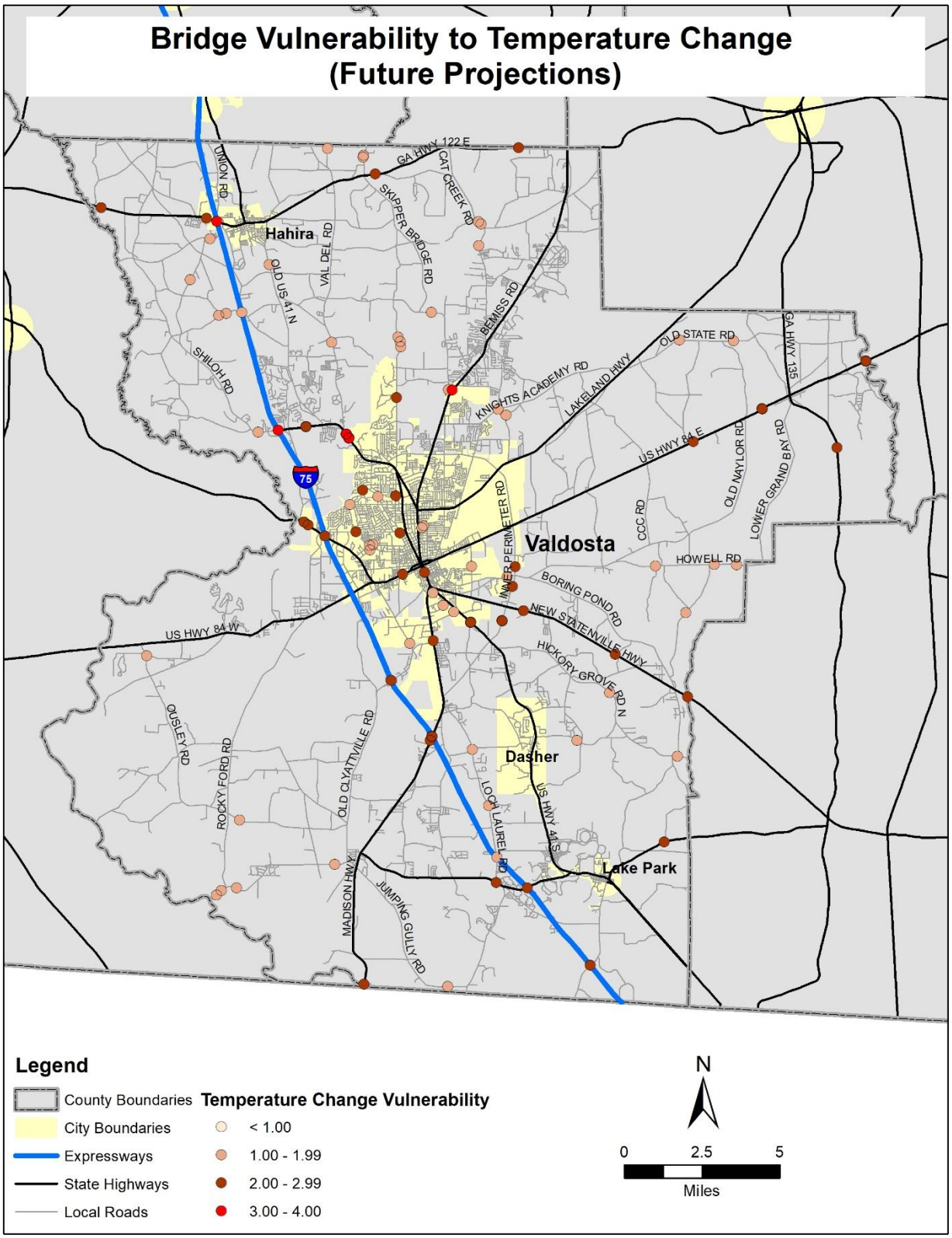


FIGURE 29: BRIDGE VULNERABILITY TO TEMPERATURE CHANGE (FUTURE PROJECTIONS)

Precipitation

Baseline Projections

The top ten bridges vulnerable to changes in precipitation based on baseline projections are shown in Table 10 and are mapped in Figure 30. Several of these bridges have flooded in the past, including the most vulnerable bridge in Lowndes County, Gornto Road at Sugar Creek. There are several bridges located along collector roads in the City of Valdosta, including Baytree Road at Sugar Creek, Jerry Jones Drive at Two Mile Creek, or the millpond, and Lankford Drive at Sugar Creek. The bridge that carries Madison Highway (SR 31) across the Withlacoochee River into Florida is also vulnerable to heavy precipitation.

TABLE 10: TOP 10 BRIDGES VULNERABLE TO PRECIPITATION CHANGES – BASELINE PROJECTIONS (1950-2005)

ID	Name	Score
18500770	GORNTO RD @ SUGAR CREEK	2.6
18500780	BAYTREE RD @ SUGAR CREEK	2.4
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	2.4
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	2.4
18550600	SR 133 @ WITHLACOOCHEE RIVER	2.4
18500820	JERRY JONES DR @ TWO MILE CREEK	2.3
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	2.3
18550880	MADISON HWY (SR 31) @ WITHLACOOCHEE RIVER	2.3
18500800	LANKFORD DRIVE @ SUGAR CREEK	2.2
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	2.2

Note: Those bridges shown in red are vulnerable to both temperature and precipitation changes.

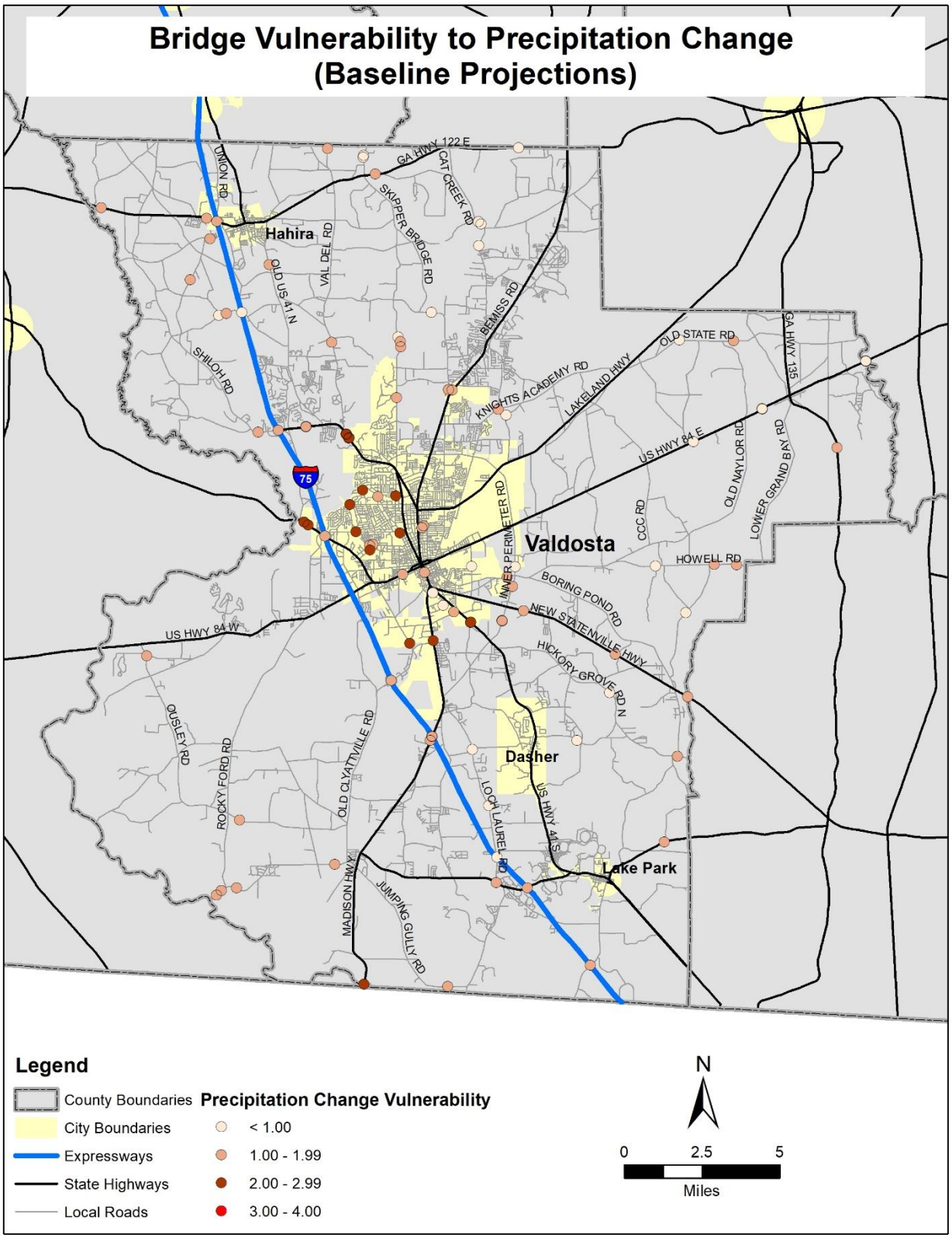


FIGURE 30: BRIDGE VULNERABILITY TO PRECIPITATION CHANGE (BASELINE PROJECTIONS)

Future Projections

The top ten bridges vulnerable to changes in precipitation based on future projections are shown in Table 11 and are mapped in Figure 31. These bridges largely echo the most vulnerable bridges in the baseline projection, with higher vulnerability scores for the future projection period.

TABLE 11: TOP 10 BRIDGES VULNERABLE TO PRECIPITATION CHANGES – FUTURE PROJECTIONS (2050-2099)

ID	Name	Score
18500770	GORNTO RD @ SUGAR CREEK	2.8
18500780	BAYTREE RD @ SUGAR CREEK	2.6
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	2.5
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	2.5
18550600	SR 133 @ WITHLACOOCHEE RIVER	2.5
18500820	JERRY JONES DR @ TWO MILE CREEK	2.4
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	2.4
18550880	MADISON HWY (SR 31) @ WITHLACOOCHEE RIVER	2.4
18500800	LANKFORD DRIVE @ SUGAR CREEK	2.4
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	2.3

Note: Those bridges shown in red are vulnerable to both temperature and precipitation changes.

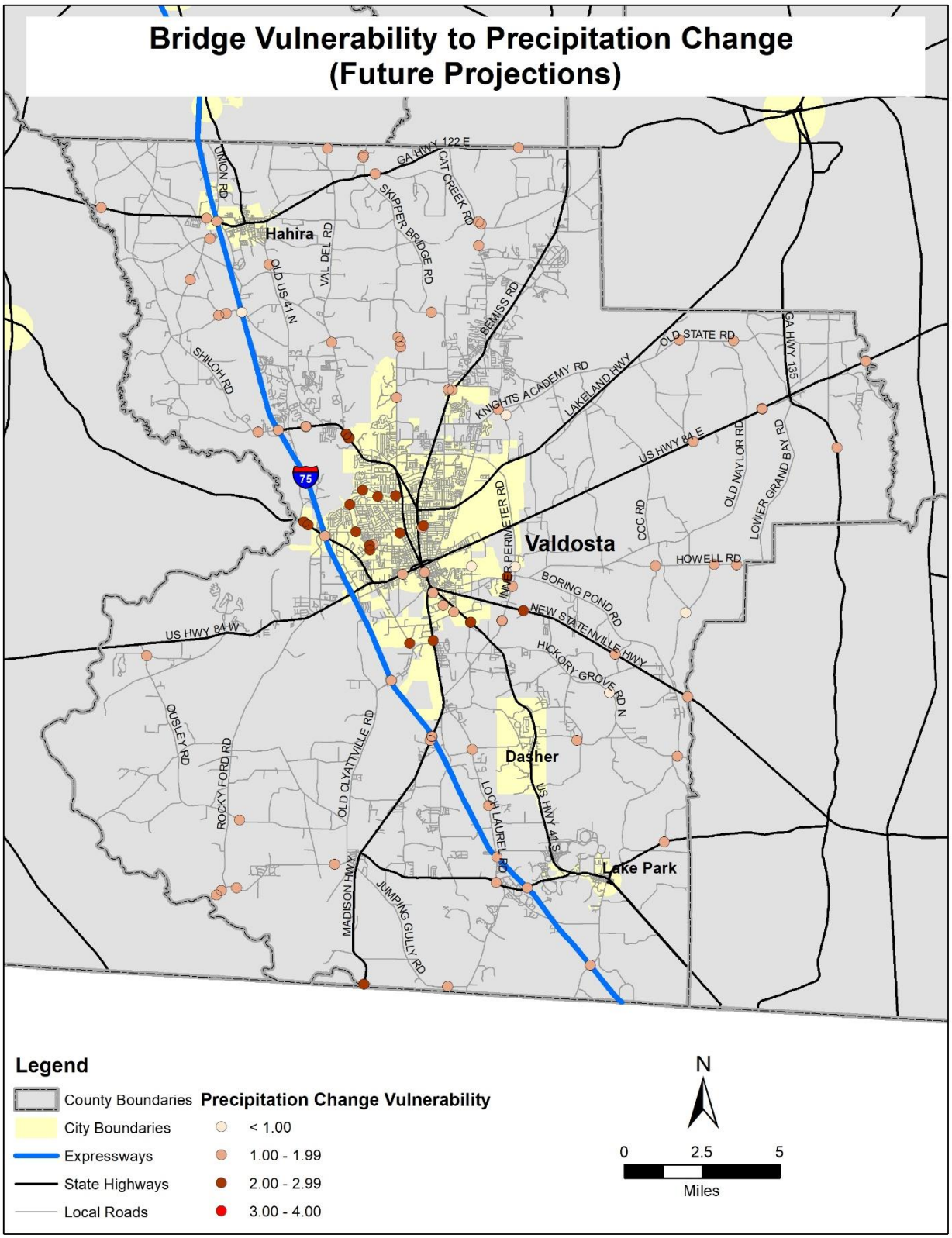


FIGURE 31: BRIDGE VULNERABILITY TO PRECIPITATION CHANGE (FUTURE PROJECTIONS)

SUMMARY OF FINDINGS

Throughout Lowndes County, there are 100 road segments that are expected to have moderate to high vulnerability to temperature change by the end of the 21st century and 15 road segments that are expected to have moderate to high vulnerability to precipitation change by the end of the 21st century. The top most vulnerable segments are located on principal arterials and major collectors including N. Valdosta Road (US 41/SR 7), Bemiss Road (SR 125), Inner Perimeter Road (US 41/SR 7), Gornto Road, Baytree Road, and N. St. Augustine Road (SR 133).

There are 48 bridges that are expected to have moderate to high vulnerability to temperature change by the end of the 21st century and 21 bridges that are expected to have moderate to high vulnerability to precipitation change by the end of the 21st century. The most vulnerable bridges are located along principal arterials and major collectors including N. Valdosta Road (US 41/SR 7), Bemiss Road (SR 125), Inner Perimeter Road (US 41/SR 7), Madison Highway (SR 31), Gornto Road, Jerry Jones Drive, Baytree Road, and N. St. Augustine Road (SR 133). If these bridges are taken out of service during an extreme weather event, some would require up to 15 miles of detour, significantly impairing mobility for travelers in Lowndes County.

Collectively, these vulnerable roads and bridges represent critical links in the transportation network for Lowndes County and the Southern Georgia region. If any of these facilities fail, there would be a wide range of impacts and cascading events, including impacts to safety; reduced access to emergency services, schools, or employment; and loss of economic productivity.

Recommendations

The project team analyzed the outcomes of the Vulnerability Assessment, and based upon the findings developed an array of high-level strategies, policies, and measures that SGRC, Lowndes County, and the City of Valdosta can undertake to address vulnerabilities for critical transportation assets. Recommendations are grouped into three categories: systems planning, asset management, and continued stakeholder engagement. The project team shared draft recommendations with stakeholders, who vetted them prior to being refined for inclusion in this technical memorandum.

Systems Planning

The VLMPO, in consultation with partner jurisdictions, can spearhead systems planning efforts to ensure vulnerable assets are incorporated into short- and long-range planning processes.

- The results from this Vulnerability Assessment should be incorporated into the Evaluation Criteria for Potential Projects as outlined in Appendix B of the Vision2045 Metropolitan Transportation Plan to further support the quantitative evaluation and prioritization of projects within Valdosta and Lowndes County. For reference, the reliability and resiliency section of this evaluation criteria is shown in Figure 32. The MPO may choose to assign one point to a project that coincides with the location of a vulnerable asset, or tie the vulnerability scores to the prioritization scoring by another methodology. During each update of the long-range transportation plan for Valdosta and Lowndes County, the MPO should revisit Vulnerability Assessment outputs and refine the project prioritization framework accordingly to account for temperature and precipitation vulnerability within the network and each asset evaluated as part of this assessment.

Reliability (includes Preservation & Enhancement) & Resiliency	30	
Project Upgrades Route to Context Sensitive /Policy Design Standards		
Project Improves Existing Route (to meet standards or best practices)	1	https://safety.fhwa.dot.gov/provencountermeasures/
Project Addresses Major Maintenance Issues	1	https://safety.fhwa.dot.gov/provencountermeasures/
Project Integrates Intelligent Technology Systems	1	https://safety.fhwa.dot.gov/provencountermeasures/
Project Operations are Sustainable (can it continue to be maintained especially technological advances)	1	FHWA INVEST
Bridge Sufficiency Rating is	> 50 = 3 50 -80 = 2 > 80 = 1	GDOT / Nat. Perf. Meas.
Road Pavement Condition is	Very Poor = 3 Fair = 2 Excellent = 1	**Measures** = **Very Poor** – Multiple Surface Defects, Deformations, Cracking, Uncomfortable with constant bumps or depressions; **Fair** – Some Surface Defects, Deformations, Comfortable with intermittent bumps or depressions, **Excellent** – Very Smooth GDOT / Nat. Perf. Meas.
*Congestion Reduction / Travel Time Reliability		
Top Priority – Addresses Corridor in Highest 25% of LOS	4	**Measure is F** TTR; NPRMDS/ RITIS TTR Index/Model
Second Priority – Addresses Corridor in Second Highest 25% of LOS	3	**Measure is E** TTR; NPRMDS/ RITIS TTR Index/Model
Third Priority – Addresses Corridor in Mid 25% of LOS	2	**Measure is D** TTR; NPRMDS/ RITIS TTR Index/Model
Fourth Priority – Addresses Corridor in Lowest 25% of LOS	1	**Measure is C** TTR; NPRMDS/ RITIS TTR Index/Model
Project incorporates congestion management/Operational Strategies		
Project Has Grade Separation or Dedicated Travel Lanes for Individual Modes	1	https://safety.fhwa.dot.gov/provencountermeasures/
Project Improves Network Connectivity	< 1.4 = 3 2.4 – 1.4 = 2 > 2.5 = 1	**Connectivity Index – Link-Node Ratio is an index of connectivity equal to the number of links (segments) divided by the number of nodes (intersections) within in a study area.** https://safety.fhwa.dot.gov/provencountermeasures/ ; https://www.vtpi.org/access.pdf
Project Provides Parallel Relief	1	**Change in Parallel V/C** https://safety.fhwa.dot.gov/provencountermeasures/
*Project Addresses Corridor with High User Delay Costs	> $1,500 = 3 $500 - $1,500 = 2 < $500 = 1	**RITIS/NPRMDS** – should be able to calculate this in RITIS based on different measures
Project Addresses a Vulnerability in the Transportation Network		
*Project Location Has Been Identified as Potential Hazard (1)	1	**Identify Natural and Human-Caused Hazards**; GIS assessment of past events (roads bridges washed out, maintenance repair costs) Identify Natural and Human-Caused Hazards
*Project Location Has Been Identified as Vulnerable or At-Risk (2)	1	**Sensitivity, Likelihood, Exposure, Consequence**; GIS assessment of past events (roads bridges washed out, maintenance repair costs) Sensitivity, Likelihood, Exposure, Consequence

FIGURE 32: EVALUATION CRITERIA FOR POTENTIAL PROJECTS FROM VISION 2045 MTP

(SOURCE: SGRC)

- The FHWA Emergency Relief (ER) Program provides for repair or reconstruction of Federal-aid roads and highways as the result of a natural disaster or manmade event. The program allows infrastructure to be rebuilt more resiliently, incorporating "betterments," if the additional cost of the betterments can be economically justified over time.[45] If roads or bridges are damaged during future events, the VLMPO should collaborate with GDOT to obtain ER funds from FHWA to rebuild infrastructure more resiliently. An example of this could be to install a more heat-resistant pavement binder on a corridor with heavy traffic that is also susceptible to pavement rutting. Additionally, the VLMPO should identify which vulnerable assets are eligible for federal funding and monitor federal funding programs that may fund resilience- or climate change-related improvements.
- The VLMPO should consider developing measures to identify populations that would be most adversely affected by disruptions to the transportation system brought upon by extreme weather events, including low-income, transportation-dependent, and minority populations. This type of analysis would advance the environmental justice planning already undertaken by the MPO. The VLMPO should incorporate the outcomes of this analysis into future Vulnerability Assessments and take the findings into account for transit planning, bicycle/pedestrian planning, and similar programs.
- The VLMPO and partner jurisdictions should explore opportunities to install green infrastructure on streets to mitigate risk in flood-prone areas. Green infrastructure is defined in Section 502 of the Clean Water Act as "the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters."[46] Green infrastructure can minimize stormwater runoff and treat it at its source through natural filtration. Examples of green infrastructure include permeable pavers, bioswales, and "green streets," which incorporate natural landscaping into the design to allow for storage and drainage of stormwater.
- Building upon this assessment, the VLMPO should utilize its travel demand model to conduct a worst case scenario impact analysis that examines the impact to the surrounding transportation network if the most vulnerable roadway and bridge assets are taken out of service. This analysis would indicate which roads would function at an unacceptable level-of-service if traffic is re-routed and travelers have to use alternate routes, and which communities could potentially be "cut off" due to lack of access.
- VLMPO should expand upon this analysis to include local streets and bridges in a subsequent vulnerability assessment. Conducting a more fine-grained analysis will likely reveal additional roadway and bridge vulnerabilities, and may highlight local communities that would lose access to critical services (emergency services, school, workplaces, etc.) in the event of a roadway or bridge closure.
- VLMPO should continue coordination with railroad operators, including Norfolk Southern Railway, CSX Transportation, and the shortline railways, to identify vulnerabilities to the rail network and opportunities for VLMPO and railroad operators to work together to help increase the resiliency of the rail network.
- Utilize the VAST tool to explore the impacts of drought, wildfire and high winds on transportation infrastructure within Lowndes County through consultation with agencies such as the United States Fish & Wildlife Service (USFWS), Georgia Department of Natural Resources (DNR), and the United States Forest Service (USFS), among others.

[45] FHWA (n.d.). FAQ: Emergency Relief Program and Resilience.
[46] EPA (2020). What is Green Infrastructure?

Asset Management

Local jurisdictions should collaborate and coordinate with the VLMPO to incorporate the Vulnerability Assessment results and findings into asset management and engineering practices, and prioritize improvements for the most vulnerable assets.

- In order to identify specific improvements needed to mitigate flood and extreme heat risks, public works staff should conduct facility-level engineering assessments of the most vulnerable assets in both the baseline and future projection periods. Potential site-specific strategies may include resurfacing a road with a higher grade pavement binder or elevating a low-lying, flood-prone bridge.

On a broader scale, local jurisdictions should consider incorporating resiliency and climate vulnerability into infrastructure design, construction, and asset management practices.

