



**S.R. 40 BLACK BEAR TRAIL
CORRIDOR PLANNING STUDY
DRAINAGE AND FLOODPLAIN REPORT**



**FPID # 436360-1
April 2019**

Florida Department of Transportation
District Five
719 South Woodland Boulevard
DeLand, FL 32720-6834

S.R. 40 BLACK BEAR TRAIL - FPID # 436360-1 CORRIDOR PLANNING STUDY - DRAINAGE AND FLOODPLAIN REPORT

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1. PROJECT DESCRIPTION

The Florida Department of Transportation (FDOT) District Five is conducting a Corridor Planning Study to assess alternative alignments for a multi-use trail along S.R. 40 from Levy Hammock Road to U.S. 17. The 27-mile study area includes eastern Marion County, northern Lake County, and northwest Volusia County. The purpose of the study is to:

- Identify reasonable alternatives to carry forward to a preferred trail alignment; and
- Establish a long-term plan to guide the evolution of the multi-use trail corridor which balances land use and transportation planning.

The S.R. 40 Black Bear Trail, also referred to as the Planned Black Bear Scenic Trail, is set to mostly fill the largest gap within the Heart of Florida Loop. The Heart of Florida Loop is a network of trails spanning ten Central Florida counties and encompassing 250 miles, linking existing trails. The trail intersects the communities of Silver Springs, Astor, Pierson, and Barberville as well as natural landmarks such as the Ocala National Forest and the St. Johns River.

The S.R. 40 Black Bear Trail Corridor Planning Study will analyze alternatives to identify a preferred multi-use trail alignment from Levy Hammock Road to U.S. 17, connecting three counties over a 27-mile corridor. The potential trail corridor would create a new pathway for Florida residents and visitors to experience Central Florida. The trail would link the Ocala National Forest to the Lake George State Forest, through the local communities of Astor Park, Astor, Volusia, and Barberville, and provide connections to other trails in the area, such as the Florida National Scenic Trail.

1.1. STUDY SEGMENTS

The study area is divided into three segments based on changing characteristics in corridor and adjacent land uses. These segments are referred to as follows:

- Segment 1 – Levy Hammock Road to Lake County Line in Marion County
- Segment 2 – Marion/Lake County Line to Volusia County in Lake County
- Segment 3 – Lake County Line to U.S. 17 in Volusia County

1.2. STUDY ALTERNATIVES

Three alternatives were identified for the multi-use trail. The first alternative, Alternative A, begins at the intersection of Levy Hammock Road and S.R. 40 in Marion County on the northern side of S.R. 40 and heads east, following S.R. 40. Alternative A crosses to the southern side of the corridor in one location; the crossing is at 3rd street and S.R. 40 in Astor due to the median that can be utilized for a refuge island, continuing over the Astor Bridge using the existing sidewalk on the south side, and then crossing back to the northern side of S.R. 40 before reaching Emporia Road. Alternative A then continues through Volusia County along the north side of S.R. 40, and ends at the intersection of U.S. 17 and S.R. 40 in Barberville.

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The second alternative, Alternative B, begins at the intersection of Levy Hammock Road and S.R. 40 in Marion County on the southern side of S.R. 40 and heads east, following S.R. 40. Alternative B crosses the Astor Bridge on the southern side as well, continuing into Volusia County from Lake County. The second alternative ends on the southern side of S.R. 40 at the intersection of U.S. 17 and S.R