- During value-engineering processes, public works staff should consider additional expenditures for more resilient design, with the perspective that additional upfront expenditures will ultimately result in greater cost-effectiveness over the life of the asset.
- Public works staff should consider increasing the frequency of routine management and maintenance, such as debris clearance, to mitigate the impact of heavy rains for roads and bridges.
- The VLMPO and partner jurisdictions should also consider conducting a detailed review of private driveway pipes and culverts in Lowndes County, including culverts that are not large enough for inclusion on the NBI but would be impacted by heavy rains nonetheless. This analysis should assess the condition of the culverts and driveway pipes, frequency of maintenance, and their capability to handle current and projected stormwater volumes. Furthermore, the analysis should identify vulnerability and mitigation measures for roadside stormwater infrastructure within the public right-of-way (ROW).

Stakeholder Engagement

In order to continue monitoring the vulnerability of transportation assets and advance these recommendations, it will be critical to keep engaging with key stakeholders. The VLMPO and partner jurisdictions should continue discussions of how extreme weather events impact the movement of people and goods throughout Lowndes County, and potential measures to mitigate these risks. This can be achieved through the following measures:

- The VLMPO should consider instituting a standing taskforce or committee to coordinate resilience efforts across jurisdictions. This committee should include planners, engineers, asset managers, emergency management, and other partners to better understand impacts from potential disruptions. This committee should meet regularly and establish a mechanism to record disruptions to the transportation system resulting from flooding or extreme heat including, but not limited to, road washouts, bridge overtopping, and pavement rutting.
- The VLMPO should also continue coordination between Lowndes County, the City of Valdosta, and GDOT to ensure that resilient materials continue to be included in specifications utilized by the county and municipalities, and adopt other state-level resiliency best practices.
- The VLMPO should explore collaboration opportunities with local and regional research partners, such as Valdosta State University, to conduct research on vulnerability and transportation resiliency to develop innovative mitigation strategies.

Action Plan

The following action plan represents a summary of the systems planning, asset management, and stakeholder engagement recommendations .

ID	Action Strategy
	Systems Planning
SP-1	Incorporate Vulnerability Assessment scores into the VLMPO long-range transportation plan (LRTP) project evaluation criteria in order to help prioritize improvements for the most vulnerable assets.
SP-2	Incorporate improvements and mitigation, or more resilient design features, for repaired or replaced assets that utilize FHWA emergency relief (ER) funds.
SP-3	Identify vulnerable assets that may eligible for improvements through federal funding programs, and continue monitoring federal funding for programs targeted towards resilience or climate change.
SP-4	Developing measures to identify environmental justice populations that would be most adversely impacted by the loss of transportation services, and incorporate the findings into transportation planning processes.
SP-5	Explore opportunities to install green infrastructure on streets to mitigate risk in flood-prone areas.
SP-6	Utilize the VLMPO travel demand model to conduct a worst-case scenario analysis, assessing the impact to the surrounding transportation network if vulnerable roadway and bridges are taken out of service.
SP-7	Include local streets and bridges in a subsequent vulnerability assessment to help identify local communities that may lose access to critical services in the event of a roadway or bridge closure.
SP-8	Coordinate with railroad operators to identify vulnerabilities to the rail network and opportunities for VLMPO and railroad operators to collaborate to help mitigate the impacts of heavy precipitation and extreme heat.
SP-9	Utilize the VAST tool to explore the impacts of drought, wildfire and high winds on transportation infrastructure within Lowndes County through consultation with agencies such as USFWS, DNR, and USFS.
	Asset Management
AM-1	Conduct facility-level engineering assessments to identify specific improvements for the most vulnerable assets.
AM-2	During value-engineering, consider additional expenditures to design assets more resiliently for long-term service.
AM-3	Identify specific maintenance practices to help mitigate flood- and heat-related risks to assets.
AM-4	Complete detailed assessments of roadside ditches, culverts, and driveway drain pipes to identify vulnerability and mitigation measures for roadside stormwater infrastructure within the public right-of-way (ROW).
	Stakeholder Engagement
SE-1	Consider instituting a standing taskforce or committee to coordinate resilience efforts across jurisdictions.
SE-2	Continue coordination among Lowndes County, the City of Valdosta, and GDOT to ensure that resilient materials are included in design and construction specifications.
SE-3	Collaborate with local and regional research partners, such as Valdosta State University, to conduct research on vulnerability and transportation resiliency to develop innovative mitigation strategies.

Appendices

Appendix A: Roadway Assets for Vulnerability Assessment Scoring Tool

ID	Road Segment Name	Miles
1	AIRPORT RD (From Old Clyattville Rd to Madison Hwy (SR 31))	0.74
2	BAYTREE RD (From Gornto Rd to NS RR Crossing)	0.67
3	BAYTREE RD (From NS RR Crossing to Jerry Jones Dr/Melody Ln)	0.53
4	BAYTREE RD (From Jerry Jones Dr to N Oak St)	0.79
5	BEMISS KNIGHTS ACADEMY RD (From Knights Academy Rd to Studstill Rd)	1.32
6	BEMISS KNIGHTS ACADEMY RD (From Studstill Rd to Old Bemiss Rd)	0.90
7	BEMISS RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Northside Dr)	1.05
8	BEMISS RD (From Northside Dr to Inner Perimeter Rd (US 41/SR 7))	0.77
9	BEMISS RD (From Inner Perimeter Rd (US 41/SR 7) to Knights Academy Rd)	1.04
10	BEMISS RD (From Knights Academy Rd to Skipper Bridge Rd)	1.04
11	BEMISS RD (From Skipper Bridge Rd to Studstill Rd)	1.08
12	BEMISS RD (From Studstill Rd to Cat Creek Rd)	1.04
13	BEMISS RD (From Cat Creek Rd to Davidson Rd/Moody AFB South Entrance)	2.12
14	BEMISS RD (From Davidson Rd/Moody AFB South Entrance to Radar Site Rd/Moody AFB Main Entrance)	0.78
15	BEMISS RD (From Radar Site Rd/Moody AFB Main Entrance to New Bethel Rd)	2.31
16	BEMISS RD (From New Bethel Rd to SR 122)	1.66
17	BERKLEY DR (From Gornto Rd to Eager Rd)	0.63
18	BETHANY RD (From Old US 41 to Val Del Rd)	1.73
19	BORING POND RD (From SR 94 to Lake Park Rd)	0.42
20	CAT CREEK RD (From Bemiss Rd (SR 125) to Radar Site Rd)	2.67
21	CAT CREEK RD (From Radar Site Rd to SR 122)	3.98
22	CHERRY CREEK RD (From N Oak St Ext to Orr Rd)	2.46
23	CLAY RD (From Statenville Hwy (SR 94) to E Hill Ave (US 84/SR 38))	1.71
24	CLYATTVILLE LAKE PARK RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	4.88
25	CLYATTVILLE NANKIN RD (From Withlacoochee River/Brooks County Line to Rocky Ford Rd)	0.69
26	CLYATTVILLE NANKIN RD (From Rocky Ford Rd to Old Clyattville Rd)	4.45
27	COFFEE RD (From Morven Rd to SR 122)	1.43
28	COFFEE RD (From SR 122 to Cook County Line)	2.55
29	CONNELL RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Bemiss Rd)	0.78
30	COPELAND RD (From Madison Hwy (SR 31) to US 41/SR 7)	2.20
31	COUNTRY CLUB DR (From Jerry Jones Dr/Eager Rd to N Valdosta Rd (US 41/SR 7))	0.77
32	COUNTRY CLUB RD (From N Valdosta Rd (US 41/SR 7) to N Valdosta Rd (US 41/SR 7))	1.26
33	CYPRESS ST (From N Forrest St to Hollywood St)	1.04
34	DAMPIER ST (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	0.31
35	DASHER GROVE RD (From Old US 41 to End of Road)	1.07

ID	Road Segment Name	Miles
36	DAVIDSON RD (From Bemiss Rd (SR 125) to Moody AFB South Entrance)	0.28
37	DELMAR RD (From Lakeland Hwy (US 221/SR 31) to US 84/SR 38)	3.40
38	E BROOKWOOD PL (From N Troup St to N Forrest St)	0.54
39	E CENTRAL AVE (From N Forrest St to N Patterson St)	0.47
40	E COTTON AVE (From S Main St to N East St (SR 376))	0.06
41	E GORDON ST (From N Patterson St to N Forrest St)	0.90
42	E HILL AVE (From N Patterson St to N Forrest St)	0.45
43	E HILL AVE (From N Forrest St to Clay Rd/Hollywood St)	1.26
44	E HILL AVE (From Clay Rd/Hollywood St to Inner Perimeter Rd (US 41/SR 7))	1.51
45	E MAIN ST/SR 122 (From Church St (US 41/SR 7) to Val Del Rd)	3.16
46	E MOORE ST (From N Patterson St to N Ashley St (US 41 Bus/SR 7 Bus))	0.44
47	E PARK AVE (From N Ashley St (US 41 Bus/SR 7 Bus) to N Forrest St)	0.89
48	E PARK AVE (From N Forrest St to Inner Perimeter Rd)	2.18
49	E SAVANNAH AVE (From James Beck Overpass to S Fry St)	0.48
50	E VALLEY ST (From River St to N Ashley St)	0.28
51	EAGER RD (From Country Club Dr to N Oak St)	0.79
52	FORREST ST EX (From Inner Perimeter Rd (US 41/SR 7) to Bemiss Rd (SR 125))	1.33
53	FRANKS CREEK RD (From Miller Bridge Rd to Union Rd)	2.60
54	GA HWY 122 E (From Val Del Rd to Cat Creek Rd)	3.95
55	GA HWY 122 E (From SR 125 to Lanier County Line)	1.04
56	GA HWY 122 E (From Cat Creek Rd to SR 125)	3.80
57	GA HWY 122 W (From Coffee Rd to I-75)	2.46
58	GA HWY 122 W (From Little River/Brooks County Line to Coffee Rd)	1.70
59	GA HWY 135 (From Echols County Line to US 84/SR 38)	4.67
60	GA HWY 135 (From US 84/SR 38 to Lanier County Line)	2.70
61	GA HWY 376 (From Marion Ave (US 41/SR 7) to Echols County Line)	3.12
62	GEORGIA AVE (From Gornto Rd to N Oak St)	0.74
63	GIL HARBIN INDUSTRIAL BLVD (From Old Clyattville Rd to Madison Hwy (SR 31))	0.99
64	GIL HARBIN INDUSTRIAL BLVD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	0.96
65	GLENN RD (From Hickory Grove Rd to SR 94)	2.23
66	GORNTO RD (From St Augustine Rd (SR 133) to NS RR Crossing)	1.38
67	GORNTO RD (From NS RR Crossing to Jerry Jones Dr)	0.59
68	GORNTO RD (From Jerry Jones Dr to N Patterson St)	1.17
69	GUEST RD (From Bemiss Rd (SR 125) to Bemiss Knights Academy Rd)	1.41
70	HICKORY GROVE RD N (From Johnston Rd to Glenn Rd)	1.96
71	HICKORY GROVE RD N (From US 41/SR 7 to Johnston Rd)	5.72
72	HOLLYWOOD ST (From Cypress St to E Hill Ave (US 84/SR 38))	0.25
73	HOWELL RD (From New Statenville Hwy/Griffin Ave to Inner Perimeter Rd (US 41/SR 7))	1.95
74	HOWELL RD (From Lake Park Rd to Echols County Line)	2.09
75	HOWELL RD (From Inner Perimeter Rd to Old Naylor Rd)	3.41

ID	Road Segment Name	Miles
76	HOWELL RD (From Old Naylor Rd to Lake Park Rd)	3.01
77	INNER PERIMETER RD (From Madison Hwy (SR 31) to US 41/SR 7)	2.36
78	INNER PERIMETER RD (From US 41/SR 7 to SR 94)	1.26
79	INNER PERIMETER RD (From SR 94 to E Hill Ave (US 84/SR 38))	2.67
80	INNER PERIMETER RD (From E Hill Ave (US 84/SR 38) to Lakeland Hwy (US 221/SR 31))	1.88
81	INNER PERIMETER RD (From N Valdosta Rd (US 41/SR 7) to N Oak St Ext)	0.47
82	INNER PERIMETER RD (From Bemiss Rd (SR 125) to N Forrest St)	0.46
83	INNER PERIMETER RD (From N Forrest St to Lakeland Hwy (US 221/SR 31))	1.86
84	INNER PERIMETER RD (From N Oak St Ext to Bemiss Rd (SR 125))	1.09
85	IVEY RD (From Bemiss Rd (SR 125) to Old Bemiss Rd)	0.10
86	JAYCEE SHACK RD (From E Park Ave to Northside Dr)	0.79
87	JERRY JONES DR (From Baytree Rd to Gornto Rd)	0.93
88	JERRY JONES DR (From Gornto Rd to Country Club Dr)	0.84
89	JOHNSTON RD (From US 41/SR 7 to Hickory Grove Rd)	3.09
90	JUMPING GULLY RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	5.89
91	KNIGHTS ACADEMY RD (From Bemiss Rd (SR 125) to RR Crossing)	1.44
92	KNIGHTS ACADEMY RD (From RR Crossing to Studstill Rd)	2.56
93	KNIGHTS ACADEMY RD (From Studstill Rd to Lakeland Hwy (US 221/SR 31))	2.44
94	LAKE PARK BELLVILLE RD (From I-75 to E Cotton Ave)	2.91
95	LAKE PARK RD (From E Martin Luther King Jr Dr to Old Statenville Rd)	0.79
96	LAKE PARK RD (From Glenn Rd to Howell Rd)	4.06
97	LAKELAND HWY (From Inner Perimeter Rd to Knights Academy Rd)	5.32
98	LAKELAND HWY (From Knights Academy Rd to Lanier County Line)	2.43
99	LAKES BLVD (From Loch Laurel Rd to I-75)	0.81
100	LAKES BLVD (From I-75 to Marion Ave (US 41/SR 7))	1.50
101	LANKFORD DR (From St Augustine Rd (SR 133) to W Gordon St)	0.57
102	LOCH LAUREL RD (From Florida State Line to I-75)	4.75
103	LOCH LAUREL RD (From I-75 to Madison Hwy (SR 31))	5.43
104	MADISON HWY (From Florida State Line to SR 376)	4.45
105	MADISON HWY (From SR 376 to I-75)	4.42
106	MADISON HWY (From I-75 to Inner Perimeter Rd)	1.34
107	MADISON HWY (From Inner Perimeter Rd to Gil Harbin Industrial Blvd)	2.37
108	MADISON HWY (From Gil Harbin Industrial Blvd to S Patterson St (US 41 Bus/SR 7 Bus))	1.28
109	MAGNOLIA ST (From N Oak St to N Ashley St)	0.27
110	MARTIN LUTHER KING JR DR (From S Oak St to S Fry St)	0.72
111	MCMILLAN RD (From Val Del Rd to Staten Rd)	2.19
112	MELODY LN (From W Gordon St to Baytree Rd)	0.50
113	MILLER BRIDGE RD (From Shiloh Rd to Morven Rd)	3.23
114	MORVEN RD (From Little River/Brooks County Line to SR 122)	4.08
115	MT ZION CHURCH RD (From Forrest St Ext to Stallings Rd)	2.09
116	N ASHLEY ST (From E Savannah Ave to E Magnolia St)	0.34

ID	Road Segment Name	Miles
117	N ASHLEY ST (From E Magnolia St to Bemiss Rd)	1.56
118	N ASHLEY ST (From Bemiss Rd to N Oak St Ext)	1.44
119	N CHURCH ST/US 41 (From SR 122 to Cook County Line)	2.79
120	N FORREST ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.72
121	N FORREST ST (From E Park Ave to Inner Perimeter Rd (US 41/SR 7))	1.74
122	N HAGAN BRIDGE RD (From SR 122 to SR 122)	1.98
123	N LEE ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.76
124	N OAK ST (From W Hill Ave (US 84/SR 38) to Baytree Rd)	1.30
125	N OAK ST (From Baytree Rd to Gornto Rd)	0.90
126	N OAK ST (From Gornto Rd to Smithbriar Dr)	1.00
127	N OAK ST EX (From N Valdosta Rd (US 41/SR 7) to Cherry Creek Rd)	0.87
128	N OAK ST EXT/MT ZION CHURCH RD (From Cherry Creek Rd to Forrest St Ext)	1.72
129	N PATTERSON ST (From Magnolia St to Hill Ave)	0.33
130	N PATTERSON ST (From Magnolia St to Park Ave)	1.63
131	N PATTERSON ST (From Park Ave to N Oak St Ext)	1.31
132	N ST AUGUSTINE RD (From W Hill Ave (US 84/SR 38) to Lankford Dr)	0.90
133	N ST AUGUSTINE RD (From Lankford Dr to Norman Dr)	0.63
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	0.71
135	N ST AUGUSTINE RD (From I-75 to Little River/Brooks County Line)	1.10
136	N TROUP ST (From E Central Ave to Vallotton Dr)	1.10
137	N VALDOSTA RD (From N Oak St Ext to Country Club Rd)	1.49
138	N VALDOSTA RD (From I-75 to Old US 41)	1.57
139	N VALDOSTA RD (From Country Club Rd to Old US 41)	1.52
140	NEW BETHEL RD (From Cat Creek Rd to SR 125)	2.80
141	NEW BETHEL RD (From SR 125 to Lanier County Line)	1.56
142	NEW STATENVILLE HWY (From Inner Perimeter Rd (US 41/SR 7) to Echols County Line)	6.56
143	NEW STATENVILLE HWY (From S Patterson St (US 41 Bus/SR 7 Bus) to Inner Perimeter Rd (US 41/SR 7))	2.47
144	NORMAN DR (From W Hill Ave (US 84/SR 38) to Baytree Rd)	2.05
145	NORTHLAKE DR (From N Valdosta Rd (US 41/SR 7) to End of Road)	0.72
146	NORTHSIDE DR (From N Oak St to Bemiss Rd)	0.91
147	NORTHSIDE DR (From Bemiss Rd to Jaycee Shack Rd)	1.42
148	OLD BEMISS RD (From Old Pine Rd Ext to Bemiss Knights Academy Rd)	0.10
149	OLD CLYATTVILLE RD (From SR 31 to Ousley Rd)	1.49
150	OLD CLYATTVILLE RD (From Ousley Rd to I-75)	5.02
151	OLD CLYATTVILLE RD (From I-75 to Airport Rd)	1.31
152	OLD CLYATTVILLE RD (From Airport Rd to Old Clyattville Rd)	1.17
153	OLD CLYATTVILLE RD (From St Augustine Rd to S Patterson St (US 41 Bus/SR 7 Bus))	1.58
154	OLD NAYLOR RD (From Howell Rd to US 84/SR 38)	7.27
155	OLD PINE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.37
156	OLD STATE RD (From Lakeland Hwy (US 221/SR 31) to SR 135)	5.45

ID	Road Segment Name	Miles
157	OLD US 41 N (From N Valdosta Rd (US 41/SR 7) to Union Rd)	2.91
158	OLD US 41 N (From Union Rd to S Hagan Bridge Rd)	3.28
159	OLD VALDOSTA RD (From Cook County Line to Coffee Rd)	1.97
160	ORR RD (From Staten Rd to Skipper Bridge Rd)	1.65
161	OUSLEY RD (From Rocky Ford Rd to Old Clyattville Rd)	3.96
162	OUSLEY RD (From US 84/SR 38 to Rocky Ford Rd)	6.90
163	PARK AVE (From N Oak St to N Ashley St (US 41 Bus/SR 7 Bus))	0.70
164	PINEVIEW DR (From Bemiss Rd to N Forrest St)	0.83
165	RADAR SITE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.82
166	RIVER ST (From Norman Dr to St Augustine Rd (SR 133))	0.57
167	RIVER ST (From NS RR Crossing to N Oak St)	0.66
168	RIVER ST (From St Augustine Rd (SR 133) to NS RR Crossing)	0.92
169	ROCKY FORD RD (From Clyattville Nankin Rd to Ousley Rd)	2.42
170	ROCKY FORD RD (From Ousley Rd to US 84/SR 38)	6.95
171	S ASHLEY ST (From S Patterson St to E Savannah Ave)	0.40
172	S CHURCH ST (From S Hagan Bridge Rd to Main St (SR 122))	1.05
173	S FRY ST (From Lake Park Rd to N Forrest St)	0.72
174	S HAGAN BRIDGE RD (From Old US 41 to SR 122)	0.89
175	S LEE ST (From Griffin Ave to E Hill Ave (US 84/SR 38))	0.90
176	S OAK ST (From Madison Hwy (SR 31) to W Hill Ave (US 84/SR 38))	0.92
177	S PATTERSON ST (From Inner Perimeter Rd (US 41/SR 7) to Gil Harbin Industrial Blvd)	1.50
178	S PATTERSON ST (From Gil Harbin Industrial Blvd to James Beck Overpass)	1.35
179	S ST AUGUSTINE RD (From Old Clyattville Rd to W Hill Ave (US 84/SR 38))	1.32
180	SHILOH RD (From I-75 to Miller Bridge Rd)	4.43
181	SHILOH RD (From Miller Bridge Rd to Morven Rd)	3.62
182	SKIPPER BRIDGE RD (From Bemiss Rd (SR 125) to Withlacoochee River)	2.98
183	SKIPPER BRIDGE RD (From Withlacoochee River to Staten Rd)	3.46
184	SKIPPER BRIDGE RD (From Staten Rd to Cook County Line)	3.15
185	SMITHBRIAR DR (From N Oak St to N Ashley St)	0.06
186	SNAKE NATION RD (From Shiloh Rd to Miller Bridge Rd)	5.05
187	STALLINGS RD (From Lakeland Hwy (US 221/SR 31) to Knights Academy Rd)	2.18
188	STATEN RD (From Orr Rd to McMillan Rd)	2.26
189	STATEN RD (From McMillan Rd to Skipper Bridge Rd)	2.37
190	STUDSTILL RD (From Bemiss Rd (SR 125) to Knights Academy Rd)	2.80
191	TUCKER RD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	0.73
192	ULMER AVE (From S Patterson St (US 41 Bus/SR 7 Bus) to Old Statenville Rd)	0.79
193	UNION RD (From Franks Creek Rd to Old US 41)	1.82
194	US HWY 41 S (From Echols County Line to SR 376)	3.90
195	US HWY 41 S (From Lakes Blvd (SR 376) to Johnston Rd)	4.83
196	US HWY 41 S (From Johnston Rd to Inner Perimeter Rd (US 41/SR 7))	3.56
197	US HWY 84 E (From Inner Perimeter Rd (US 41/SR 7) to Delmar Rd)	6.11

ID	Road Segment Name	Miles
198	US HWY 84 E (From Delmar Rd to SR 135)	3.73
199	US HWY 84 E (From SR 135 to Lanier County Line)	2.67
200	US HWY 84 W (From Withlacoochee River/Brooks County Line to Ousley Rd)	1.34
201	US HWY 84 W (From Ousley Rd to Rocky Ford Rd)	5.41
202	US HWY 84 W (From Rocky Ford Rd to I-75)	1.73
203	VAL DEL RD (From N Valdosta Rd (US 41/SR 7) to Bethany Rd)	4.31
204	VAL DEL RD (From Bethany Rd to SR 122)	3.76
205	VAL DEL RD (From SR 122 to Cook County Line)	1.29
206	VALLOTTON DR (From N Ashley St (US 41 Bus/SR 7 Bus) to N Troup St)	0.31
207	W ALDEN AVE (From W Gordon St to N Patterson St)	1.43
208	W BROOKWOOD DR (From N Oak St to N Patterson St)	0.18
209	W CENTRAL AVE (From W Hill Ave (US 84/SR 38) to Patterson St)	0.45
210	W GORDON ST (From Lankford Dr/Melody Ln to N Patterson St)	1.39
211	W GORDON ST (From W Alden Ave to Lankford Dr/Melody Ln)	0.71
212	W HILL AVE (From I-75 to St Augustine Rd (SR 133))	0.82
213	W HILL AVE (From St Augustine Rd (SR 133) to W Central Ave)	1.21
214	W HILL AVE (From W Central Ave to Patterson St)	0.42
215	W MAIN ST (From I-75 to Church St (US 41/SR 7))	1.02
216	W MARION AVE (From Lakes Blvd (SR 376) to SR 376)	1.27
217	W SAVANNAH AVE (From NS RR Crossing to S Patterson St)	0.62
218	W SAVANNAH AVE (From St Augustine Rd to NS RR Crossing)	0.93
219	WEBB RD N (From Coffee Rd to SR 122)	1.78
220	WEST ST (From W Hill Ave (US 84/SR 38) to W Gordon St)	0.78
221	WOODROW WILSON DR (From N Patterson St to Bemiss Rd)	0.50

Appendix B: Bridge Assets for Vulnerability Assessment Scoring Tool

ID	Bridge Name & Location
18500010	US 41 BUS/SR 7 BUS - (NBL) @ MUD CREEK
18500020	JAMES BECK OVERPASS (US 41 BUS/SR 7 BUS)
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F
18500040	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER O/F
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER
18500070	N VALDOSTA RD (US 41/SR 7) - (NBL) @ CSX RAILROAD
18500080	N VALDOSTA RD (US 41/SR 7) - (SBL) @ CSX RAILROAD
18500110	MADISON HWY (SR 31) @ SWAMP CREEK
18500120	MADISON HWY (SR 31) - (NBL) @ I-75 (EXIT 11)
18500130	MADISON HWY (SR 31) - (SBL) @ I-75 (EXIT 11)
18500140	MADISON HWY (SR 31) @ MUD CREEK
18500160	US 84/SR 38 (WBL) @ GRAND BAY CREEK
18500200	N ST AUGUSTINE RD (SR 133) @ I-75 (EXIT 18)
18500210	SR 94 @ KNIGHT CREEK
18500220	SR 94 @ MUD CREEK TRIB
18500290	BEMISS RD (SR 125) @ CHERRY CREEK
18500300	SR 135 @ TY BRANCH
18500320	BELLVILLE RD @ I-75 (EXIT 2)
18500330	SR 376 @ BEVEL CREEK
18500340	LAKES BLVD (SR 376) @ I-75 (EXIT 5)
18500350	SR 376 @ CANEY BRANCH
18500600	HOWELL RD @ KNIGHTS CREEK
18500610	HOWELL RD @ OTTER CREEK
18500620	HOWELL RD @ GRAND BAY CREEK TRIB
18500630	HOWELL RD @ GRAND BAY CREEK
18500650	NANKIN RD @ WITHLACOOCHEE RIVER O/F
18500660	NANKIN RD @ WITHLACOOCHEE RIVER O/F
18500670	NANKIN RD @ WITHLACOOCHEE RIV TRIB
18500680	NANKIN RD @ CLYATT MILL CREEK
18500730	LOCH LAUREL RD @ I-75
18500770	GORNTO RD @ SUGAR CREEK
18500780	BAYTREE RD @ SUGAR CREEK
18500790	N OAK ST @ ONE MILE BRANCH
18500800	LANKFORD DRIVE @ SUGAR CREEK
18500810	MELODY LN @ ONE MILE BRANCH
18500820	JERRY JONES DR @ TWO MILE CREEK
18500830	STATEN RD @ CHERRY CREEK

ID	Bridge Name & Location
18500860	GIL HARBIN RD @ DUKES BAY CANAL
18500870	CLAY RD @ NS RAILROAD
18500890	SR 94 @ GRAND BAY CREEK
18500900	US 84/SR 38 (EBL) @ GRAND BAY CREEK
18500910	US 84/ SR38 @ MEETINGHOUSE BRANCH
18500920	SR 122 @ FRANKS CREEK
18500930	US 41 BUS/SR 7 BUS (SBL) @ MUD CREEK
18500940	OLD CLYATTVILLE RD @I-75 (EXIT 13)
18550010	LAKE PARK RD @ OTTER CREEK
18550020	OLD STATE RD @ GRAND BAY CREEK
18550030	KNIGHTS ACADEMY RD @ CHERRY CREEK
18550060	OUSLEY RD @ WITHLACOOCHEE RIV TRIB
18550070	OUSLEY RD @ TIGER CREEK
18550080	JUMPING GULLEY RD @ BEVEL CREEK
18550090	VAL-DEL RD @ BAY BRANCH
18550100	VAL-DEL RD @ WITHLACOOCHEE RIV TRIB
18550140	JOHNSTON RD @ DASHER CREEK
18550160	HICKORY CH RD @ MUD CREEK
18550170	HICKORY CH RD @ MUD CREEK TRIB
18550240	FRANKS CRK RD @ FRANKS CREEK
18550300	VALLOTTON DR @ ONE MILE CREEK
18550340	SHILOH RD @ FRANKS CREEK
18550350	SHILOH RD @ BIG CREEK
18550380	OLD US 41 @ FRANKS CREEK TRIB
18550440	INNER PERIMETER RD (US 41/SR 7) @ CSX RAILROAD
18550450	INNER PERIMETER RD (US 41/SR 7) @ KNIGHT CREEK
18550460	INNER PERIMETER RD (US 41/SR 7) - NBL @ MUD CREEK
18550470	INNER PERIMETER RD (US 41/SR 7) - SBL @ MUD CREEK
18550510	STALLINGS RD @ CHERRY CREEK
18550520	DAMPIER RD @ DUKES BAY CANAL
18550530	N OAK ST @ TWO MILE BRANCH
18550540	CLYATTVILLE RD @ MUD CREEK
18550570	OLD STATE RD @ BECKY BAY TRIB
18550580	BERKLEY DR @ TWO MILE CREEK
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F
18550600	SR 133 @ WITHLACOOCHEE RIVER
18550610	US 84/SR 38 @ ALAPAHA RIVER
18550620	LOCH LAUREL RD @ LAKE LOCH LAUREL TRIB
18550640	FRANKS CRK RD @ I-75
18550650	US 84/SR 38 @ ALAPAHA RIVER
18550690	LOCH LAUREL RD @ BEVEL CREEK

ID	Bridge Name & Location
18550700	CAT CREEK RD @ CAT CREEK
18550710	CAT CREEK RD @ CAT CREEK O/F
18550720	SR 122 @ WITHLACOOCHEE RIVER
18550730	SR 122 @ CAT CREEK
18550740	N LEE ST @ ONE MILE BRANCH
18550760	W GORDON ST @ ONE MILE BRANCH
18550770	FRANKS CREEK RD @ FRANKS CREEK TRIB
18550780	SKIPPER BRIDGE RD @ CHERRY CREEK
18550790	STATEN RD @ WITHLACOOCHEE RIVER
18550800	STATEN RD @ WITHLACOOCHEE RIVER O/F
18550810	STATEN RD @ WITHLACOOCHEE RIVER
18550820	SR 122 @ METTING HOUSE CREEK
18550830	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)
18550840	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)
18550850	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (VALDOSTA)
18550860	TUCKER RD @ DUKES BAY CANAL
18550870	W HILL AVE (US 84/SR 38) @ NORFOLK SOUTHERN RAILROAD
18550880	MADISON HWY (SR 31) @ WITHLACOOCHEE RIVER
18550890	MORVEN RD @ FRANKS CREEK
18550900	CAT CREEK RD @ BEATTY BRANCH
18550920	W MAIN ST (SR 122) @ I-75 (EXIT 29)
18550930	N VALDOSTA RD (US 41/SR 7) @ I-75 (EXIT 22)

Appendix C: Scoring Approach for Vulnerability Assessment Scoring Tool

ROADWAY SCORING METHODOLOGY

The following text describes the scoring approach the project team utilized for roadway assets within Lowndes County. For roads, the project team weighed exposure, sensitivity, and adaptive capacity evenly at one-third (33.3%) each to develop the composite vulnerability score.

Exposure

The exposure component of the VAST tool measures the degree to which a roadway asset is exposed to extreme weather events based on climate projections. The Lowndes County Transportation Infrastructure Vulnerability Assessment relies on CMIP5 data pulled for grids corresponding to Lowndes County for the exposure component of the analysis. For each asset, the closest grid point to each asset was utilized to assign projected precipitation values for each indicator. The project team utilized a countywide average for temperature since there was less geographic variability across the county compared to precipitation measures. The following measures were ultimately used for each road and bridge asset:

- Temperature Change
  - Change in Number of Days Above 95°F
  - Change in Average Annual Max Temperature
  - Highest 7-Day Average Summer High Temperature
- Precipitation Change
  - Location Within 100-Year Flood Zone
  - Location Within 500-Year Flood Zone
  - Change in Annual Total Precipitation

Within temperature change, each of the three exposure components were weighed evenly (33.3%). Within precipitation change, the location within the 100-year flood zone and change in annual total precipitation metrics were weighed 40% each while the remaining 20% was allotted for location within the 500-year flood zone. The following describes how each component of exposure was scored within the VAST tool for roadways.

Temperature Change

Change in Total Number of Days per Year Above 95°F

Above a certain temperature, workforce or operational restrictions may come into effect along area roadways. Materials such as pavement binders may have design temperature ranges, and temperatures above or below that range may cause structural damage. The Lowndes County Transportation Infrastructure Vulnerability Assessment utilized the number of days above 95°F per year as an exposure indicator based on precedent from the two case studies the project team examined for this project. The project team utilized a countywide average of the number of days above 95°F for each roadway asset. For the baseline projection period (1950-2005), 16 days were projected to have maximum temperatures above 95°F, and each roadway asset was assigned a value of one (1). For the future projection period (2050-2099), 114 days were projected to have maximum temperatures above 95°F, and each roadway asset was assigned a value of four (4).

Change in Total Number of Days per Year Above 95°F	
Value	**Score**
16 days	1
114 days	4

Change in Average Annual Maximum Temperature

The projected change in average annual maximum temperatures provided the project team with a sense of the magnitude of projected warming in Lowndes County. Similar to the number of days above 95°F, the project team utilized countywide averages for the change in annual maximum temperature exposure indicator. For the baseline projection period (1950-2005), the average annual maximum temperature was 66.9°F and each roadway asset was assigned a value of one (1). For the future projection period (2050-2099), the average annual maximum temperature was 73.8°F and each roadway asset was assigned a value of four (4).

Change in Average Annual Maximum Temperature	
Value	**Score**
66.9°F	1
73.8°F	4

Highest 7-Day Average Summer High Temperature

The highest 7-day average summer high temperature was another exposure indicator that the project team utilized to understand the highest temperature that a roadway asset is predicted to be exposed to in future conditions. For the baseline projection period (1950-2005), the highest 7-day average summer high temperature was 96.1°F and each roadway asset was assigned a value of one (1). For the future projection period (2050-2099), the highest 7-day average summer high temperature was 104.7°F and each roadway asset was assigned a value of four (4).

Highest 7-Day Average Summer High Temperature	
Value	**Score**
96.1°F	1
104.7°F	4

Precipitation Change

Location in FEMA 100-Year Flood Zone

Assets located in floodplains are more likely to be exposed to flooding resulting from precipitation changes. For this exposure indicator, the project team utilized geospatial analysis to calculate the percentage of each roadway asset within the FEMA 100-year flood zone.

The following table shows value ranges the project team assigned percentages to for this indicator:

Location in FEMA 100-Year Flood Zone	
Value Range	**Score**
0% to 15%	1
15% to 25%	2
25% to 35%	3
35% to 38%	4

Location in FEMA 500-Year Flood Zone

Similar to the above exposure indicator, the project team utilized geospatial analysis to calculate the percentage of each roadway asset within the FEMA 100-year flood zone. The following table shows value ranges the project team assigned percentages to for this indicator:

Location in FEMA 500-Year Flood Zone	
Value Range	**Score**
0% to 15%	1
15% to 25%	2
25% to 35%	3
35% to 73%	4

Change in Total Annual Precipitation

Annual precipitation can serve as an indicator for impacts on assets in addition to location within a floodplain. For this exposure indicator, the project team utilized total annual precipitation amounts for each CMIP5 grid that was collected throughout Lowndes County. Each roadway asset was assigned to the grid that the asset was located within for this portion of the analysis. Exposure scores were delineated based on the following equal interval breakdown based on baseline and future projection annual precipitation values:

Location in FEMA 500-Year Flood Zone	
Value Range (inches)	**Score**
49.24 – 49.91	1
49.91 – 50.59	2
50.59 – 51.27	3
51.27 – 51.94	4

Sensitivity

The sensitivity component examines the degree of damage that a road or bridge would experience if exposed to temperature or precipitation. Two indicators were used to measure sensitivity of roads to extreme heat, and three indicators were used to measure sensitivity of roads to extreme precipitation and inland flooding. Each sensitivity component was weighed evenly in the VAST tool.

Temperature Change

Temperature Threshold in Pavement Binder

Pavement binders are designed to withstand specific temperature thresholds. Asphalt may experience rutting if pavement temperatures exceed the high temperature thresholds. For the Lowndes County Transportation Infrastructure Vulnerability Assessment, this indicator was based on if the roadway was above or below 25,000 AADT. A yes or no value was assigned to each field; yes values received the maximum four points and no values received zero points. This approach was developed by the project team after correspondence with GDOT's Office of Materials and Testing (OMAT) to understand pavement binders and their tolerance to certain temperatures.

Temperature Threshold in Pavement Binder	
Value	**Score**
No Data	No Data
Less than 25,000 AADT (No)	0
Greater than 25,000 AADT (Yes)	4

Truck Routes

If a roadway experiences high volumes of truck traffic, this is an indicator of the asset's potential to experience rutting or another type of deformity under extreme temperature conditions. Pavement experiences greater stress from heavy vehicle traffic. As temperatures increase, rutting may occur on segments of road with high volumes of truck traffic. Truck routes are included as a sensitivity indicator to account for the effect on the ability to move and deliver goods to locations within Lowndes County. A yes or no value was assigned to each asset for this field based on its inclusion as a truck route in the Vision2045 Metropolitan Transportation Plan:

Truck Routes	
Value	**Score**
No Data	No Data
Not Along a Truck Route (No)	0
Along a Truck Route (Yes)	4

Precipitation Change

Noted as Flood-Prone Asset by Stakeholders

Road assets which have experienced damage during past heavy precipitation events are more likely to be damaged if exposed in the future, and the project team took stakeholder experiences into account in the scoring process to reflect this. This indicator was scored based on input received during stakeholder collaboration as follows:

Noted as Flood-Prone Asset by Stakeholders	
Value	**Score**
No Data	No Data
Not Along a Truck Route (No)	0
Along a Truck Route (Yes)	4

Percentage of Impervious Surface

Assets with greater impermeability to water are more likely to experience issues with flooding and run-off from precipitation. To gain an understanding of the degree of sensitivity roads within Lowndes County experience with respect to impervious surfaces, the project team utilized the 2016 release of the National Land Cover Database.[47] The specific product used was the Imperviousness raster dataset, which assigns pixels to a value of 1 to 100 based on the percent of land that is considered impervious based on Landsat imagery. The project team converted the raster to a shapefile and assigned each pixel to a road asset and then calculated the average imperviousness for each road asset within Lowndes County. Based on this process, the scoring breakdown for the VAST tool was as follows:

Noted as Flood-Prone Asset by GIS	
Value (range)	**Score**
No Data	No Data
6% to 25%	1
25% to 50%	2
50% to 75%	3
75% to 94%	4

Noted as Flood Prone Asset by GIS

To further support past exposure to heavy precipitation in addition to stakeholder input, the project team conducted GIS analysis to understand the frequency of exposure to precipitation and if a road asset was part of a prior road closure. This output is shown in Figure 6 in the technical memorandum and was scored based on the following:

Noted as Flood-Prone Asset by GIS	
Value	**Score**
No Data	No Data
Not Located Within Flood Frequency Area or in a Place with Past Road Closure Due to Flooding (No)	0
Located Within Flood Frequency Area or in a Place with Past Road Closure Due to Flooding (Yes)	4

[47] USGS (2016). National Land Cover Database.

Adaptive Capacity

The adaptive capacity of a critical transportation asset refers to its ability to adjust to changing climate conditions and moderate potential damage to the overall system. For roadways, adaptive capacity was examined through functional classification (minor collectors scored a one, major collectors two, minor arterials three, and principal arterials four), whether a road/bridge is part of an evacuation route, whether a road/bridge is within a ½-mile buffer of an evacuation route, average annual daily traffic (AADT), and base year (2015) and future year (2045) level-of-service (LOS).[48] Each component of adaptive capacity was weighed evenly in the VAST tool.

FHWA Roadway Functional Classification

Functional classification characterizes the type of services roadways are intended to provide. Roadways with a higher functional classification may cause greater system disruptions if damaged. The project team utilized the roadway functional classification scheme administered by GDOT to assign each road asset to a functional classification. Local roads and freeways were not included in the scoring process. Minor collectors scored the lowest (1) while principal arterials scored the highest (4) since principal arterials carry more regional traffic over longer distances across the county. The scoring breakdown includes the following:

FHWA Roadway Functional Classification	
Value	**Score**
Minor Collector	1
Major Collector	2
Minor Arterial	3
Principal Arterial	4

Evacuation Route

Roads designated as evacuation routes could have a greater consequence to evacuees from hurricanes or tropical storms as well as a lower adaptive capacity if they suffer damage from extreme weather events. Roads are designated as evacuation routes by GDOT to help direct coastal traffic further inland in the event of a hurricane or tropical storm. Multiple evacuation routes exist within Lowndes County including US 41, US 84, and I-75. Road assets were scored for VAST based on their designation as an evacuation route as follows:

Evacuation Route	
Value	**Score**
No	0
Partial	2
Yes	4

[48] LOS was based volume-to-capacity ratios calculated through the statewide travel demand model run completed as part of the Vision2045 Metropolitan Transportation Plan to calculate level-of-service (LOS).

Access to Critical Areas (1/2 Mile)

Roads that provide the only access to critical areas are more significant to the adaptive capacity of the larger response system following an extreme weather event. This is especially important in rural portions of Lowndes County where route redundancy is lesser than in urban areas such as Valdosta. Critical facilities were designated in collaboration with SGRC and consist of schools, government facilities, public safety complexes, wastewater treatment plants, and lift stations. One-half (1/2) mile buffers were created around approximately 300 critical facilities in GIS and roads and bridges located within these buffers were scored as being in close proximity to critical facilities with a score of four (4) based on the following scoring criteria:

Access to Critical Areas (1/2 Mile)	
Value	**Score**
No	0
Yes	4

Average Annual Daily Traffic (AADT)

AADT is the volume of vehicle traffic of a road for a year divided by 365 days. Roadways with higher traffic volumes would affect drivers' ability to reach their destinations and cause a greater disruption if assets suffer damage. Recent traffic count data from the GDOT Traffic Analysis and Data Application (TADA) was used to identify the annual average daily traffic (AADT) along segments of each corridor. The year used for this analysis was 2019 as it was the most recent year of data available from traffic count stations within Lowndes County. Based on available data acquired, the scoring breakdown for AADT is as follows:

Average Annual Daily Traffic (AADT)	
Value Range	**Score**
10 -10000	1
10000 - 20000	2
20000 - 30000	3
30000 - 34700	4

Base Year Level of Service (2015)

The project team utilized the travel demand run utilized for the Vision2045 Transportation Metropolitan Plan to understand locations which operate at poor levels-of-service based on daily traffic volume and a defined set of assumptions about the roadway's characteristics. According to the Highway Capacity Manual (HCM), there are six levels of service (LOS) by which the operational performance of a roadway may be described. is measured according to the concept of level of service (LOS), measured using a lettered scale of A through F. LOS A, B, and C indicate free-flow conditions. At LOS D, speed and freedom to maneuver in traffic become more restrictive but are still acceptable in urban settings such as Brookhaven. LOS E indicates that a road is nearing its capacity to serve traffic and flow is unstable, driver comfort and convenience are poor, and "stop and go" conditions are present. LOS F is assigned to roads

with severe traffic congestion.[49] For the VAST tool, LOS was assigned a score ranging from one to four based on the following:

Base Year LOS (2015)	
Value	**Score**
LOS C or Better	1
LOS D	2
LOS E	3
LOS F	4

Future Year Level of Service (2045)

The same scoring methodology was used for future LOS as base-year LOS and provided a degree of separation for transportation assets throughout Lowndes County for the purposes of the Vulnerability Assessment. For the VAST tool, LOS was assigned a score ranging from one to four based on the following:

Future Year LOS (2045)	
Value	**Score**
LOS C or Better	1
LOS D	2
LOS E	3
LOS F	4

[49] Transportation Research Board (2015). Highway Capacity Manual, 6th Edition.

BRIDGE SCORING METHODOLOGY

The following text describes the scoring approach the project team utilized for bridge assets within Lowndes County. For bridges, the project team weighed exposure, sensitivity, and adaptive capacity evenly at one-third (33.3%) each to develop the composite vulnerability score.

Exposure

The same approach for exposure that was utilized for roadway assets was utilized for temperature. Please refer to the preceding section for discussion on the exposure component.

Sensitivity

For bridges, four indicators were carried over from the roadway asset scoring methodology – temperature threshold in pavement binders, truck routes, noted as a flood-prone asset by stakeholders, and noted as a flood-prone asset by GIS. Five additional indicators from the National Bridge Inventory (NBI) were used to evaluate sensitivity to heavy precipitation – bridge age, bridge condition, scour rating, overtopping frequency, and channel condition.[50] Each sensitivity indicator was weighed evenly in the VAST tool.

Temperature Change

Temperature Threshold in Pavement Binders

See the previous discussion on roadways for details on how bridges were scored based on temperature threshold in pavement binders.

Truck Routes

See the previous discussion on roadways for details on how bridges were scored based on its location along a truck route as defined by the Vision2045 Metropolitan Transportation Plan.

Precipitation Change

Noted as Flood-Prone Asset by Stakeholders

See the previous discussion on roadways for details on how bridges were scored based on their identification as a flood-prone asset by stakeholders.

Bridge Condition

Bridge condition ratings are used to uniformly describe the existing bridge comprising of the deck, superstructure, and substructure components of a bridge. This composite indicator also includes channels and channel protection factors in the condition rating.

[50] FHWA (1995). Recording and Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges.

This sensitivity indicator is based on the NBI Item 57 and the project team assigned scores in the VAST tool as follows:[51]

Bridge Condition	
Value	**Score**
No Data	No Data
Good (G)	1
Fair (F)	2
Poor (P)	4

Bridge Age

Older bridges may have been built to outdated design standards, rendering them more sensitive to precipitation events than bridges designed more recently. This sensitivity indicator is based on the NBI Item 27 (Year Built) and the project team assigned scores in the VAST tool as follows, with older bridges scoring higher than newer bridges:[52]

Bridge Age	
Value (based on year built)	**Score**
1937 - 1958	4
1958 - 1978	3
1978 - 1999	2
1999 - 2019	1

Scour Rating

Scour is the potential of erosion of a bridge's soil surroundings as a result of flooding. Bridges that have already been identified as having problems with scour are more likely to be damaged during precipitation events. This sensitivity indicator is based on the NBI Item 113 (Scour Critical Bridges) and the project team assigned scores in the VAST tool as follows based on data for bridges in Lowndes County:[53]

Scour Rating	
Value	**Score**
N - Not Over Waterway	0
8 - Stable	2
U - Not evaluated	3
5 - Stable	4

[51] Ibid, p. 37-38.
[52] Ibid, p. 37-38.
[53] Ibid, p. 75-76.

Channel Condition

NBI Item 61 (Channel Condition Rating) describes the physical conditions associated with the flow of water through the bridge such as stream stability and the condition of the channel, slope protection, or stream control devices associated with each bridge asset. Bridges with erosion or bank failure will be more sensitive to flooding and high stream flows, especially during and following extreme weather events. This sensitivity indicator is based on the NBI Item 61 (Channel Condition Rating) and the project team assigned scores in the VAST tool as follows based on data for bridges in Lowndes County:[54]

Channel Condition	
Value	**Score**
N - Not Applicable	0
8 - Banks are protected or well vegetated	1
7 - Bank protection is in need of minor repairs.	2
6 - Bank is beginning to slump.	3
5 - Bank protection is being eroded.	4

Frequency that Water Overtops a Bridge

This NBI item standardizes the waterway opening with respect to flow and passage through the bridge. Bridges that are subject to more frequent overtopping may be sensitive to damage from flooding impacts. This sensitivity indicator is based on the NBI Item 71 (Waterway Adequacy) and the project team assigned scores in the VAST tool as follows based on data for bridges in Lowndes County:[55]

Overtopping Frequency	
Value	**Score**
N – Not Applicable	0
8 – Equal to present desirable criteria	0
7 – Better than present minimum criteria	1
6 – Equal to present minimum criteria	2
5 – Somewhat better than minimum adequacy to tolerate being left in place as is	3
4 – Meets minimum tolerable limits to be left in place as is	4

Noted as Flood-Prone Asset by GIS

See the previous discussion on roadways for details on how bridges were scored based on their identification as a flood-prone asset by GIS.

[54] Ibid, p. 40.
[55] Ibid, p. 45.

Adaptive Capacity

For bridges, two additional adaptive capacity indicators from the NBI dataset were examined – replacement cost and detour length. Replacement cost relates the bridge to the availability of financial resources to address damage to a bridge while detour length factors in the amount of delay experienced due to either damage or closure to a bridge facility. Other indicators are similar to those used for roadway assets. Each adaptive capacity indicator was weighed evenly in the VAST tool.

Replacement Cost

Replacement costs for each asset are used as a rough proxy for the ease in which assets could be repaired or replaced following a bridge closure. Resources are assumed to be more easily mobilized for lower cost repairs, and replacement costs may indicate overall complexity, size, and expense of the bridge asset. This indicator is based on the NBI Item 96 (Total Project Cost) and comprises of all costs associated with a bridge improvement. It was delineated by the project team in the VAST tool based on the following scoring criteria in thousands of dollars as reported in the 2019 NBI dataset for Lowndes County:[56]

Bridge Replacement Cost	
Value (in thousands)	**Score**
0 - 25000	1
25000 - 50000	2
50000 - 75000	3
75000 - 103896	4

Detour Length

Detour length is used as an indicator of redundancy in the system. Bridges with longer detour lengths are assumed to have less adaptive capacity than bridges with shorter detours in the event of a bridge closure.[57] This indicator was based on the NBI Item 19 and delineated by the project team in the VAST tool based on the following scoring criteria in kilometers as reported in the 2019 NBI dataset for Lowndes County:

Bridge Detour Length	
Value (kilometers)	**Score**
0 - 10	1
10 - 15	2
15 - 20	3
20 - 27	4

FHWA Roadway Functional Classification

See the previous discussion on roadways for details on how bridges were scored based on their functional classification.

[56] Ibid, p. 65.
[57] Ibid, p. 10.

Evacuation Route

See the previous discussion on roadways for details on how bridges were scored based on their location along an evacuation route.

Access to Critical Areas (1/2 Mile)

See the previous discussion on roadways for details on how bridges were scored based on their proximity to a critical facility within Lowndes County.

Base Year Level of Service (2015)

See the previous discussion on roadways for details on how bridges were scored based on their base year (2015) level of service (LOS).

Future Year Level of Service (2045)

See the previous discussion on roadways for details on how bridges were scored based on their future year (2045) level of service (LOS).

Appendix D: Vulnerability Assessment Scoring Tool Results – Roads

The following tables show ranked Lowndes County Transportation Infrastructure Vulnerability Assessment results for roadways based on the climate stressor and the projection period. Scores are on a scale of one to four, with four representing the most vulnerable assets.

TEMPERATURE CHANGE – BASELINE PROJECTIONS (1950-2005)

Asset ID	Asset Name	Vulnerability
137	N VALDOSTA RD (From N Oak St Ext to Country Club Rd)	2.6
139	N VALDOSTA RD (From Country Club Rd to Old US 41)	2.6
194	US HWY 41 S (From Echols County Line to SR 376)	2.5
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	2.5
10	BEMISS RD (From Knights Academy Rd to Skipper Bridge Rd)	2.4
9	BEMISS RD (From Inner Perimeter Rd (US 41/SR 7) to Knights Academy Rd)	2.4
14	BEMISS RD (From Davidson Rd/Moody AFB South Entrance to Radar Site Rd/Moody AFB Main Entrance)	2.4
15	BEMISS RD (From Radar Site Rd/Moody AFB Main Entrance to New Bethel Rd)	2.4
81	INNER PERIMETER RD (From N Valdosta Rd (US 41/SR 7) to N Oak St Ext)	2.4
11	BEMISS RD (From Skipper Bridge Rd to Studstill Rd)	2.3
82	INNER PERIMETER RD (From Bemiss Rd (SR 125) to N Forrest St)	2.3
12	BEMISS RD (From Studstill Rd to Cat Creek Rd)	2.3
200	US HWY 84 W (From Withlacoochee River/Brooks County Line to Ousley Rd)	2.1
209	W CENTRAL AVE (From W Hill Ave (US 84/SR 38) to Patterson St)	2.0
212	W HILL AVE (From I-75 to St Augustine Rd (SR 133))	2.0
58	GA HWY 122 W (From Little River/Brooks County Line to Coffee Rd)	2.0
98	LAKELAND HWY (From Knights Academy Rd to Lanier County Line)	2.0
213	W HILL AVE (From St Augustine Rd (SR 133) to W Central Ave)	1.9
116	N ASHLEY ST (From E Savannah Ave to E Magnolia St)	1.9
178	S PATTERSON ST (From Gil Harbin Industrial Blvd to James Beck Overpass)	1.9
135	N ST AUGUSTINE RD (From I-75 to Little River/Brooks County Line)	1.9
196	US HWY 41 S (From Johnston Rd to Inner Perimeter Rd (US 41/SR 7))	1.9
214	W HILL AVE (From W Central Ave to Patterson St)	1.9
105	MADISON HWY (From SR 376 to I-75)	1.8

Asset ID	Asset Name	Vulnerability
117	N ASHLEY ST (From E Magnolia St to Bemiss Rd)	1.8
195	US HWY 41 S (From Lakes Blvd (SR 376) to Johnston Rd)	1.8
104	MADISON HWY (From Florida State Line to SR 376)	1.8
118	N ASHLEY ST (From Bemiss Rd to N Oak St Ext)	1.8
129	N PATTERSON ST (From Magnolia St to Hill Ave)	1.8
138	N VALDOSTA RD (From I-75 to Old US 41)	1.8
216	W MARION AVE (From Lakes Blvd (SR 376) to SR 376)	1.8
78	INNER PERIMETER RD (From US 41/SR 7 to SR 94)	1.7
8	BEMISS RD (From Northside Dr to Inner Perimeter Rd (US 41/SR 7))	1.7
13	BEMISS RD (From Cat Creek Rd to Davidson Rd/Moody AFB South Entrance)	1.7
61	GA HWY 376 (From Marion Ave (US 41/SR 7) to Echols County Line)	1.7
79	INNER PERIMETER RD (From SR 94 to E Hill Ave (US 84/SR 38))	1.7
84	INNER PERIMETER RD (From N Oak St Ext to Bemiss Rd (SR 125))	1.7
202	US HWY 84 W (From Rocky Ford Rd to I-75)	1.7
215	W MAIN ST (From I-75 to Church St (US 41/SR 7))	1.7
2	BAYTREE RD (From Gornto Rd to NS RR Crossing)	1.7
7	BEMISS RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Northside Dr)	1.7
42	E HILL AVE (From N Patterson St to N Forrest St)	1.7
80	INNER PERIMETER RD (From E Hill Ave (US 84/SR 38) to Lakeland Hwy (US 221/SR 31))	1.7
83	INNER PERIMETER RD (From N Forrest St to Lakeland Hwy (US 221/SR 31))	1.7
130	N PATTERSON ST (From Magnolia St to Park Ave)	1.7
131	N PATTERSON ST (From Park Ave to N Oak St Ext)	1.7
133	N ST AUGUSTINE RD (From Lankford Dr to Norman Dr)	1.7
201	US HWY 84 W (From Ousley Rd to Rocky Ford Rd)	1.7
3	BAYTREE RD (From NS RR Crossing to Jerry Jones Dr/Melody Ln)	1.6
4	BAYTREE RD (From Jerry Jones Dr to N Oak St)	1.6
43	E HILL AVE (From N Forrest St to Clay Rd/Hollywood St)	1.6
44	E HILL AVE (From Clay Rd/Hollywood St to Inner Perimeter Rd (US 41/SR 7))	1.6
77	INNER PERIMETER RD (From Madison Hwy (SR 31) to US 41/SR 7)	1.6

Asset ID	Asset Name	Vulnerability
106	MADISON HWY (From I-75 to Inner Perimeter Rd)	1.6
132	N ST AUGUSTINE RD (From W Hill Ave (US 84/SR 38) to Lankford Dr)	1.6
143	NEW STATENVILLE HWY (From S Patterson St (US 41 Bus/SR 7 Bus) to Inner Perimeter Rd (US 41/SR 7))	1.6
177	S PATTERSON ST (From Inner Perimeter Rd (US 41/SR 7) to Gil Harbin Industrial Blvd)	1.6
197	US HWY 84 E (From Inner Perimeter Rd (US 41/SR 7) to Delmar Rd)	1.6
198	US HWY 84 E (From Delmar Rd to SR 135)	1.6
199	US HWY 84 E (From SR 135 to Lanier County Line)	1.6
16	BEMISS RD (From New Bethel Rd to SR 122)	1.6
45	E MAIN ST/SR 122 (From Church St (US 41/SR 7) to Val Del Rd)	1.6
57	GA HWY 122 W (From Coffee Rd to I-75)	1.6
100	LAKES BLVD (From I-75 to Marion Ave (US 41/SR 7))	1.6
107	MADISON HWY (From Inner Perimeter Rd to Gil Harbin Industrial Blvd)	1.6
108	MADISON HWY (From Gil Harbin Industrial Blvd to S Patterson St (US 41 Bus/SR 7 Bus))	1.6
119	N CHURCH ST/US 41 (From SR 122 to Cook County Line)	1.6
24	CLYATTVILLE LAKE PARK RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	1.5
40	E COTTON AVE (From S Main St to N East St (SR 376))	1.5
59	GA HWY 135 (From Echols County Line to US 84/SR 38)	1.5
60	GA HWY 135 (From US 84/SR 38 to Lanier County Line)	1.5
99	LAKES BLVD (From Loch Laurel Rd to I-75)	1.5
142	NEW STATENVILLE HWY (From Inner Perimeter Rd (US 41/SR 7) to Echols County Line)	1.5
185	SMITHBRIAR DR (From N Oak St to N Ashley St)	1.4
54	GA HWY 122 E (From Val Del Rd to Cat Creek Rd)	1.3
55	GA HWY 122 E (From SR 125 to Lanier County Line)	1.3
56	GA HWY 122 E (From Cat Creek Rd to SR 125)	1.3
97	LAKELAND HWY (From Inner Perimeter Rd to Knights Academy Rd)	1.3
88	JERRY JONES DR (From Gornto Rd to Country Club Dr)	1.2
208	W BROOKWOOD DR (From N Oak St to N Patterson St)	1.2
127	N OAK ST EX (From N Valdosta Rd (US 41/SR 7) to Cherry Creek Rd)	1.2
207	W ALDEN AVE (From W Gordon St to N Patterson St)	1.1

Asset ID	Asset Name	Vulnerability
39	E CENTRAL AVE (From N Forrest St to N Patterson St)	1.1
1	AIRPORT RD (From Old Clyattville Rd to Madison Hwy (SR 31))	1.1
32	COUNTRY CLUB RD (From N Valdosta Rd (US 41/SR 7) to N Valdosta Rd (US 41/SR 7))	1.1
20	CAT CREEK RD (From Bemiss Rd (SR 125) to Radar Site Rd)	1.1
31	COUNTRY CLUB DR (From Jerry Jones Dr/Eager Rd to N Valdosta Rd (US 41/SR 7))	1.1
66	GORNTO RD (From St Augustine Rd (SR 133) to NS RR Crossing)	1.1
67	GORNTO RD (From NS RR Crossing to Jerry Jones Dr)	1.1
87	JERRY JONES DR (From Baytree Rd to Gornto Rd)	1.1
101	LANKFORD DR (From St Augustine Rd (SR 133) to W Gordon St)	1.1
120	N FORREST ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.1
21	CAT CREEK RD (From Radar Site Rd to SR 122)	1.0
22	CHERRY CREEK RD (From N Oak St Ext to Orr Rd)	1.0
123	N LEE ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.0
125	N OAK ST (From Baytree Rd to Gornto Rd)	1.0
126	N OAK ST (From Gornto Rd to Smithbriar Dr)	1.0
149	OLD CLYATTVILLE RD (From SR 31 to Ousley Rd)	1.0
192	ULMER AVE (From S Patterson St (US 41 Bus/SR 7 Bus) to Old Statenville Rd)	1.0
52	FORREST ST EX (From Inner Perimeter Rd (US 41/SR 7) to Bemiss Rd (SR 125))	1.0
47	E PARK AVE (From N Ashley St (US 41 Bus/SR 7 Bus) to N Forrest St)	0.9
51	EAGER RD (From Country Club Dr to N Oak St)	0.9
68	GORNTO RD (From Jerry Jones Dr to N Patterson St)	0.9
112	MELODY LN (From W Gordon St to Baytree Rd)	0.9
121	N FORREST ST (From E Park Ave to Inner Perimeter Rd (US 41/SR 7))	0.9
124	N OAK ST (From W Hill Ave (US 84/SR 38) to Baytree Rd)	0.9
144	NORMAN DR (From W Hill Ave (US 84/SR 38) to Baytree Rd)	0.9
146	NORTHSIDE DR (From N Oak St to Bemiss Rd)	0.9
150	OLD CLYATTVILLE RD (From Ousley Rd to I-75)	0.9
151	OLD CLYATTVILLE RD (From I-75 to Airport Rd)	0.9
153	OLD CLYATTVILLE RD (From St Augustine Rd to S Patterson St (US 41 Bus/SR 7 Bus))	0.9

Asset ID	Asset Name	Vulnerability
166	RIVER ST (From Norman Dr to St Augustine Rd (SR 133))	0.9
171	S ASHLEY ST (From S Patterson St to E Savannah Ave)	0.9
172	S CHURCH ST (From S Hagan Bridge Rd to Main St (SR 122))	0.9
176	S OAK ST (From Madison Hwy (SR 31) to W Hill Ave (US 84/SR 38))	0.9
179	S ST AUGUSTINE RD (From Old Clyattville Rd to W Hill Ave (US 84/SR 38))	0.9
182	SKIPPER BRIDGE RD (From Bemiss Rd (SR 125) to Withlacoochee River)	0.9
190	STUDSTILL RD (From Bemiss Rd (SR 125) to Knights Academy Rd)	0.9
203	VAL DEL RD (From N Valdosta Rd (US 41/SR 7) to Bethany Rd)	0.9
221	WOODROW WILSON DR (From N Patterson St to Bemiss Rd)	0.9
128	N OAK ST EXT/MT ZION CHURCH RD (From Cherry Creek Rd to Forrest St Ext)	0.9
148	OLD BEMISS RD (From Old Pine Rd Ext to Bemiss Knights Academy Rd)	0.9
158	OLD US 41 N (From Union Rd to S Hagan Bridge Rd)	0.9
17	BERKLEY DR (From Gornto Rd to Eager Rd)	0.9
5	BEMISS KNIGHTS ACADEMY RD (From Knights Academy Rd to Studstill Rd)	0.9
6	BEMISS KNIGHTS ACADEMY RD (From Studstill Rd to Old Bemiss Rd)	0.9
23	CLAY RD (From Statenville Hwy (SR 94) to E Hill Ave (US 84/SR 38))	0.9
35	DASHER GROVE RD (From Old US 41 to End of Road)	0.9
36	DAVIDSON RD (From Bemiss Rd (SR 125) to Moody AFB South Entrance)	0.9
48	E PARK AVE (From N Forrest St to Inner Perimeter Rd)	0.9
50	E VALLEY ST (From River St to N Ashley St)	0.9
69	GUEST RD (From Bemiss Rd (SR 125) to Bemiss Knights Academy Rd)	0.9
73	HOWELL RD (From New Statenville Hwy/Griffin Ave to Inner Perimeter Rd (US 41/SR 7))	0.9
85	IVEY RD (From Bemiss Rd (SR 125) to Old Bemiss Rd)	0.9
136	N TROUP ST (From E Central Ave to Vallotton Dr)	0.9
145	NORTHLAKE DR (From N Valdosta Rd (US 41/SR 7) to End of Road)	0.9
147	NORTHSIDE DR (From Bemiss Rd to Jaycee Shack Rd)	0.9
152	OLD CLYATTVILLE RD (From Airport Rd to Old Clyattville Rd)	0.9
155	OLD PINE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	0.9
157	OLD US 41 N (From N Valdosta Rd (US 41/SR 7) to Union Rd)	0.9

Asset ID	Asset Name	Vulnerability
163	PARK AVE (From N Oak St to N Ashley St (US 41 Bus/SR 7 Bus))	0.9
165	RADAR SITE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	0.9
173	S FRY ST (From Lake Park Rd to N Forrest St)	0.9
206	VALLOTTON DR (From N Ashley St (US 41 Bus/SR 7 Bus) to N Troup St)	0.9
217	W SAVANNAH AVE (From NS RR Crossing to S Patterson St)	0.9
29	CONNELL RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Bemiss Rd)	0.9
72	HOLLYWOOD ST (From Cypress St to E Hill Ave (US 84/SR 38))	0.9
102	LOCH LAUREL RD (From Florida State Line to I-75)	0.9
164	PINEVIEW DR (From Bemiss Rd to N Forrest St)	0.9
204	VAL DEL RD (From Bethany Rd to SR 122)	0.9
218	W SAVANNAH AVE (From St Augustine Rd to NS RR Crossing)	0.9
26	CLYATTVILLE NANKIN RD (From Rocky Ford Rd to Old Clyattville Rd)	0.8
30	COPELAND RD (From Madison Hwy (SR 31) to US 41/SR 7)	0.8
33	CYPRESS ST (From N Forrest St to Hollywood St)	0.8
38	E BROOKWOOD PL (From N Troup St to N Forrest St)	0.8
41	E GORDON ST (From N Patterson St to N Forrest St)	0.8
46	E MOORE ST (From N Patterson St to N Ashley St (US 41 Bus/SR 7 Bus))	0.8
49	E SAVANNAH AVE (From James Beck Overpass to S Fry St)	0.8
62	GEORGIA AVE (From Gornto Rd to N Oak St)	0.8
75	HOWELL RD (From Inner Perimeter Rd to Old Naylor Rd)	0.8
94	LAKE PARK BELLVILLE RD (From I-75 to E Cotton Ave)	0.8
95	LAKE PARK RD (From E Martin Luther King Jr Dr to Old Statenville Rd)	0.8
103	LOCH LAUREL RD (From I-75 to Madison Hwy (SR 31))	0.8
109	MAGNOLIA ST (From N Oak St to N Ashley St)	0.8
110	MARTIN LUTHER KING JR DR (From S Oak St to S Fry St)	0.8
114	MORVEN RD (From Little River/Brooks County Line to SR 122)	0.8
122	N HAGAN BRIDGE RD (From SR 122 to SR 122)	0.8
167	RIVER ST (From NS RR Crossing to N Oak St)	0.8
168	RIVER ST (From St Augustine Rd (SR 133) to NS RR Crossing)	0.8

Asset ID	Asset Name	Vulnerability
170	ROCKY FORD RD (From Ousley Rd to US 84/SR 38)	0.8
174	S HAGAN BRIDGE RD (From Old US 41 to SR 122)	0.8
175	S LEE ST (From Griffin Ave to E Hill Ave (US 84/SR 38))	0.8
191	TUCKER RD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	0.8
210	W GORDON ST (From Lankford Dr/Melody Ln to N Patterson St)	0.8
211	W GORDON ST (From W Alden Ave to Lankford Dr/Melody Ln)	0.8
220	WEST ST (From W Hill Ave (US 84/SR 38) to W Gordon St)	0.8
86	JAYCEE SHACK RD (From E Park Ave to Northside Dr)	0.8
90	JUMPING GULLY RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	0.8
91	KNIGHTS ACADEMY RD (From Bemiss Rd (SR 125) to RR Crossing)	0.8
113	MILLER BRIDGE RD (From Shiloh Rd to Morven Rd)	0.8
115	MT ZION CHURCH RD (From Forrest St Ext to Stallings Rd)	0.8
140	NEW BETHEL RD (From Cat Creek Rd to SR 125)	0.8
186	SNAKE NATION RD (From Shiloh Rd to Miller Bridge Rd)	0.8
219	WEBB RD N (From Coffee Rd to SR 122)	0.8
53	FRANKS CREEK RD (From Miller Bridge Rd to Union Rd)	0.8
63	GIL HARBIN INDUSTRIAL BLVD (From Old Clyattville Rd to Madison Hwy (SR 31))	0.8
64	GIL HARBIN INDUSTRIAL BLVD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	0.8
89	JOHNSTON RD (From US 41/SR 7 to Hickory Grove Rd)	0.8
92	KNIGHTS ACADEMY RD (From RR Crossing to Studstill Rd)	0.8
141	NEW BETHEL RD (From SR 125 to Lanier County Line)	0.8
180	SHILOH RD (From I-75 to Miller Bridge Rd)	0.8
181	SHILOH RD (From Miller Bridge Rd to Morven Rd)	0.8
111	MCMILLAN RD (From Val Del Rd to Staten Rd)	0.7
188	STATEN RD (From Orr Rd to McMillan Rd)	0.7
34	DAMPIER ST (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	0.7
76	HOWELL RD (From Old Naylor Rd to Lake Park Rd)	0.6
169	ROCKY FORD RD (From Clyattville Nankin Rd to Ousley Rd)	0.6
187	STALLINGS RD (From Lakeland Hwy (US 221/SR 31) to Knights Academy Rd)	0.6

Asset ID	Asset Name	Vulnerability
18	BETHANY RD (From Old US 41 to Val Del Rd)	0.6
25	CLYATTVILLE NANKIN RD (From Withlacoochee River/Brooks County Line to Rocky Ford Rd)	0.6
74	HOWELL RD (From Lake Park Rd to Echols County Line)	0.6
189	STATEN RD (From McMillan Rd to Skipper Bridge Rd)	0.6
205	VAL DEL RD (From SR 122 to Cook County Line)	0.6
70	HICKORY GROVE RD N (From Johnston Rd to Glenn Rd)	0.6
71	HICKORY GROVE RD N (From US 41/SR 7 to Johnston Rd)	0.6
96	LAKE PARK RD (From Glenn Rd to Howell Rd)	0.6
156	OLD STATE RD (From Lakeland Hwy (US 221/SR 31) to SR 135)	0.6
161	OUSLEY RD (From Rocky Ford Rd to Old Clyattville Rd)	0.6
162	OUSLEY RD (From US 84/SR 38 to Rocky Ford Rd)	0.6
183	SKIPPER BRIDGE RD (From Withlacoochee River to Staten Rd)	0.6
184	SKIPPER BRIDGE RD (From Staten Rd to Cook County Line)	0.6
28	COFFEE RD (From SR 122 to Cook County Line)	0.5
37	DELMAR RD (From Lakeland Hwy (US 221/SR 31) to US 84/SR 38)	0.5
65	GLENN RD (From Hickory Grove Rd to SR 94)	0.5
93	KNIGHTS ACADEMY RD (From Studstill Rd to Lakeland Hwy (US 221/SR 31))	0.5
154	OLD NAYLOR RD (From Howell Rd to US 84/SR 38)	0.5
159	OLD VALDOSTA RD (From Cook County Line to Coffee Rd)	0.5
160	ORR RD (From Staten Rd to Skipper Bridge Rd)	0.5
193	UNION RD (From Franks Creek Rd to Old US 41)	0.5
19	BORING POND RD (From SR 94 to Lake Park Rd)	0.5
27	COFFEE RD (From Morven Rd to SR 122)	0.4

TEMPERATURE CHANGE – FUTURE PROJECTIONS (2050-2099)

Asset ID	Asset Name	Vulnerability
137	N VALDOSTA RD (From N Oak St Ext to Country Club Rd)	3.6
139	N VALDOSTA RD (From Country Club Rd to Old US 41)	3.6
194	US HWY 41 S (From Echols County Line to SR 376)	3.5
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	3.5
10	BEMISS RD (From Knights Academy Rd to Skipper Bridge Rd)	3.4
9	BEMISS RD (From Inner Perimeter Rd (US 41/SR 7) to Knights Academy Rd)	3.4
14	BEMISS RD (From Davidson Rd/Moody AFB South Entrance to Radar Site Rd/Moody AFB Main Entrance)	3.4
15	BEMISS RD (From Radar Site Rd/Moody AFB Main Entrance to New Bethel Rd)	3.4
81	INNER PERIMETER RD (From N Valdosta Rd (US 41/SR 7) to N Oak St Ext)	3.4
11	BEMISS RD (From Skipper Bridge Rd to Studstill Rd)	3.3
82	INNER PERIMETER RD (From Bemiss Rd (SR 125) to N Forrest St)	3.3
12	BEMISS RD (From Studstill Rd to Cat Creek Rd)	3.3
200	US HWY 84 W (From Withlacoochee River/Brooks County Line to Ousley Rd)	3.1
209	W CENTRAL AVE (From W Hill Ave (US 84/SR 38) to Patterson St)	3.0
212	W HILL AVE (From I-75 to St Augustine Rd (SR 133))	3.0
58	GA HWY 122 W (From Little River/Brooks County Line to Coffee Rd)	3.0
98	LAKELAND HWY (From Knights Academy Rd to Lanier County Line)	3.0
213	W HILL AVE (From St Augustine Rd (SR 133) to W Central Ave)	2.9
116	N ASHLEY ST (From E Savannah Ave to E Magnolia St)	2.9
178	S PATTERSON ST (From Gil Harbin Industrial Blvd to James Beck Overpass)	2.9
135	N ST AUGUSTINE RD (From I-75 to Little River/Brooks County Line)	2.9
196	US HWY 41 S (From Johnston Rd to Inner Perimeter Rd (US 41/SR 7))	2.9
214	W HILL AVE (From W Central Ave to Patterson St)	2.9
105	MADISON HWY (From SR 376 to I-75)	2.8
117	N ASHLEY ST (From E Magnolia St to Bemiss Rd)	2.8
195	US HWY 41 S (From Lakes Blvd (SR 376) to Johnston Rd)	2.8
104	MADISON HWY (From Florida State Line to SR 376)	2.8
118	N ASHLEY ST (From Bemiss Rd to N Oak St Ext)	2.8

Asset ID	Asset Name	Vulnerability
129	N PATTERSON ST (From Magnolia St to Hill Ave)	2.8
138	N VALDOSTA RD (From I-75 to Old US 41)	2.8
216	W MARION AVE (From Lakes Blvd (SR 376) to SR 376)	2.8
78	INNER PERIMETER RD (From US 41/SR 7 to SR 94)	2.7
8	BEMISS RD (From Northside Dr to Inner Perimeter Rd (US 41/SR 7))	2.7
13	BEMISS RD (From Cat Creek Rd to Davidson Rd/Moody AFB South Entrance)	2.7
61	GA HWY 376 (From Marion Ave (US 41/SR 7) to Echols County Line)	2.7
79	INNER PERIMETER RD (From SR 94 to E Hill Ave (US 84/SR 38))	2.7
84	INNER PERIMETER RD (From N Oak St Ext to Bemiss Rd (SR 125))	2.7
202	US HWY 84 W (From Rocky Ford Rd to I-75)	2.7
215	W MAIN ST (From I-75 to Church St (US 41/SR 7))	2.7
2	BAYTREE RD (From Gornto Rd to NS RR Crossing)	2.7
7	BEMISS RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Northside Dr)	2.7
42	E HILL AVE (From N Patterson St to N Forrest St)	2.7
80	INNER PERIMETER RD (From E Hill Ave (US 84/SR 38) to Lakeland Hwy (US 221/SR 31))	2.7
83	INNER PERIMETER RD (From N Forrest St to Lakeland Hwy (US 221/SR 31))	2.7
130	N PATTERSON ST (From Magnolia St to Park Ave)	2.7
131	N PATTERSON ST (From Park Ave to N Oak St Ext)	2.7
133	N ST AUGUSTINE RD (From Lankford Dr to Norman Dr)	2.7
201	US HWY 84 W (From Ousley Rd to Rocky Ford Rd)	2.7
3	BAYTREE RD (From NS RR Crossing to Jerry Jones Dr/Melody Ln)	2.6
4	BAYTREE RD (From Jerry Jones Dr to N Oak St)	2.6
43	E HILL AVE (From N Forrest St to Clay Rd/Hollywood St)	2.6
44	E HILL AVE (From Clay Rd/Hollywood St to Inner Perimeter Rd (US 41/SR 7))	2.6
77	INNER PERIMETER RD (From Madison Hwy (SR 31) to US 41/SR 7)	2.6
106	MADISON HWY (From I-75 to Inner Perimeter Rd)	2.6
132	N ST AUGUSTINE RD (From W Hill Ave (US 84/SR 38) to Lankford Dr)	2.6
143	NEW STATENVILLE HWY (From S Patterson St (US 41 Bus/SR 7 Bus) to Inner Perimeter Rd (US 41/SR 7))	2.6
177	S PATTERSON ST (From Inner Perimeter Rd (US 41/SR 7) to Gil Harbin Industrial Blvd)	2.6

Asset ID	Asset Name	Vulnerability
197	US HWY 84 E (From Inner Perimeter Rd (US 41/SR 7) to Delmar Rd)	2.6
198	US HWY 84 E (From Delmar Rd to SR 135)	2.6
199	US HWY 84 E (From SR 135 to Lanier County Line)	2.6
16	BEMISS RD (From New Bethel Rd to SR 122)	2.6
45	E MAIN ST/SR 122 (From Church St (US 41/SR 7) to Val Del Rd)	2.6
57	GA HWY 122 W (From Coffee Rd to I-75)	2.6
100	LAKES BLVD (From I-75 to Marion Ave (US 41/SR 7))	2.6
107	MADISON HWY (From Inner Perimeter Rd to Gil Harbin Industrial Blvd)	2.6
108	MADISON HWY (From Gil Harbin Industrial Blvd to S Patterson St (US 41 Bus/SR 7 Bus))	2.6
119	N CHURCH ST/US 41 (From SR 122 to Cook County Line)	2.6
24	CLYATTVILLE LAKE PARK RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	2.5
40	E COTTON AVE (From S Main St to N East St (SR 376))	2.5
59	GA HWY 135 (From Echols County Line to US 84/SR 38)	2.5
60	GA HWY 135 (From US 84/SR 38 to Lanier County Line)	2.5
99	LAKES BLVD (From Loch Laurel Rd to I-75)	2.5
142	NEW STATENVILLE HWY (From Inner Perimeter Rd (US 41/SR 7) to Echols County Line)	2.5
185	SMITHBRIAR DR (From N Oak St to N Ashley St)	2.4
54	GA HWY 122 E (From Val Del Rd to Cat Creek Rd)	2.3
55	GA HWY 122 E (From SR 125 to Lanier County Line)	2.3
56	GA HWY 122 E (From Cat Creek Rd to SR 125)	2.3
97	LAKELAND HWY (From Inner Perimeter Rd to Knights Academy Rd)	2.3
88	JERRY JONES DR (From Gornto Rd to Country Club Dr)	2.2
208	W BROOKWOOD DR (From N Oak St to N Patterson St)	2.2
127	N OAK ST EX (From N Valdosta Rd (US 41/SR 7) to Cherry Creek Rd)	2.2
207	W ALDEN AVE (From W Gordon St to N Patterson St)	2.1
39	E CENTRAL AVE (From N Forrest St to N Patterson St)	2.1
1	AIRPORT RD (From Old Clyattville Rd to Madison Hwy (SR 31))	2.1
32	COUNTRY CLUB RD (From N Valdosta Rd (US 41/SR 7) to N Valdosta Rd (US 41/SR 7))	2.1
20	CAT CREEK RD (From Bemiss Rd (SR 125) to Radar Site Rd)	2.1

Asset ID	Asset Name	Vulnerability
31	COUNTRY CLUB DR (From Jerry Jones Dr/Eager Rd to N Valdosta Rd (US 41/SR 7))	2.1
66	GORNTO RD (From St Augustine Rd (SR 133) to NS RR Crossing)	2.1
67	GORNTO RD (From NS RR Crossing to Jerry Jones Dr)	2.1
87	JERRY JONES DR (From Baytree Rd to Gornto Rd)	2.1
101	LANKFORD DR (From St Augustine Rd (SR 133) to W Gordon St)	2.1
120	N FORREST ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	2.1
21	CAT CREEK RD (From Radar Site Rd to SR 122)	2.0
22	CHERRY CREEK RD (From N Oak St Ext to Orr Rd)	2.0
123	N LEE ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	2.0
125	N OAK ST (From Baytree Rd to Gornto Rd)	2.0
126	N OAK ST (From Gornto Rd to Smithbriar Dr)	2.0
149	OLD CLYATTVILLE RD (From SR 31 to Ousley Rd)	2.0
192	ULMER AVE (From S Patterson St (US 41 Bus/SR 7 Bus) to Old Statenville Rd)	2.0
52	FORREST ST EX (From Inner Perimeter Rd (US 41/SR 7) to Bemiss Rd (SR 125))	2.0
150	OLD CLYATTVILLE RD (From Ousley Rd to I-75)	1.9
153	OLD CLYATTVILLE RD (From St Augustine Rd to S Patterson St (US 41 Bus/SR 7 Bus))	1.9
171	S ASHLEY ST (From S Patterson St to E Savannah Ave)	1.9
182	SKIPPER BRIDGE RD (From Bemiss Rd (SR 125) to Withlacoochee River)	1.9
190	STUDSTILL RD (From Bemiss Rd (SR 125) to Knights Academy Rd)	1.9
203	VAL DEL RD (From N Valdosta Rd (US 41/SR 7) to Bethany Rd)	1.9
47	E PARK AVE (From N Ashley St (US 41 Bus/SR 7 Bus) to N Forrest St)	1.9
51	EAGER RD (From Country Club Dr to N Oak St)	1.9
68	GORNTO RD (From Jerry Jones Dr to N Patterson St)	1.9
112	MELODY LN (From W Gordon St to Baytree Rd)	1.9
121	N FORREST ST (From E Park Ave to Inner Perimeter Rd (US 41/SR 7))	1.9
124	N OAK ST (From W Hill Ave (US 84/SR 38) to Baytree Rd)	1.9
144	NORMAN DR (From W Hill Ave (US 84/SR 38) to Baytree Rd)	1.9
146	NORTHSIDE DR (From N Oak St to Bemiss Rd)	1.9
151	OLD CLYATTVILLE RD (From I-75 to Airport Rd)	1.9

Asset ID	Asset Name	Vulnerability
166	RIVER ST (From Norman Dr to St Augustine Rd (SR 133))	1.9
172	S CHURCH ST (From S Hagan Bridge Rd to Main St (SR 122))	1.9
176	S OAK ST (From Madison Hwy (SR 31) to W Hill Ave (US 84/SR 38))	1.9
179	S ST AUGUSTINE RD (From Old Clyattville Rd to W Hill Ave (US 84/SR 38))	1.9
221	WOODROW WILSON DR (From N Patterson St to Bemiss Rd)	1.9
128	N OAK ST EXT/MT ZION CHURCH RD (From Cherry Creek Rd to Forrest St Ext)	1.9
148	OLD BEMISS RD (From Old Pine Rd Ext to Bemiss Knights Academy Rd)	1.9
158	OLD US 41 N (From Union Rd to S Hagan Bridge Rd)	1.9
17	BERKLEY DR (From Gornto Rd to Eager Rd)	1.9
5	BEMISS KNIGHTS ACADEMY RD (From Knights Academy Rd to Studstill Rd)	1.9
6	BEMISS KNIGHTS ACADEMY RD (From Studstill Rd to Old Bemiss Rd)	1.9
23	CLAY RD (From Statenville Hwy (SR 94) to E Hill Ave (US 84/SR 38))	1.9
35	DASHER GROVE RD (From Old US 41 to End of Road)	1.9
36	DAVIDSON RD (From Bemiss Rd (SR 125) to Moody AFB South Entrance)	1.9
48	E PARK AVE (From N Forrest St to Inner Perimeter Rd)	1.9
50	E VALLEY ST (From River St to N Ashley St)	1.9
69	GUEST RD (From Bemiss Rd (SR 125) to Bemiss Knights Academy Rd)	1.9
73	HOWELL RD (From New Statenville Hwy/Griffin Ave to Inner Perimeter Rd (US 41/SR 7))	1.9
85	IVEY RD (From Bemiss Rd (SR 125) to Old Bemiss Rd)	1.9
136	N TROUP ST (From E Central Ave to Vallotton Dr)	1.9
145	NORTHLAKE DR (From N Valdosta Rd (US 41/SR 7) to End of Road)	1.9
147	NORTHSIDE DR (From Bemiss Rd to Jaycee Shack Rd)	1.9
152	OLD CLYATTVILLE RD (From Airport Rd to Old Clyattville Rd)	1.9
155	OLD PINE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.9
157	OLD US 41 N (From N Valdosta Rd (US 41/SR 7) to Union Rd)	1.9
163	PARK AVE (From N Oak St to N Ashley St (US 41 Bus/SR 7 Bus))	1.9
165	RADAR SITE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.9
173	S FRY ST (From Lake Park Rd to N Forrest St)	1.9
206	VALLOTTON DR (From N Ashley St (US 41 Bus/SR 7 Bus) to N Troup St)	1.9

Asset ID	Asset Name	Vulnerability
217	W SAVANNAH AVE (From NS RR Crossing to S Patterson St)	1.9
29	CONNELL RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Bemiss Rd)	1.9
72	HOLLYWOOD ST (From Cypress St to E Hill Ave (US 84/SR 38))	1.9
102	LOCH LAUREL RD (From Florida State Line to I-75)	1.9
164	PINEVIEW DR (From Bemiss Rd to N Forrest St)	1.9
204	VAL DEL RD (From Bethany Rd to SR 122)	1.9
218	W SAVANNAH AVE (From St Augustine Rd to NS RR Crossing)	1.9
26	CLYATTVILLE NANKIN RD (From Rocky Ford Rd to Old Clyattville Rd)	1.8
30	COPELAND RD (From Madison Hwy (SR 31) to US 41/SR 7)	1.8
33	CYPRESS ST (From N Forrest St to Hollywood St)	1.8
38	E BROOKWOOD PL (From N Troup St to N Forrest St)	1.8
41	E GORDON ST (From N Patterson St to N Forrest St)	1.8
46	E MOORE ST (From N Patterson St to N Ashley St (US 41 Bus/SR 7 Bus))	1.8
49	E SAVANNAH AVE (From James Beck Overpass to S Fry St)	1.8
62	GEORGIA AVE (From Gornto Rd to N Oak St)	1.8
75	HOWELL RD (From Inner Perimeter Rd to Old Naylor Rd)	1.8
94	LAKE PARK BELLVILLE RD (From I-75 to E Cotton Ave)	1.8
95	LAKE PARK RD (From E Martin Luther King Jr Dr to Old Statenville Rd)	1.8
103	LOCH LAUREL RD (From I-75 to Madison Hwy (SR 31))	1.8
109	MAGNOLIA ST (From N Oak St to N Ashley St)	1.8
110	MARTIN LUTHER KING JR DR (From S Oak St to S Fry St)	1.8
114	MORVEN RD (From Little River/Brooks County Line to SR 122)	1.8
122	N HAGAN BRIDGE RD (From SR 122 to SR 122)	1.8
167	RIVER ST (From NS RR Crossing to N Oak St)	1.8
168	RIVER ST (From St Augustine Rd (SR 133) to NS RR Crossing)	1.8
170	ROCKY FORD RD (From Ousley Rd to US 84/SR 38)	1.8
174	S HAGAN BRIDGE RD (From Old US 41 to SR 122)	1.8
175	S LEE ST (From Griffin Ave to E Hill Ave (US 84/SR 38))	1.8
191	TUCKER RD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.8

Asset ID	Asset Name	Vulnerability
210	W GORDON ST (From Lankford Dr/Melody Ln to N Patterson St)	1.8
211	W GORDON ST (From W Alden Ave to Lankford Dr/Melody Ln)	1.8
220	WEST ST (From W Hill Ave (US 84/SR 38) to W Gordon St)	1.8
86	JAYCEE SHACK RD (From E Park Ave to Northside Dr)	1.8
90	JUMPING GULLY RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	1.8
91	KNIGHTS ACADEMY RD (From Bemiss Rd (SR 125) to RR Crossing)	1.8
113	MILLER BRIDGE RD (From Shiloh Rd to Morven Rd)	1.8
115	MT ZION CHURCH RD (From Forrest St Ext to Stallings Rd)	1.8
140	NEW BETHEL RD (From Cat Creek Rd to SR 125)	1.8
186	SNAKE NATION RD (From Shiloh Rd to Miller Bridge Rd)	1.8
219	WEBB RD N (From Coffee Rd to SR 122)	1.8
53	FRANKS CREEK RD (From Miller Bridge Rd to Union Rd)	1.8
63	GIL HARBIN INDUSTRIAL BLVD (From Old Clyattville Rdq to Madison Hwy (SR 31))	1.8
64	GIL HARBIN INDUSTRIAL BLVD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.8
89	JOHNSTON RD (From US 41/SR 7 to Hickory Grove Rd)	1.8
92	KNIGHTS ACADEMY RD (From RR Crossing to Studstill Rd)	1.8
141	NEW BETHEL RD (From SR 125 to Lanier County Line)	1.8
180	SHILOH RD (From I-75 to Miller Bridge Rd)	1.8
181	SHILOH RD (From Miller Bridge Rd to Morven Rd)	1.8
111	MCMILLAN RD (From Val Del Rd to Staten Rd)	1.7
188	STATEN RD (From Orr Rd to McMillan Rd)	1.7
34	DAMPIER ST (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.7
76	HOWELL RD (From Old Naylor Rd to Lake Park Rd)	1.6
169	ROCKY FORD RD (From Clyattville Nankin Rd to Ousley Rd)	1.6
187	STALLINGS RD (From Lakeland Hwy (US 221/SR 31) to Knights Academy Rd)	1.6
18	BETHANY RD (From Old US 41 to Val Del Rd)	1.6
25	CLYATTVILLE NANKIN RD (From Withlacoochee River/Brooks County Line to Rocky Ford Rd)	1.6
74	HOWELL RD (From Lake Park Rd to Echols County Line)	1.6
189	STATEN RD (From McMillan Rd to Skipper Bridge Rd)	1.6

Asset ID	Asset Name	Vulnerability
205	VAL DEL RD (From SR 122 to Cook County Line)	1.6
70	HICKORY GROVE RD N (From Johnston Rd to Glenn Rd)	1.6
71	HICKORY GROVE RD N (From US 41/SR 7 to Johnston Rd)	1.6
96	LAKE PARK RD (From Glenn Rd to Howell Rd)	1.6
156	OLD STATE RD (From Lakeland Hwy (US 221/SR 31) to SR 135)	1.6
161	OUSLEY RD (From Rocky Ford Rd to Old Clyattville Rd)	1.6
162	OUSLEY RD (From US 84/SR 38 to Rocky Ford Rd)	1.6
183	SKIPPER BRIDGE RD (From Withlacoochee River to Staten Rd)	1.6
184	SKIPPER BRIDGE RD (From Staten Rd to Cook County Line)	1.6
28	COFFEE RD (From SR 122 to Cook County Line)	1.5
37	DELMAR RD (From Lakeland Hwy (US 221/SR 31) to US 84/SR 38)	1.5
65	GLENN RD (From Hickory Grove Rd to SR 94)	1.5
93	KNIGHTS ACADEMY RD (From Studstill Rd to Lakeland Hwy (US 221/SR 31))	1.5
154	OLD NAYLOR RD (From Howell Rd to US 84/SR 38)	1.5
159	OLD VALDOSTA RD (From Cook County Line to Coffee Rd)	1.5
160	ORR RD (From Staten Rd to Skipper Bridge Rd)	1.5
193	UNION RD (From Franks Creek Rd to Old US 41)	1.5
19	BORING POND RD (From SR 94 to Lake Park Rd)	1.5
27	COFFEE RD (From Morven Rd to SR 122)	1.4

PRECIPITATION CHANGE – BASELINE PROJECTIONS (1950-2005)

Asset ID	Asset Name	Vulnerability
135	N ST AUGUSTINE RD (From I-75 to Little River/Brooks County Line)	2.5
67	GORNTO RD (From NS RR Crossing to Jerry Jones Dr)	2.4
117	N ASHLEY ST (From E Magnolia St to Bemiss Rd)	2.3
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	2.2
152	OLD CLYATTVILLE RD (From Airport Rd to Old Clyattville Rd)	2.0
114	MORVEN RD (From Little River/Brooks County Line to SR 122)	2.0
86	JAYCEE SHACK RD (From E Park Ave to Northside Dr)	2.0
178	S PATTERSON ST (From Gil Harbin Industrial Blvd to James Beck Overpass)	1.9
180	SHILOH RD (From I-75 to Miller Bridge Rd)	1.9
2	BAYTREE RD (From Gornto Rd to NS RR Crossing)	1.9
133	N ST AUGUSTINE RD (From Lankford Dr to Norman Dr)	1.9
138	N VALDOSTA RD (From I-75 to Old US 41)	1.9
47	E PARK AVE (From N Ashley St (US 41 Bus/SR 7 Bus) to N Forrest St)	1.9
25	CLYATTVILLE NANKIN RD (From Withlacoochee River/Brooks County Line to Rocky Ford Rd)	1.9
200	US HWY 84 W (From Withlacoochee River/Brooks County Line to Ousley Rd)	1.9
144	NORMAN DR (From W Hill Ave (US 84/SR 38) to Baytree Rd)	1.9
66	GORNTO RD (From St Augustine Rd (SR 133) to NS RR Crossing)	1.9
105	MADISON HWY (From SR 376 to I-75)	1.9
127	N OAK ST EX (From N Valdosta Rd (US 41/SR 7) to Cherry Creek Rd)	1.8
212	W HILL AVE (From I-75 to St Augustine Rd (SR 133))	1.8
88	JERRY JONES DR (From Gornto Rd to Country Club Dr)	1.8
151	OLD CLYATTVILLE RD (From I-75 to Airport Rd)	1.7
209	W CENTRAL AVE (From W Hill Ave (US 84/SR 38) to Patterson St)	1.7
216	W MARION AVE (From Lakes Blvd (SR 376) to SR 376)	1.7
185	SMITHBRIAR DR (From N Oak St to N Ashley St)	1.7
101	LANKFORD DR (From St Augustine Rd (SR 133) to W Gordon St)	1.7
3	BAYTREE RD (From NS RR Crossing to Jerry Jones Dr/Melody Ln)	1.7
112	MELODY LN (From W Gordon St to Baytree Rd)	1.7

Asset ID	Asset Name	Vulnerability
116	N ASHLEY ST (From E Savannah Ave to E Magnolia St)	1.7
194	US HWY 41 S (From Echols County Line to SR 376)	1.7
206	VALLOTTON DR (From N Ashley St (US 41 Bus/SR 7 Bus) to N Troup St)	1.7
149	OLD CLYATTVILLE RD (From SR 31 to Ousley Rd)	1.7
207	W ALDEN AVE (From W Gordon St to N Patterson St)	1.7
214	W HILL AVE (From W Central Ave to Patterson St)	1.7
1	AIRPORT RD (From Old Clyattville Rd to Madison Hwy (SR 31))	1.6
139	N VALDOSTA RD (From Country Club Rd to Old US 41)	1.6
150	OLD CLYATTVILLE RD (From Ousley Rd to I-75)	1.6
203	VAL DEL RD (From N Valdosta Rd (US 41/SR 7) to Bethany Rd)	1.6
90	JUMPING GULLY RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	1.6
158	OLD US 41 N (From Union Rd to S Hagan Bridge Rd)	1.6
4	BAYTREE RD (From Jerry Jones Dr to N Oak St)	1.6
43	E HILL AVE (From N Forrest St to Clay Rd/Hollywood St)	1.6
153	OLD CLYATTVILLE RD (From St Augustine Rd to S Patterson St (US 41 Bus/SR 7 Bus))	1.6
213	W HILL AVE (From St Augustine Rd (SR 133) to W Central Ave)	1.6
31	COUNTRY CLUB DR (From Jerry Jones Dr/Eager Rd to N Valdosta Rd (US 41/SR 7))	1.6
41	E GORDON ST (From N Patterson St to N Forrest St)	1.6
87	JERRY JONES DR (From Baytree Rd to Gornto Rd)	1.6
211	W GORDON ST (From W Alden Ave to Lankford Dr/Melody Ln)	1.6
57	GA HWY 122 W (From Coffee Rd to I-75)	1.6
157	OLD US 41 N (From N Valdosta Rd (US 41/SR 7) to Union Rd)	1.6
145	NORTHLAKE DR (From N Valdosta Rd (US 41/SR 7) to End of Road)	1.6
129	N PATTERSON ST (From Magnolia St to Hill Ave)	1.6
204	VAL DEL RD (From Bethany Rd to SR 122)	1.6
17	BERKLEY DR (From Gornto Rd to Eager Rd)	1.5
26	CLYATTVILLE NANKIN RD (From Rocky Ford Rd to Old Clyattville Rd)	1.5
195	US HWY 41 S (From Lakes Blvd (SR 376) to Johnston Rd)	1.5
44	E HILL AVE (From Clay Rd/Hollywood St to Inner Perimeter Rd (US 41/SR 7))	1.5

Asset ID	Asset Name	Vulnerability
51	EAGER RD (From Country Club Dr to N Oak St)	1.5
68	GORNTO RD (From Jerry Jones Dr to N Patterson St)	1.5
137	N VALDOSTA RD (From N Oak St Ext to Country Club Rd)	1.5
182	SKIPPER BRIDGE RD (From Bemiss Rd (SR 125) to Withlacoochee River)	1.5
100	LAKES BLVD (From I-75 to Marion Ave (US 41/SR 7))	1.5
104	MADISON HWY (From Florida State Line to SR 376)	1.5
201	US HWY 84 W (From Ousley Rd to Rocky Ford Rd)	1.5
113	MILLER BRIDGE RD (From Shiloh Rd to Morven Rd)	1.5
128	N OAK ST EXT/MT ZION CHURCH RD (From Cherry Creek Rd to Forrest St Ext)	1.5
148	OLD BEMISS RD (From Old Pine Rd Ext to Bemiss Knights Academy Rd)	1.5
186	SNAKE NATION RD (From Shiloh Rd to Miller Bridge Rd)	1.5
219	WEBB RD N (From Coffee Rd to SR 122)	1.5
176	S OAK ST (From Madison Hwy (SR 31) to W Hill Ave (US 84/SR 38))	1.5
48	E PARK AVE (From N Forrest St to Inner Perimeter Rd)	1.5
53	FRANKS CREEK RD (From Miller Bridge Rd to Union Rd)	1.5
181	SHILOH RD (From Miller Bridge Rd to Morven Rd)	1.5
118	N ASHLEY ST (From Bemiss Rd to N Oak St Ext)	1.4
196	US HWY 41 S (From Johnston Rd to Inner Perimeter Rd (US 41/SR 7))	1.4
208	W BROOKWOOD DR (From N Oak St to N Patterson St)	1.4
5	BEMISS KNIGHTS ACADEMY RD (From Knights Academy Rd to Studstill Rd)	1.4
6	BEMISS KNIGHTS ACADEMY RD (From Studstill Rd to Old Bemiss Rd)	1.4
39	E CENTRAL AVE (From N Forrest St to N Patterson St)	1.4
69	GUEST RD (From Bemiss Rd (SR 125) to Bemiss Knights Academy Rd)	1.4
99	LAKES BLVD (From Loch Laurel Rd to I-75)	1.4
169	ROCKY FORD RD (From Clyattville Nankin Rd to Ousley Rd)	1.4
188	STATEN RD (From Orr Rd to McMillan Rd)	1.4
106	MADISON HWY (From I-75 to Inner Perimeter Rd)	1.4
61	GA HWY 376 (From Marion Ave (US 41/SR 7) to Echols County Line)	1.4
202	US HWY 84 W (From Rocky Ford Rd to I-75)	1.4

Asset ID	Asset Name	Vulnerability
215	W MAIN ST (From I-75 to Church St (US 41/SR 7))	1.4
8	BEMISS RD (From Northside Dr to Inner Perimeter Rd (US 41/SR 7))	1.4
62	GEORGIA AVE (From Gornto Rd to N Oak St)	1.4
81	INNER PERIMETER RD (From N Valdosta Rd (US 41/SR 7) to N Oak St Ext)	1.4
146	NORTHSIDE DR (From N Oak St to Bemiss Rd)	1.4
171	S ASHLEY ST (From S Patterson St to E Savannah Ave)	1.4
162	OUSLEY RD (From US 84/SR 38 to Rocky Ford Rd)	1.4
175	S LEE ST (From Griffin Ave to E Hill Ave (US 84/SR 38))	1.4
107	MADISON HWY (From Inner Perimeter Rd to Gil Harbin Industrial Blvd)	1.4
108	MADISON HWY (From Gil Harbin Industrial Blvd to S Patterson St (US 41 Bus/SR 7 Bus))	1.4
126	N OAK ST (From Gornto Rd to Smithbriar Dr)	1.4
58	GA HWY 122 W (From Little River/Brooks County Line to Coffee Rd)	1.4
40	E COTTON AVE (From S Main St to N East St (SR 376))	1.3
94	LAKE PARK BELLVILLE RD (From I-75 to E Cotton Ave)	1.3
7	BEMISS RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Northside Dr)	1.3
10	BEMISS RD (From Knights Academy Rd to Skipper Bridge Rd)	1.3
42	E HILL AVE (From N Patterson St to N Forrest St)	1.3
77	INNER PERIMETER RD (From Madison Hwy (SR 31) to US 41/SR 7)	1.3
177	S PATTERSON ST (From Inner Perimeter Rd (US 41/SR 7) to Gil Harbin Industrial Blvd)	1.3
166	RIVER ST (From Norman Dr to St Augustine Rd (SR 133))	1.3
172	S CHURCH ST (From S Hagan Bridge Rd to Main St (SR 122))	1.3
9	BEMISS RD (From Inner Perimeter Rd (US 41/SR 7) to Knights Academy Rd)	1.3
14	BEMISS RD (From Davidson Rd/Moody AFB South Entrance to Radar Site Rd/Moody AFB Main Entrance)	1.3
15	BEMISS RD (From Radar Site Rd/Moody AFB Main Entrance to New Bethel Rd)	1.3
18	BETHANY RD (From Old US 41 to Val Del Rd)	1.3
111	MCMILLAN RD (From Val Del Rd to Staten Rd)	1.3
123	N LEE ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.3
130	N PATTERSON ST (From Magnolia St to Park Ave)	1.3
131	N PATTERSON ST (From Park Ave to N Oak St Ext)	1.3

Asset ID	Asset Name	Vulnerability
78	INNER PERIMETER RD (From US 41/SR 7 to SR 94)	1.3
13	BEMISS RD (From Cat Creek Rd to Davidson Rd/Moody AFB South Entrance)	1.3
79	INNER PERIMETER RD (From SR 94 to E Hill Ave (US 84/SR 38))	1.3
84	INNER PERIMETER RD (From N Oak St Ext to Bemiss Rd (SR 125))	1.3
109	MAGNOLIA ST (From N Oak St to N Ashley St)	1.3
120	N FORREST ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.3
124	N OAK ST (From W Hill Ave (US 84/SR 38) to Baytree Rd)	1.3
132	N ST AUGUSTINE RD (From W Hill Ave (US 84/SR 38) to Lankford Dr)	1.3
221	WOODROW WILSON DR (From N Patterson St to Bemiss Rd)	1.3
205	VAL DEL RD (From SR 122 to Cook County Line)	1.3
102	LOCH LAUREL RD (From Florida State Line to I-75)	1.2
161	OUSLEY RD (From Rocky Ford Rd to Old Clyattville Rd)	1.2
50	E VALLEY ST (From River St to N Ashley St)	1.2
83	INNER PERIMETER RD (From N Forrest St to Lakeland Hwy (US 221/SR 31))	1.2
192	ULMER AVE (From S Patterson St (US 41 Bus/SR 7 Bus) to Old Statenville Rd)	1.2
217	W SAVANNAH AVE (From NS RR Crossing to S Patterson St)	1.2
11	BEMISS RD (From Skipper Bridge Rd to Studstill Rd)	1.2
28	COFFEE RD (From SR 122 to Cook County Line)	1.2
82	INNER PERIMETER RD (From Bemiss Rd (SR 125) to N Forrest St)	1.2
159	OLD VALDOSTA RD (From Cook County Line to Coffee Rd)	1.2
24	CLYATTVILLE LAKE PARK RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	1.2
29	CONNELL RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Bemiss Rd)	1.2
191	TUCKER RD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.2
32	COUNTRY CLUB RD (From N Valdosta Rd (US 41/SR 7) to N Valdosta Rd (US 41/SR 7))	1.2
198	US HWY 84 E (From Delmar Rd to SR 135)	1.2
199	US HWY 84 E (From SR 135 to Lanier County Line)	1.2
20	CAT CREEK RD (From Bemiss Rd (SR 125) to Radar Site Rd)	1.2
143	NEW STATENVILLE HWY (From S Patterson St (US 41 Bus/SR 7 Bus) to Inner Perimeter Rd (US 41/SR 7))	1.2
179	S ST AUGUSTINE RD (From Old Clyattville Rd to W Hill Ave (US 84/SR 38))	1.2

Asset ID	Asset Name	Vulnerability
12	BEMISS RD (From Studstill Rd to Cat Creek Rd)	1.2
189	STATEN RD (From McMillan Rd to Skipper Bridge Rd)	1.2
27	COFFEE RD (From Morven Rd to SR 122)	1.1
35	DASHER GROVE RD (From Old US 41 to End of Road)	1.1
45	E MAIN ST/SR 122 (From Church St (US 41/SR 7) to Val Del Rd)	1.1
63	GIL HARBIN INDUSTRIAL BLVD (From Old Clyattville Rdq to Madison Hwy (SR 31))	1.1
64	GIL HARBIN INDUSTRIAL BLVD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.1
119	N CHURCH ST/US 41 (From SR 122 to Cook County Line)	1.1
33	CYPRESS ST (From N Forrest St to Hollywood St)	1.1
21	CAT CREEK RD (From Radar Site Rd to SR 122)	1.1
22	CHERRY CREEK RD (From N Oak St Ext to Orr Rd)	1.1
23	CLAY RD (From Statenville Hwy (SR 94) to E Hill Ave (US 84/SR 38))	1.1
71	HICKORY GROVE RD N (From US 41/SR 7 to Johnston Rd)	1.1
80	INNER PERIMETER RD (From E Hill Ave (US 84/SR 38) to Lakeland Hwy (US 221/SR 31))	1.1
125	N OAK ST (From Baytree Rd to Gornto Rd)	1.1
136	N TROUP ST (From E Central Ave to Vallotton Dr)	1.1
147	NORTHSIDE DR (From Bemiss Rd to Jaycee Shack Rd)	1.1
163	PARK AVE (From N Oak St to N Ashley St (US 41 Bus/SR 7 Bus))	1.1
173	S FRY ST (From Lake Park Rd to N Forrest St)	1.1
183	SKIPPER BRIDGE RD (From Withlacoochee River to Staten Rd)	1.1
184	SKIPPER BRIDGE RD (From Staten Rd to Cook County Line)	1.1
52	FORREST ST EX (From Inner Perimeter Rd (US 41/SR 7) to Bemiss Rd (SR 125))	1.1
72	HOLLYWOOD ST (From Cypress St to E Hill Ave (US 84/SR 38))	1.1
218	W SAVANNAH AVE (From St Augustine Rd to NS RR Crossing)	1.1
30	COPELAND RD (From Madison Hwy (SR 31) to US 41/SR 7)	1.1
103	LOCH LAUREL RD (From I-75 to Madison Hwy (SR 31))	1.1
122	N HAGAN BRIDGE RD (From SR 122 to SR 122)	1.1
142	NEW STATENVILLE HWY (From Inner Perimeter Rd (US 41/SR 7) to Echols County Line)	1.1
170	ROCKY FORD RD (From Ousley Rd to US 84/SR 38)	1.1

Asset ID	Asset Name	Vulnerability
174	S HAGAN BRIDGE RD (From Old US 41 to SR 122)	1.1
46	E MOORE ST (From N Patterson St to N Ashley St (US 41 Bus/SR 7 Bus))	1.1
49	E SAVANNAH AVE (From James Beck Overpass to S Fry St)	1.1
95	LAKE PARK RD (From E Martin Luther King Jr Dr to Old Statenville Rd)	1.1
110	MARTIN LUTHER KING JR DR (From S Oak St to S Fry St)	1.1
167	RIVER ST (From NS RR Crossing to N Oak St)	1.1
168	RIVER ST (From St Augustine Rd (SR 133) to NS RR Crossing)	1.1
190	STUDSTILL RD (From Bemiss Rd (SR 125) to Knights Academy Rd)	1.1
197	US HWY 84 E (From Inner Perimeter Rd (US 41/SR 7) to Delmar Rd)	1.1
210	W GORDON ST (From Lankford Dr/Melody Ln to N Patterson St)	1.1
220	WEST ST (From W Hill Ave (US 84/SR 38) to W Gordon St)	1.1
121	N FORREST ST (From E Park Ave to Inner Perimeter Rd (US 41/SR 7))	1.1
16	BEMISS RD (From New Bethel Rd to SR 122)	1.0
73	HOWELL RD (From New Statenville Hwy/Griffin Ave to Inner Perimeter Rd (US 41/SR 7))	1.0
34	DAMPIER ST (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.0
36	DAVIDSON RD (From Bemiss Rd (SR 125) to Moody AFB South Entrance)	1.0
85	IVEY RD (From Bemiss Rd (SR 125) to Old Bemiss Rd)	1.0
155	OLD PINE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.0
165	RADAR SITE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.0
164	PINEVIEW DR (From Bemiss Rd to N Forrest St)	1.0
38	E BROOKWOOD PL (From N Troup St to N Forrest St)	0.9
59	GA HWY 135 (From Echols County Line to US 84/SR 38)	0.9
60	GA HWY 135 (From US 84/SR 38 to Lanier County Line)	0.9
75	HOWELL RD (From Inner Perimeter Rd to Old Naylor Rd)	0.9
91	KNIGHTS ACADEMY RD (From Bemiss Rd (SR 125) to RR Crossing)	0.9
115	MT ZION CHURCH RD (From Forrest St Ext to Stallings Rd)	0.9
140	NEW BETHEL RD (From Cat Creek Rd to SR 125)	0.9
89	JOHNSTON RD (From US 41/SR 7 to Hickory Grove Rd)	0.9
92	KNIGHTS ACADEMY RD (From RR Crossing to Studstill Rd)	0.9

Asset ID	Asset Name	Vulnerability
141	NEW BETHEL RD (From SR 125 to Lanier County Line)	0.9
70	HICKORY GROVE RD N (From Johnston Rd to Glenn Rd)	0.8
96	LAKE PARK RD (From Glenn Rd to Howell Rd)	0.8
54	GA HWY 122 E (From Val Del Rd to Cat Creek Rd)	0.8
55	GA HWY 122 E (From SR 125 to Lanier County Line)	0.8
56	GA HWY 122 E (From Cat Creek Rd to SR 125)	0.8
65	GLENN RD (From Hickory Grove Rd to SR 94)	0.8
97	LAKELAND HWY (From Inner Perimeter Rd to Knights Academy Rd)	0.8
98	LAKELAND HWY (From Knights Academy Rd to Lanier County Line)	0.8
193	UNION RD (From Franks Creek Rd to Old US 41)	0.8
19	BORING POND RD (From SR 94 to Lake Park Rd)	0.7
76	HOWELL RD (From Old Naylor Rd to Lake Park Rd)	0.7
187	STALLINGS RD (From Lakeland Hwy (US 221/SR 31) to Knights Academy Rd)	0.7
74	HOWELL RD (From Lake Park Rd to Echols County Line)	0.7
156	OLD STATE RD (From Lakeland Hwy (US 221/SR 31) to SR 135)	0.7
37	DELMAR RD (From Lakeland Hwy (US 221/SR 31) to US 84/SR 38)	0.6
93	KNIGHTS ACADEMY RD (From Studstill Rd to Lakeland Hwy (US 221/SR 31))	0.6
154	OLD NAYLOR RD (From Howell Rd to US 84/SR 38)	0.6
160	ORR RD (From Staten Rd to Skipper Bridge Rd)	0.6

PRECIPITATION CHANGE – FUTURE PROJECTIONS (2050-2099)

Asset ID	Asset Name	Vulnerability
135	N ST AUGUSTINE RD (From I-75 to Little River/Brooks County Line)	2.6
67	GORNTO RD (From NS RR Crossing to Jerry Jones Dr)	2.6
117	N ASHLEY ST (From E Magnolia St to Bemiss Rd)	2.4
134	N ST AUGUSTINE RD (From Norman Dr to I-75)	2.3
114	MORVEN RD (From Little River/Brooks County Line to SR 122)	2.2
180	SHILOH RD (From I-75 to Miller Bridge Rd)	2.2
86	JAYCEE SHACK RD (From E Park Ave to Northside Dr)	2.1
178	S PATTERSON ST (From Gil Harbin Industrial Blvd to James Beck Overpass)	2.1
2	BAYTREE RD (From Gornto Rd to NS RR Crossing)	2.0
133	N ST AUGUSTINE RD (From Lankford Dr to Norman Dr)	2.0
138	N VALDOSTA RD (From I-75 to Old US 41)	2.0
152	OLD CLYATTVILLE RD (From Airport Rd to Old Clyattville Rd)	2.0
47	E PARK AVE (From N Ashley St (US 41 Bus/SR 7 Bus) to N Forrest St)	2.0
25	CLYATTVILLE NANKIN RD (From Withlacoochee River/Brooks County Line to Rocky Ford Rd)	2.0
200	US HWY 84 W (From Withlacoochee River/Brooks County Line to Ousley Rd)	2.0
144	NORMAN DR (From W Hill Ave (US 84/SR 38) to Baytree Rd)	2.0
66	GORNTO RD (From St Augustine Rd (SR 133) to NS RR Crossing)	2.0
105	MADISON HWY (From SR 376 to I-75)	2.0
127	N OAK ST EX (From N Valdosta Rd (US 41/SR 7) to Cherry Creek Rd)	2.0
212	W HILL AVE (From I-75 to St Augustine Rd (SR 133))	1.9
88	JERRY JONES DR (From Gornto Rd to Country Club Dr)	1.9
209	W CENTRAL AVE (From W Hill Ave (US 84/SR 38) to Patterson St)	1.9
185	SMITHBRIAR DR (From N Oak St to N Ashley St)	1.9
3	BAYTREE RD (From NS RR Crossing to Jerry Jones Dr/Melody Ln)	1.9
112	MELODY LN (From W Gordon St to Baytree Rd)	1.9
101	LANKFORD DR (From St Augustine Rd (SR 133) to W Gordon St)	1.9
116	N ASHLEY ST (From E Savannah Ave to E Magnolia St)	1.9
57	GA HWY 122 W (From Coffee Rd to I-75)	1.8

Asset ID	Asset Name	Vulnerability
206	VALLOTTON DR (From N Ashley St (US 41 Bus/SR 7 Bus) to N Troup St)	1.8
149	OLD CLYATTVILLE RD (From SR 31 to Ousley Rd)	1.8
207	W ALDEN AVE (From W Gordon St to N Patterson St)	1.8
214	W HILL AVE (From W Central Ave to Patterson St)	1.8
139	N VALDOSTA RD (From Country Club Rd to Old US 41)	1.8
150	OLD CLYATTVILLE RD (From Ousley Rd to I-75)	1.8
203	VAL DEL RD (From N Valdosta Rd (US 41/SR 7) to Bethany Rd)	1.8
90	JUMPING GULLY RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	1.8
113	MILLER BRIDGE RD (From Shiloh Rd to Morven Rd)	1.8
158	OLD US 41 N (From Union Rd to S Hagan Bridge Rd)	1.8
186	SNAKE NATION RD (From Shiloh Rd to Miller Bridge Rd)	1.8
219	WEBB RD N (From Coffee Rd to SR 122)	1.8
4	BAYTREE RD (From Jerry Jones Dr to N Oak St)	1.7
41	E GORDON ST (From N Patterson St to N Forrest St)	1.7
43	E HILL AVE (From N Forrest St to Clay Rd/Hollywood St)	1.7
151	OLD CLYATTVILLE RD (From I-75 to Airport Rd)	1.7
153	OLD CLYATTVILLE RD (From St Augustine Rd to S Patterson St (US 41 Bus/SR 7 Bus))	1.7
211	W GORDON ST (From W Alden Ave to Lankford Dr/Melody Ln)	1.7
213	W HILL AVE (From St Augustine Rd (SR 133) to W Central Ave)	1.7
31	COUNTRY CLUB DR (From Jerry Jones Dr/Eager Rd to N Valdosta Rd (US 41/SR 7))	1.7
87	JERRY JONES DR (From Baytree Rd to Gornto Rd)	1.7
216	W MARION AVE (From Lakes Blvd (SR 376) to SR 376)	1.7
53	FRANKS CREEK RD (From Miller Bridge Rd to Union Rd)	1.7
181	SHILOH RD (From Miller Bridge Rd to Morven Rd)	1.7
194	US HWY 41 S (From Echols County Line to SR 376)	1.7
157	OLD US 41 N (From N Valdosta Rd (US 41/SR 7) to Union Rd)	1.7
145	NORTHLAKE DR (From N Valdosta Rd (US 41/SR 7) to End of Road)	1.7
188	STATEN RD (From Orr Rd to McMillan Rd)	1.7
129	N PATTERSON ST (From Magnolia St to Hill Ave)	1.7

Asset ID	Asset Name	Vulnerability
204	VAL DEL RD (From Bethany Rd to SR 122)	1.7
215	W MAIN ST (From I-75 to Church St (US 41/SR 7))	1.7
17	BERKLEY DR (From Gornto Rd to Eager Rd)	1.7
26	CLYATTVILLE NANKIN RD (From Rocky Ford Rd to Old Clyattville Rd)	1.7
195	US HWY 41 S (From Lakes Blvd (SR 376) to Johnston Rd)	1.7
1	AIRPORT RD (From Old Clyattville Rd to Madison Hwy (SR 31))	1.6
44	E HILL AVE (From Clay Rd/Hollywood St to Inner Perimeter Rd (US 41/SR 7))	1.6
51	EAGER RD (From Country Club Dr to N Oak St)	1.6
68	GORNTO RD (From Jerry Jones Dr to N Patterson St)	1.6
137	N VALDOSTA RD (From N Oak St Ext to Country Club Rd)	1.6
182	SKIPPER BRIDGE RD (From Bemiss Rd (SR 125) to Withlacoochee River)	1.6
100	LAKES BLVD (From I-75 to Marion Ave (US 41/SR 7))	1.6
104	MADISON HWY (From Florida State Line to SR 376)	1.6
201	US HWY 84 W (From Ousley Rd to Rocky Ford Rd)	1.6
58	GA HWY 122 W (From Little River/Brooks County Line to Coffee Rd)	1.6
128	N OAK ST EXT/MT ZION CHURCH RD (From Cherry Creek Rd to Forrest St Ext)	1.6
148	OLD BEMISS RD (From Old Pine Rd Ext to Bemiss Knights Academy Rd)	1.6
176	S OAK ST (From Madison Hwy (SR 31) to W Hill Ave (US 84/SR 38))	1.6
48	E PARK AVE (From N Forrest St to Inner Perimeter Rd)	1.6
118	N ASHLEY ST (From Bemiss Rd to N Oak St Ext)	1.6
39	E CENTRAL AVE (From N Forrest St to N Patterson St)	1.6
196	US HWY 41 S (From Johnston Rd to Inner Perimeter Rd (US 41/SR 7))	1.6
208	W BROOKWOOD DR (From N Oak St to N Patterson St)	1.6
5	BEMISS KNIGHTS ACADEMY RD (From Knights Academy Rd to Studstill Rd)	1.6
6	BEMISS KNIGHTS ACADEMY RD (From Studstill Rd to Old Bemiss Rd)	1.6
69	GUEST RD (From Bemiss Rd (SR 125) to Bemiss Knights Academy Rd)	1.6
99	LAKES BLVD (From Loch Laurel Rd to I-75)	1.6
169	ROCKY FORD RD (From Clyattville Nankin Rd to Ousley Rd)	1.6
111	MCMILLAN RD (From Val Del Rd to Staten Rd)	1.6

Asset ID	Asset Name	Vulnerability
61	GA HWY 376 (From Marion Ave (US 41/SR 7) to Echols County Line)	1.5
202	US HWY 84 W (From Rocky Ford Rd to I-75)	1.5
8	BEMISS RD (From Northside Dr to Inner Perimeter Rd (US 41/SR 7))	1.5
62	GEORGIA AVE (From Gornto Rd to N Oak St)	1.5
81	INNER PERIMETER RD (From N Valdosta Rd (US 41/SR 7) to N Oak St Ext)	1.5
146	NORTHSIDE DR (From N Oak St to Bemiss Rd)	1.5
171	S ASHLEY ST (From S Patterson St to E Savannah Ave)	1.5
162	OUSLEY RD (From US 84/SR 38 to Rocky Ford Rd)	1.5
175	S LEE ST (From Griffin Ave to E Hill Ave (US 84/SR 38))	1.5
126	N OAK ST (From Gornto Rd to Smithbriar Dr)	1.5
28	COFFEE RD (From SR 122 to Cook County Line)	1.5
159	OLD VALDOSTA RD (From Cook County Line to Coffee Rd)	1.5
7	BEMISS RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Northside Dr)	1.5
42	E HILL AVE (From N Patterson St to N Forrest St)	1.5
10	BEMISS RD (From Knights Academy Rd to Skipper Bridge Rd)	1.5
166	RIVER ST (From Norman Dr to St Augustine Rd (SR 133))	1.4
172	S CHURCH ST (From S Hagan Bridge Rd to Main St (SR 122))	1.4
9	BEMISS RD (From Inner Perimeter Rd (US 41/SR 7) to Knights Academy Rd)	1.4
14	BEMISS RD (From Davidson Rd/Moody AFB South Entrance to Radar Site Rd/Moody AFB Main Entrance)	1.4
15	BEMISS RD (From Radar Site Rd/Moody AFB Main Entrance to New Bethel Rd)	1.4
18	BETHANY RD (From Old US 41 to Val Del Rd)	1.4
123	N LEE ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.4
130	N PATTERSON ST (From Magnolia St to Park Ave)	1.4
131	N PATTERSON ST (From Park Ave to N Oak St Ext)	1.4
189	STATEN RD (From McMillan Rd to Skipper Bridge Rd)	1.4
78	INNER PERIMETER RD (From US 41/SR 7 to SR 94)	1.4
106	MADISON HWY (From I-75 to Inner Perimeter Rd)	1.4
13	BEMISS RD (From Cat Creek Rd to Davidson Rd/Moody AFB South Entrance)	1.4
79	INNER PERIMETER RD (From SR 94 to E Hill Ave (US 84/SR 38))	1.4

Asset ID	Asset Name	Vulnerability
84	INNER PERIMETER RD (From N Oak St Ext to Bemiss Rd (SR 125))	1.4
109	MAGNOLIA ST (From N Oak St to N Ashley St)	1.4
120	N FORREST ST (From E Hill Ave (US 84/SR 38) to E Park Ave)	1.4
124	N OAK ST (From W Hill Ave (US 84/SR 38) to Baytree Rd)	1.4
132	N ST AUGUSTINE RD (From W Hill Ave (US 84/SR 38) to Lankford Dr)	1.4
221	WOODROW WILSON DR (From N Patterson St to Bemiss Rd)	1.4
205	VAL DEL RD (From SR 122 to Cook County Line)	1.4
119	N CHURCH ST/US 41 (From SR 122 to Cook County Line)	1.4
27	COFFEE RD (From Morven Rd to SR 122)	1.4
21	CAT CREEK RD (From Radar Site Rd to SR 122)	1.4
102	LOCH LAUREL RD (From Florida State Line to I-75)	1.4
161	OUSLEY RD (From Rocky Ford Rd to Old Clyattville Rd)	1.4
183	SKIPPER BRIDGE RD (From Withlacoochee River to Staten Rd)	1.4
184	SKIPPER BRIDGE RD (From Staten Rd to Cook County Line)	1.4
50	E VALLEY ST (From River St to N Ashley St)	1.4
83	INNER PERIMETER RD (From N Forrest St to Lakeland Hwy (US 221/SR 31))	1.4
107	MADISON HWY (From Inner Perimeter Rd to Gil Harbin Industrial Blvd)	1.4
108	MADISON HWY (From Gil Harbin Industrial Blvd to S Patterson St (US 41 Bus/SR 7 Bus))	1.4
192	ULMER AVE (From S Patterson St (US 41 Bus/SR 7 Bus) to Old Statenville Rd)	1.4
217	W SAVANNAH AVE (From NS RR Crossing to S Patterson St)	1.4
11	BEMISS RD (From Skipper Bridge Rd to Studstill Rd)	1.4
82	INNER PERIMETER RD (From Bemiss Rd (SR 125) to N Forrest St)	1.4
24	CLYATTVILLE LAKE PARK RD (From Madison Hwy (SR 31) to Loch Laurel Rd)	1.3
40	E COTTON AVE (From S Main St to N East St (SR 376))	1.3
94	LAKE PARK BELLVILLE RD (From I-75 to E Cotton Ave)	1.3
29	CONNELL RD (From N Ashley St (US 41 Bus/SR 7 Bus) to Bemiss Rd)	1.3
32	COUNTRY CLUB RD (From N Valdosta Rd (US 41/SR 7) to N Valdosta Rd (US 41/SR 7))	1.3
77	INNER PERIMETER RD (From Madison Hwy (SR 31) to US 41/SR 7)	1.3
177	S PATTERSON ST (From Inner Perimeter Rd (US 41/SR 7) to Gil Harbin Industrial Blvd)	1.3

Asset ID	Asset Name	Vulnerability
198	US HWY 84 E (From Delmar Rd to SR 135)	1.3
199	US HWY 84 E (From SR 135 to Lanier County Line)	1.3
20	CAT CREEK RD (From Bemiss Rd (SR 125) to Radar Site Rd)	1.3
143	NEW STATENVILLE HWY (From S Patterson St (US 41 Bus/SR 7 Bus) to Inner Perimeter Rd (US 41/SR 7))	1.3
179	S ST AUGUSTINE RD (From Old Clyattville Rd to W Hill Ave (US 84/SR 38))	1.3
12	BEMISS RD (From Studstill Rd to Cat Creek Rd)	1.3
45	E MAIN ST/SR 122 (From Church St (US 41/SR 7) to Val Del Rd)	1.3
35	DASHER GROVE RD (From Old US 41 to End of Road)	1.3
33	CYPRESS ST (From N Forrest St to Hollywood St)	1.3
22	CHERRY CREEK RD (From N Oak St Ext to Orr Rd)	1.2
23	CLAY RD (From Statenville Hwy (SR 94) to E Hill Ave (US 84/SR 38))	1.2
71	HICKORY GROVE RD N (From US 41/SR 7 to Johnston Rd)	1.2
80	INNER PERIMETER RD (From E Hill Ave (US 84/SR 38) to Lakeland Hwy (US 221/SR 31))	1.2
125	N OAK ST (From Baytree Rd to Gornto Rd)	1.2
136	N TROUP ST (From E Central Ave to Vallotton Dr)	1.2
147	NORTHSIDE DR (From Bemiss Rd to Jaycee Shack Rd)	1.2
163	PARK AVE (From N Oak St to N Ashley St (US 41 Bus/SR 7 Bus))	1.2
173	S FRY ST (From Lake Park Rd to N Forrest St)	1.2
52	FORREST ST EX (From Inner Perimeter Rd (US 41/SR 7) to Bemiss Rd (SR 125))	1.2
72	HOLLYWOOD ST (From Cypress St to E Hill Ave (US 84/SR 38))	1.2
218	W SAVANNAH AVE (From St Augustine Rd to NS RR Crossing)	1.2
103	LOCH LAUREL RD (From I-75 to Madison Hwy (SR 31))	1.2
122	N HAGAN BRIDGE RD (From SR 122 to SR 122)	1.2
170	ROCKY FORD RD (From Ousley Rd to US 84/SR 38)	1.2
174	S HAGAN BRIDGE RD (From Old US 41 to SR 122)	1.2
46	E MOORE ST (From N Patterson St to N Ashley St (US 41 Bus/SR 7 Bus))	1.2
49	E SAVANNAH AVE (From James Beck Overpass to S Fry St)	1.2
95	LAKE PARK RD (From E Martin Luther King Jr Dr to Old Statenville Rd)	1.2
110	MARTIN LUTHER KING JR DR (From S Oak St to S Fry St)	1.2

Asset ID	Asset Name	Vulnerability
167	RIVER ST (From NS RR Crossing to N Oak St)	1.2
168	RIVER ST (From St Augustine Rd (SR 133) to NS RR Crossing)	1.2
190	STUDSTILL RD (From Bemiss Rd (SR 125) to Knights Academy Rd)	1.2
191	TUCKER RD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.2
197	US HWY 84 E (From Inner Perimeter Rd (US 41/SR 7) to Delmar Rd)	1.2
210	W GORDON ST (From Lankford Dr/Melody Ln to N Patterson St)	1.2
220	WEST ST (From W Hill Ave (US 84/SR 38) to W Gordon St)	1.2
121	N FORREST ST (From E Park Ave to Inner Perimeter Rd (US 41/SR 7))	1.2
16	BEMISS RD (From New Bethel Rd to SR 122)	1.1
34	DAMPIER ST (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.1
36	DAVIDSON RD (From Bemiss Rd (SR 125) to Moody AFB South Entrance)	1.1
63	GIL HARBIN INDUSTRIAL BLVD (From Old Clyattville Rdq to Madison Hwy (SR 31))	1.1
64	GIL HARBIN INDUSTRIAL BLVD (From Madison Hwy (SR 31) to S Patterson St (US 41 Bus/SR 7 Bus))	1.1
73	HOWELL RD (From New Statenville Hwy/Griffin Ave to Inner Perimeter Rd (US 41/SR 7))	1.1
85	IVEY RD (From Bemiss Rd (SR 125) to Old Bemiss Rd)	1.1
155	OLD PINE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.1
165	RADAR SITE RD (From Cat Creek Rd to Bemiss Rd (SR 125))	1.1
164	PINEVIEW DR (From Bemiss Rd to N Forrest St)	1.1
30	COPELAND RD (From Madison Hwy (SR 31) to US 41/SR 7)	1.1
38	E BROOKWOOD PL (From N Troup St to N Forrest St)	1.1
59	GA HWY 135 (From Echols County Line to US 84/SR 38)	1.1
60	GA HWY 135 (From US 84/SR 38 to Lanier County Line)	1.1
75	HOWELL RD (From Inner Perimeter Rd to Old Naylor Rd)	1.1
142	NEW STATENVILLE HWY (From Inner Perimeter Rd (US 41/SR 7) to Echols County Line)	1.1
54	GA HWY 122 E (From Val Del Rd to Cat Creek Rd)	1.0
91	KNIGHTS ACADEMY RD (From Bemiss Rd (SR 125) to RR Crossing)	1.0
115	MT ZION CHURCH RD (From Forrest St Ext to Stallings Rd)	1.0
140	NEW BETHEL RD (From Cat Creek Rd to SR 125)	1.0
89	JOHNSTON RD (From US 41/SR 7 to Hickory Grove Rd)	1.0

Asset ID	Asset Name	Vulnerability
92	KNIGHTS ACADEMY RD (From RR Crossing to Studstill Rd)	1.0
141	NEW BETHEL RD (From SR 125 to Lanier County Line)	1.0
70	HICKORY GROVE RD N (From Johnston Rd to Glenn Rd)	0.9
193	UNION RD (From Franks Creek Rd to Old US 41)	0.9
55	GA HWY 122 E (From SR 125 to Lanier County Line)	0.9
56	GA HWY 122 E (From Cat Creek Rd to SR 125)	0.9
97	LAKELAND HWY (From Inner Perimeter Rd to Knights Academy Rd)	0.9
98	LAKELAND HWY (From Knights Academy Rd to Lanier County Line)	0.9
76	HOWELL RD (From Old Naylor Rd to Lake Park Rd)	0.9
187	STALLINGS RD (From Lakeland Hwy (US 221/SR 31) to Knights Academy Rd)	0.9
74	HOWELL RD (From Lake Park Rd to Echols County Line)	0.8
96	LAKE PARK RD (From Glenn Rd to Howell Rd)	0.8
156	OLD STATE RD (From Lakeland Hwy (US 221/SR 31) to SR 135)	0.8
37	DELMAR RD (From Lakeland Hwy (US 221/SR 31) to US 84/SR 38)	0.8
65	GLENN RD (From Hickory Grove Rd to SR 94)	0.8
93	KNIGHTS ACADEMY RD (From Studstill Rd to Lakeland Hwy (US 221/SR 31))	0.8
154	OLD NAYLOR RD (From Howell Rd to US 84/SR 38)	0.8
160	ORR RD (From Staten Rd to Skipper Bridge Rd)	0.8
19	BORING POND RD (From SR 94 to Lake Park Rd)	0.7

Appendix E: Vulnerability Assessment Scoring Tool Results – Bridges

The following tables show ranked Lowndes County Transportation Infrastructure Vulnerability Assessment results for bridges based on the climate stressor and the projection period. Scores are on a scale of one to four, with four representing the most vulnerable assets.

TEMPERATURE CHANGE – BASELINE PROJECTIONS (1950-2005)

Asset ID	Asset Name	Vulnerability
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	2.4
18500040	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER O/F	2.4
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	2.4
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	2.4
18500290	BEMISS RD (SR 125) @ CHERRY CREEK	2.3
18550930	N VALDOSTA RD (US 41/SR 7) @ I-75 (EXIT 22)	2.1
18550920	W MAIN ST (SR 122) @ I-75 (EXIT 29)	2.0
18550870	W HILL AVE (US 84/SR 38) @ NORFOLK SOUTHERN RAILROAD	1.9
18500120	MADISON HWY (SR 31) - (NBL) @ I-75 (EXIT 11)	1.8
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	1.8
18550600	SR 133 @ WITHLACOOCHEE RIVER	1.8
18550880	MADISON HWY (SR 31) @ WITHLACOOCHEE RIVER	1.8
18500020	JAMES BECK OVERPASS (US 41 BUS/SR 7 BUS)	1.8
18500110	MADISON HWY (SR 31) @ SWAMP CREEK	1.8
18500130	MADISON HWY (SR 31) - (SBL) @ I-75 (EXIT 11)	1.8
18500200	N ST AUGUSTINE RD (SR 133) @ I-75 (EXIT 18)	1.7
18500340	LAKES BLVD (SR 376) @ I-75 (EXIT 5)	1.7
18500920	SR 122 @ FRANKS CREEK	1.7
18500070	N VALDOSTA RD (US 41/SR 7) - (NBL) @ CSX RAILROAD	1.6
18500080	N VALDOSTA RD (US 41/SR 7) - (SBL) @ CSX RAILROAD	1.6
18550450	INNER PERIMETER RD (US 41/SR 7) @ KNIGHT CREEK	1.6
18500010	US 41 BUS/SR 7 BUS - (NBL) @ MUD CREEK	1.6
18500780	BAYTREE RD @ SUGAR CREEK	1.6
18500930	US 41 BUS/SR 7 BUS (SBL) @ MUD CREEK	1.6

Asset ID	Asset Name	Vulnerability
18550460	INNER PERIMETER RD (US 41/SR 7) - NBL @ MUD CREEK	1.5
18550470	INNER PERIMETER RD (US 41/SR 7) - SBL @ MUD CREEK	1.5
18500140	MADISON HWY (SR 31) @ MUD CREEK	1.5
18500210	SR 94 @ KNIGHT CREEK	1.5
18500330	SR 376 @ BEVEL CREEK	1.5
18500350	SR 376 @ CANEY BRANCH	1.5
18550720	SR 122 @ WITHLACOOCHEE RIVER	1.4
18550730	SR 122 @ CAT CREEK	1.4
18500160	US 84/SR 38 (WBL) @ GRAND BAY CREEK	1.4
18500300	SR 135 @ TY BRANCH	1.4
18500900	US 84/SR 38 (EBL) @ GRAND BAY CREEK	1.4
18500910	US 84/ SR38 @ MEETINGHOUSE BRANCH	1.4
18550440	INNER PERIMETER RD (US 41/SR 7) @ CSX RAILROAD	1.4
18550610	US 84/SR 38 @ ALAPAHA RIVER	1.4
18550650	US 84/SR 38 @ ALAPAHA RIVER	1.4
18550820	SR 122 @ METTING HOUSE CREEK	1.4
18500220	SR 94 @ MUD CREEK TRIB	1.3
18500890	SR 94 @ GRAND BAY CREEK	1.3
18500940	OLD CLYATTVILLE RD @I-75 (EXIT 13)	1.2
18500820	JERRY JONES DR @ TWO MILE CREEK	1.1
18500830	STATEN RD @ CHERRY CREEK	1.1
18550530	N OAK ST @ TWO MILE BRANCH	1.1
18500320	BELLVILLE RD @ I-75 (EXIT 2)	1.0
18500790	N OAK ST @ ONE MILE BRANCH	1.0
18550780	SKIPPER BRIDGE RD @ CHERRY CREEK	1.0
18500770	GORNTO RD @ SUGAR CREEK	1.0
18500800	LANKFORD DRIVE @ SUGAR CREEK	1.0
18500810	MELODY LN @ ONE MILE BRANCH	0.9
18550340	SHILOH RD @ FRANKS CREEK	0.9

Asset ID	Asset Name	Vulnerability
18550580	BERKLEY DR @ TWO MILE CREEK	0.9
18500600	HOWELL RD @ KNIGHTS CREEK	0.9
18500870	CLAY RD @ NS RAILROAD	0.9
18550300	VALLOTTON DR @ ONE MILE CREEK	0.9
18550540	CLYATTVILLE RD @ MUD CREEK	0.9
18550740	N LEE ST @ ONE MILE BRANCH	0.9
18500730	LOCH LAUREL RD @ I-75	0.8
18550030	KNIGHTS ACADEMY RD @ CHERRY CREEK	0.8
18550760	W GORDON ST @ ONE MILE BRANCH	0.8
18550860	TUCKER RD @ DUKES BAY CANAL	0.8
18550890	MORVEN RD @ FRANKS CREEK	0.8
18500650	NANKIN RD @ WITHLACOOCHEE RIVER O/F	0.8
18500660	NANKIN RD @ WITHLACOOCHEE RIVER O/F	0.8
18550640	FRANKS CRK RD @ I-75	0.8
18550900	CAT CREEK RD @ BEATTY BRANCH	0.8
18500630	HOWELL RD @ GRAND BAY CREEK	0.7
18550090	VAL-DEL RD @ BAY BRANCH	0.7
18550100	VAL-DEL RD @ WITHLACOOCHEE RIV TRIB	0.7
18550020	OLD STATE RD @ GRAND BAY CREEK	0.7
18550160	HICKORY CH RD @ MUD CREEK	0.7
18550380	OLD US 41 @ FRANKS CREEK TRIB	0.7
18550520	DAMPIER RD @ DUKES BAY CANAL	0.7
18550570	OLD STATE RD @ BECKY BAY TRIB	0.7
18550790	STATEN RD @ WITHLACOOCHEE RIVER	0.7
18550800	STATEN RD @ WITHLACOOCHEE RIVER O/F	0.7
18550810	STATEN RD @ WITHLACOOCHEE RIVER	0.7
18550850	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (VALDOSTA)	0.7
18500610	HOWELL RD @ OTTER CREEK	0.6
18500620	HOWELL RD @ GRAND BAY CREEK TRIB	0.6

Asset ID	Asset Name	Vulnerability
18500670	NANKIN RD @ WITHLACOOCHEE RIV TRIB	0.6
18500680	NANKIN RD @ CLYATT MILL CREEK	0.6
18550070	OUSLEY RD @ TIGER CREEK	0.6
18550240	FRANKS CRK RD @ FRANKS CREEK	0.6
18550620	LOCH LAUREL RD @ LAKE LOCH LAUREL TRIB	0.6
18550690	LOCH LAUREL RD @ BEVEL CREEK	0.6
18550700	CAT CREEK RD @ CAT CREEK	0.6
18550710	CAT CREEK RD @ CAT CREEK O/F	0.6
18500860	GIL HARBIN RD @ DUKES BAY CANAL	0.6
18550010	LAKE PARK RD @ OTTER CREEK	0.6
18550060	OUSLEY RD @ WITHLACOOCHEE RIV TRIB	0.6
18550080	JUMPING GULLEY RD @ BEVEL CREEK	0.6
18550140	JOHNSTON RD @ DASHER CREEK	0.6
18550170	HICKORY CH RD @ MUD CREEK TRIB	0.6
18550350	SHILOH RD @ BIG CREEK	0.6
18550510	STALLINGS RD @ CHERRY CREEK	0.6
18550770	FRANKS CREEK RD @ FRANKS CREEK TRIB	0.6
18550830	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	0.6
18550840	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	0.6

TEMPERATURE CHANGE – FUTURE PROJECTIONS (2050-2099)

Asset ID	Asset Name	Vulnerability
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	3.4
18500040	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER O/F	3.4
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	3.4
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	3.4
18500290	BEMISS RD (SR 125) @ CHERRY CREEK	3.3
18550930	N VALDOSTA RD (US 41/SR 7) @ I-75 (EXIT 22)	3.1
18550920	W MAIN ST (SR 122) @ I-75 (EXIT 29)	3.0
18550870	W HILL AVE (US 84/SR 38) @ NORFOLK SOUTHERN RAILROAD	2.9
18500120	MADISON HWY (SR 31) - (NBL) @ I-75 (EXIT 11)	2.8
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	2.8
18550600	SR 133 @ WITHLACOOCHEE RIVER	2.8
18550880	MADISON HWY (SR 31) @ WITHLACOOCHEE RIVER	2.8
18500020	JAMES BECK OVERPASS (US 41 BUS/SR 7 BUS)	2.8
18500110	MADISON HWY (SR 31) @ SWAMP CREEK	2.8
18500130	MADISON HWY (SR 31) - (SBL) @ I-75 (EXIT 11)	2.8
18500200	N ST AUGUSTINE RD (SR 133) @ I-75 (EXIT 18)	2.7
18500340	LAKES BLVD (SR 376) @ I-75 (EXIT 5)	2.7
18500920	SR 122 @ FRANKS CREEK	2.7
18500070	N VALDOSTA RD (US 41/SR 7) - (NBL) @ CSX RAILROAD	2.6
18500080	N VALDOSTA RD (US 41/SR 7) - (SBL) @ CSX RAILROAD	2.6
18550450	INNER PERIMETER RD (US 41/SR 7) @ KNIGHT CREEK	2.6
18500010	US 41 BUS/SR 7 BUS - (NBL) @ MUD CREEK	2.6
18500780	BAYTREE RD @ SUGAR CREEK	2.6
18500930	US 41 BUS/SR 7 BUS (SBL) @ MUD CREEK	2.6
18500140	MADISON HWY (SR 31) @ MUD CREEK	2.5
18500210	SR 94 @ KNIGHT CREEK	2.5
18500330	SR 376 @ BEVEL CREEK	2.5
18500350	SR 376 @ CANEY BRANCH	2.5

Asset ID	Asset Name	Vulnerability
18550460	INNER PERIMETER RD (US 41/SR 7) - NBL @ MUD CREEK	2.5
18550470	INNER PERIMETER RD (US 41/SR 7) - SBL @ MUD CREEK	2.5
18550720	SR 122 @ WITHLACOOCHEE RIVER	2.4
18550730	SR 122 @ CAT CREEK	2.4
18500160	US 84/SR 38 (WBL) @ GRAND BAY CREEK	2.4
18500300	SR 135 @ TY BRANCH	2.4
18500900	US 84/SR 38 (EBL) @ GRAND BAY CREEK	2.4
18500910	US 84/ SR38 @ MEETINGHOUSE BRANCH	2.4
18550440	INNER PERIMETER RD (US 41/SR 7) @ CSX RAILROAD	2.4
18550610	US 84/SR 38 @ ALAPAHA RIVER	2.4
18550650	US 84/SR 38 @ ALAPAHA RIVER	2.4
18550820	SR 122 @ METTING HOUSE CREEK	2.4
18500220	SR 94 @ MUD CREEK TRIB	2.3
18500890	SR 94 @ GRAND BAY CREEK	2.3
18500940	OLD CLYATTVILLE RD @I-75 (EXIT 13)	2.2
18500820	JERRY JONES DR @ TWO MILE CREEK	2.1
18500830	STATEN RD @ CHERRY CREEK	2.1
18550530	N OAK ST @ TWO MILE BRANCH	2.1
18500320	BELLVILLE RD @ I-75 (EXIT 2)	2.0
18500790	N OAK ST @ ONE MILE BRANCH	2.0
18500770	GORNTO RD @ SUGAR CREEK	2.0
18500800	LANKFORD DRIVE @ SUGAR CREEK	2.0
18550780	SKIPPER BRIDGE RD @ CHERRY CREEK	2.0
18500810	MELODY LN @ ONE MILE BRANCH	1.9
18550340	SHILOH RD @ FRANKS CREEK	1.9
18550580	BERKLEY DR @ TWO MILE CREEK	1.9
18500600	HOWELL RD @ KNIGHTS CREEK	1.9
18500870	CLAY RD @ NS RAILROAD	1.9
18550300	VALLOTTON DR @ ONE MILE CREEK	1.9

Asset ID	Asset Name	Vulnerability
18550540	CLYATTVILLE RD @ MUD CREEK	1.9
18550740	N LEE ST @ ONE MILE BRANCH	1.9
18500730	LOCH LAUREL RD @ I-75	1.8
18550030	KNIGHTS ACADEMY RD @ CHERRY CREEK	1.8
18550760	W GORDON ST @ ONE MILE BRANCH	1.8
18550860	TUCKER RD @ DUKES BAY CANAL	1.8
18550890	MORVEN RD @ FRANKS CREEK	1.8
18500650	NANKIN RD @ WITHLACOOCHEE RIVER O/F	1.8
18500660	NANKIN RD @ WITHLACOOCHEE RIVER O/F	1.8
18550640	FRANKS CRK RD @ I-75	1.8
18550900	CAT CREEK RD @ BEATTY BRANCH	1.8
18500630	HOWELL RD @ GRAND BAY CREEK	1.7
18550090	VAL-DEL RD @ BAY BRANCH	1.7
18550100	VAL-DEL RD @ WITHLACOOCHEE RIV TRIB	1.7
18550020	OLD STATE RD @ GRAND BAY CREEK	1.7
18550160	HICKORY CH RD @ MUD CREEK	1.7
18550380	OLD US 41 @ FRANKS CREEK TRIB	1.7
18550520	DAMPIER RD @ DUKES BAY CANAL	1.7
18550570	OLD STATE RD @ BECKY BAY TRIB	1.7
18550790	STATEN RD @ WITHLACOOCHEE RIVER	1.7
18550800	STATEN RD @ WITHLACOOCHEE RIVER O/F	1.7
18550810	STATEN RD @ WITHLACOOCHEE RIVER	1.7
18550850	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (VALDOSTA)	1.7
18500610	HOWELL RD @ OTTER CREEK	1.6
18500620	HOWELL RD @ GRAND BAY CREEK TRIB	1.6
18500670	NANKIN RD @ WITHLACOOCHEE RIV TRIB	1.6
18500680	NANKIN RD @ CLYATT MILL CREEK	1.6
18550070	OUSLEY RD @ TIGER CREEK	1.6
18550240	FRANKS CRK RD @ FRANKS CREEK	1.6

Asset ID	Asset Name	Vulnerability
18550620	LOCH LAUREL RD @ LAKE LOCH LAUREL TRIB	1.6
18550690	LOCH LAUREL RD @ BEVEL CREEK	1.6
18550700	CAT CREEK RD @ CAT CREEK	1.6
18550710	CAT CREEK RD @ CAT CREEK O/F	1.6
18500860	GIL HARBIN RD @ DUKES BAY CANAL	1.6
18550010	LAKE PARK RD @ OTTER CREEK	1.6
18550060	OUSLEY RD @ WITHLACOOCHEE RIV TRIB	1.6
18550080	JUMPING GULLEY RD @ BEVEL CREEK	1.6
18550140	JOHNSTON RD @ DASHER CREEK	1.6
18550170	HICKORY CH RD @ MUD CREEK TRIB	1.6
18550350	SHILOH RD @ BIG CREEK	1.6
18550510	STALLINGS RD @ CHERRY CREEK	1.6
18550770	FRANKS CREEK RD @ FRANKS CREEK TRIB	1.6
18550830	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	1.6
18550840	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	1.6

PRECIPITATION CHANGE – BASELINE PROJECTIONS (1950-2005)

Asset ID	Asset Name	Vulnerability
18500770	GORNTO RD @ SUGAR CREEK	2.6
18500780	BAYTREE RD @ SUGAR CREEK	2.4
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	2.4
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	2.4
18550600	SR 133 @ WITHLACOOCHEE RIVER	2.4
18500820	JERRY JONES DR @ TWO MILE CREEK	2.3
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	2.3
18550880	MADISON HWY (SR 31) @ WITHLACOOCHEE RIVER	2.3
18500800	LANKFORD DRIVE @ SUGAR CREEK	2.2
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	2.2
18500040	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER O/F	2.2
18500790	N OAK ST @ ONE MILE BRANCH	2.1
18500140	MADISON HWY (SR 31) @ MUD CREEK	2.1
18550540	CLYATTVILLE RD @ MUD CREEK	2.1
18550530	N OAK ST @ TWO MILE BRANCH	2.0
18500010	US 41 BUS/SR 7 BUS - (NBL) @ MUD CREEK	2.0
18550580	BERKLEY DR @ TWO MILE CREEK	2.0
18550300	VALLOTTON DR @ ONE MILE CREEK	2.0
18500930	US 41 BUS/SR 7 BUS (SBL) @ MUD CREEK	2.0
18500210	SR 94 @ KNIGHT CREEK	1.9
18500600	HOWELL RD @ KNIGHTS CREEK	1.9
18550760	W GORDON ST @ ONE MILE BRANCH	1.9
18550450	INNER PERIMETER RD (US 41/SR 7) @ KNIGHT CREEK	1.8
18500660	NANKIN RD @ WITHLACOOCHEE RIVER O/F	1.8
18550460	INNER PERIMETER RD (US 41/SR 7) - NBL @ MUD CREEK	1.8
18550470	INNER PERIMETER RD (US 41/SR 7) - SBL @ MUD CREEK	1.8
18500650	NANKIN RD @ WITHLACOOCHEE RIVER O/F	1.8
18550740	N LEE ST @ ONE MILE BRANCH	1.7

Asset ID	Asset Name	Vulnerability
18500860	GIL HARBIN RD @ DUKES BAY CANAL	1.7
18550930	N VALDOSTA RD (US 41/SR 7) @ I-75 (EXIT 22)	1.6
18500670	NANKIN RD @ WITHLACOOCHEE RIV TRIB	1.6
18500110	MADISON HWY (SR 31) @ SWAMP CREEK	1.6
18550340	SHILOH RD @ FRANKS CREEK	1.6
18550790	STATEN RD @ WITHLACOOCHEE RIVER	1.6
18550800	STATEN RD @ WITHLACOOCHEE RIVER O/F	1.6
18550080	JUMPING GULLEY RD @ BEVEL CREEK	1.5
18500330	SR 376 @ BEVEL CREEK	1.5
18550100	VAL-DEL RD @ WITHLACOOCHEE RIV TRIB	1.5
18500920	SR 122 @ FRANKS CREEK	1.5
18500940	OLD CLYATTVILLE RD @I-75 (EXIT 13)	1.5
18500830	STATEN RD @ CHERRY CREEK	1.4
18550920	W MAIN ST (SR 122) @ I-75 (EXIT 29)	1.4
18550070	OUSLEY RD @ TIGER CREEK	1.4
18500810	MELODY LN @ ONE MILE BRANCH	1.4
18500200	N ST AUGUSTINE RD (SR 133) @ I-75 (EXIT 18)	1.4
18500350	SR 376 @ CANEY BRANCH	1.4
18500320	BELLVILLE RD @ I-75 (EXIT 2)	1.4
18500070	N VALDOSTA RD (US 41/SR 7) - (NBL) @ CSX RAILROAD	1.3
18500080	N VALDOSTA RD (US 41/SR 7) - (SBL) @ CSX RAILROAD	1.3
18500120	MADISON HWY (SR 31) - (NBL) @ I-75 (EXIT 11)	1.3
18550090	VAL-DEL RD @ BAY BRANCH	1.3
18500130	MADISON HWY (SR 31) - (SBL) @ I-75 (EXIT 11)	1.3
18550820	SR 122 @ METTING HOUSE CREEK	1.3
18500340	LAKES BLVD (SR 376) @ I-75 (EXIT 5)	1.3
18500290	BEMISS RD (SR 125) @ CHERRY CREEK	1.2
18550160	HICKORY CH RD @ MUD CREEK	1.2
18550240	FRANKS CRK RD @ FRANKS CREEK	1.2

Asset ID	Asset Name	Vulnerability
18500680	NANKIN RD @ CLYATT MILL CREEK	1.2
18550350	SHILOH RD @ BIG CREEK	1.2
18550060	OUSLEY RD @ WITHLACOOCHEE RIV TRIB	1.2
18500630	HOWELL RD @ GRAND BAY CREEK	1.1
18550030	KNIGHTS ACADEMY RD @ CHERRY CREEK	1.1
18550780	SKIPPER BRIDGE RD @ CHERRY CREEK	1.1
18550870	W HILL AVE (US 84/SR 38) @ NORFOLK SOUTHERN RAILROAD	1.1
18550720	SR 122 @ WITHLACOOCHEE RIVER	1.1
18500220	SR 94 @ MUD CREEK TRIB	1.1
18550380	OLD US 41 @ FRANKS CREEK TRIB	1.1
18550890	MORVEN RD @ FRANKS CREEK	1.1
18500020	JAMES BECK OVERPASS (US 41 BUS/SR 7 BUS)	1.0
18500300	SR 135 @ TY BRANCH	1.0
18500620	HOWELL RD @ GRAND BAY CREEK TRIB	1.0
18550020	OLD STATE RD @ GRAND BAY CREEK	1.0
18500890	SR 94 @ GRAND BAY CREEK	1.0
18500160	US 84/SR 38 (WBL) @ GRAND BAY CREEK	1.0
18500610	HOWELL RD @ OTTER CREEK	1.0
18550850	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (VALDOSTA)	1.0
18550140	JOHNSTON RD @ DASHER CREEK	1.0
18550170	HICKORY CH RD @ MUD CREEK TRIB	1.0
18550770	FRANKS CREEK RD @ FRANKS CREEK TRIB	1.0
18500910	US 84/ SR38 @ MEETINGHOUSE BRANCH	0.9
18550830	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	0.9
18550840	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	0.9
18500730	LOCH LAUREL RD @ I-75	0.9
18500900	US 84/SR 38 (EBL) @ GRAND BAY CREEK	0.9
18550610	US 84/SR 38 @ ALAPAHA RIVER	0.9
18550700	CAT CREEK RD @ CAT CREEK	0.9

Asset ID	Asset Name	Vulnerability
18550710	CAT CREEK RD @ CAT CREEK O/F	0.9
18550860	TUCKER RD @ DUKES BAY CANAL	0.9
18550520	DAMPIER RD @ DUKES BAY CANAL	0.9
18550570	OLD STATE RD @ BECKY BAY TRIB	0.9
18550730	SR 122 @ CAT CREEK	0.9
18550900	CAT CREEK RD @ BEATTY BRANCH	0.9
18550620	LOCH LAUREL RD @ LAKE LOCH LAUREL TRIB	0.9
18550690	LOCH LAUREL RD @ BEVEL CREEK	0.9
18550010	LAKE PARK RD @ OTTER CREEK	0.8
18500870	CLAY RD @ NS RAILROAD	0.8
18550650	US 84/SR 38 @ ALAPAHA RIVER	0.8
18550640	FRANKS CRK RD @ I-75	0.8
18550510	STALLINGS RD @ CHERRY CREEK	0.8
18550810	STATEN RD @ WITHLACOOCHEE RIVER	0.8
18550440	INNER PERIMETER RD (US 41/SR 7) @ CSX RAILROAD	0.7

PRECIPITATION CHANGE – FUTURE PROJECTIONS (2050-2099)

Asset ID	Asset Name	Vulnerability
18500770	GORNTO RD @ SUGAR CREEK	2.8
18500780	BAYTREE RD @ SUGAR CREEK	2.6
18550590	SR 133 @ WITHLACOOCHEE RIVER O/F	2.5
18500050	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER	2.5
18550600	SR 133 @ WITHLACOOCHEE RIVER	2.5
18500820	JERRY JONES DR @ TWO MILE CREEK	2.4
18500060	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER	2.4
18550880	MADISON HWY (SR 31) @ WITHLACOOCHEE RIVER	2.4
18500800	LANKFORD DRIVE @ SUGAR CREEK	2.4
18500030	N VALDOSTA RD (US 41/SR 7) - (NBL) @ WITHLACOOCHEE RIVER O/F	2.3
18500040	N VALDOSTA RD (US 41/SR 7) - (SBL) @ WITHLACOOCHEE RIVER O/F	2.3
18500790	N OAK ST @ ONE MILE BRANCH	2.3
18550530	N OAK ST @ TWO MILE BRANCH	2.2
18550580	BERKLEY DR @ TWO MILE CREEK	2.1
18500140	MADISON HWY (SR 31) @ MUD CREEK	2.1
18550300	VALLOTTON DR @ ONE MILE CREEK	2.1
18500210	SR 94 @ KNIGHT CREEK	2.1
18500600	HOWELL RD @ KNIGHTS CREEK	2.1
18550540	CLYATTVILLE RD @ MUD CREEK	2.1
18550760	W GORDON ST @ ONE MILE BRANCH	2.1
18500010	US 41 BUS/SR 7 BUS - (NBL) @ MUD CREEK	2.0
18500930	US 41 BUS/SR 7 BUS (SBL) @ MUD CREEK	2.0
18550450	INNER PERIMETER RD (US 41/SR 7) @ KNIGHT CREEK	2.0
18500660	NANKIN RD @ WITHLACOOCHEE RIVER O/F	2.0
18550460	INNER PERIMETER RD (US 41/SR 7) - NBL @ MUD CREEK	1.9
18550470	INNER PERIMETER RD (US 41/SR 7) - SBL @ MUD CREEK	1.9
18500650	NANKIN RD @ WITHLACOOCHEE RIVER O/F	1.9
18550740	N LEE ST @ ONE MILE BRANCH	1.9

Asset ID	Asset Name	Vulnerability
18550930	N VALDOSTA RD (US 41/SR 7) @ I-75 (EXIT 22)	1.8
18500860	GIL HARBIN RD @ DUKES BAY CANAL	1.7
18500670	NANKIN RD @ WITHLACOOCHEE RIV TRIB	1.7
18500920	SR 122 @ FRANKS CREEK	1.7
18500110	MADISON HWY (SR 31) @ SWAMP CREEK	1.7
18550340	SHILOH RD @ FRANKS CREEK	1.7
18550790	STATEN RD @ WITHLACOOCHEE RIVER	1.7
18550800	STATEN RD @ WITHLACOOCHEE RIVER O/F	1.7
18550080	JUMPING GULLEY RD @ BEVEL CREEK	1.7
18550920	W MAIN ST (SR 122) @ I-75 (EXIT 29)	1.7
18500330	SR 376 @ BEVEL CREEK	1.6
18550100	VAL-DEL RD @ WITHLACOOCHEE RIV TRIB	1.6
18500830	STATEN RD @ CHERRY CREEK	1.6
18550070	OUSLEY RD @ TIGER CREEK	1.5
18550820	SR 122 @ METTING HOUSE CREEK	1.5
18500810	MELODY LN @ ONE MILE BRANCH	1.5
18500200	N ST AUGUSTINE RD (SR 133) @ I-75 (EXIT 18)	1.5
18500350	SR 376 @ CANEY BRANCH	1.5
18500320	BELLVILLE RD @ I-75 (EXIT 2)	1.5
18550240	FRANKS CRK RD @ FRANKS CREEK	1.5
18500940	OLD CLYATTVILLE RD @I-75 (EXIT 13)	1.5
18500070	N VALDOSTA RD (US 41/SR 7) - (NBL) @ CSX RAILROAD	1.4
18500080	N VALDOSTA RD (US 41/SR 7) - (SBL) @ CSX RAILROAD	1.4
18550090	VAL-DEL RD @ BAY BRANCH	1.4
18550350	SHILOH RD @ BIG CREEK	1.4
18500340	LAKES BLVD (SR 376) @ I-75 (EXIT 5)	1.4
18500290	BEMISS RD (SR 125) @ CHERRY CREEK	1.4
18550160	HICKORY CH RD @ MUD CREEK	1.4
18550720	SR 122 @ WITHLACOOCHEE RIVER	1.4

Asset ID	Asset Name	Vulnerability
18550890	MORVEN RD @ FRANKS CREEK	1.3
18500120	MADISON HWY (SR 31) - (NBL) @ I-75 (EXIT 11)	1.3
18500680	NANKIN RD @ CLYATT MILL CREEK	1.3
18550060	OUSLEY RD @ WITHLACOOCHEE RIV TRIB	1.3
18500130	MADISON HWY (SR 31) - (SBL) @ I-75 (EXIT 11)	1.3
18500630	HOWELL RD @ GRAND BAY CREEK	1.3
18550850	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (VALDOSTA)	1.3
18550770	FRANKS CREEK RD @ FRANKS CREEK TRIB	1.2
18550030	KNIGHTS ACADEMY RD @ CHERRY CREEK	1.2
18550780	SKIPPER BRIDGE RD @ CHERRY CREEK	1.2
18550870	W HILL AVE (US 84/SR 38) @ NORFOLK SOUTHERN RAILROAD	1.2
18550380	OLD US 41 @ FRANKS CREEK TRIB	1.2
18550830	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	1.2
18550840	SKIPPER BRIDGE RD @ WITHLACOOCHEE RIVER (HAHIRA)	1.2
18500020	JAMES BECK OVERPASS (US 41 BUS/SR 7 BUS)	1.2
18500300	SR 135 @ TY BRANCH	1.2
18500620	HOWELL RD @ GRAND BAY CREEK TRIB	1.2
18550020	OLD STATE RD @ GRAND BAY CREEK	1.2
18500160	US 84/SR 38 (WBL) @ GRAND BAY CREEK	1.1
18500610	HOWELL RD @ OTTER CREEK	1.1
18550140	JOHNSTON RD @ DASHER CREEK	1.1
18500910	US 84/ SR38 @ MEETINGHOUSE BRANCH	1.1
18500220	SR 94 @ MUD CREEK TRIB	1.1
18500730	LOCH LAUREL RD @ I-75	1.1
18500890	SR 94 @ GRAND BAY CREEK	1.0
18500900	US 84/SR 38 (EBL) @ GRAND BAY CREEK	1.0
18550520	DAMPIER RD @ DUKES BAY CANAL	1.0
18550570	OLD STATE RD @ BECKY BAY TRIB	1.0
18550610	US 84/SR 38 @ ALAPAHA RIVER	1.0

Asset ID	Asset Name	Vulnerability
18550700	CAT CREEK RD @ CAT CREEK	1.0
18550710	CAT CREEK RD @ CAT CREEK O/F	1.0
18550730	SR 122 @ CAT CREEK	1.0
18550860	TUCKER RD @ DUKES BAY CANAL	1.0
18550900	CAT CREEK RD @ BEATTY BRANCH	1.0
18550620	LOCH LAUREL RD @ LAKE LOCH LAUREL TRIB	1.0
18550690	LOCH LAUREL RD @ BEVEL CREEK	1.0
18550810	STATEN RD @ WITHLACOOCHEE RIVER	1.0
18550170	HICKORY CH RD @ MUD CREEK TRIB	1.0
18550650	US 84/SR 38 @ ALAPAHA RIVER	0.9
18500870	CLAY RD @ NS RAILROAD	0.9
18550640	FRANKS CRK RD @ I-75	0.9
18550510	STALLINGS RD @ CHERRY CREEK	0.9
18550010	LAKE PARK RD @ OTTER CREEK	0.8
18550440	INNER PERIMETER RD (US 41/SR 7) @ CSX RAILROAD	0.8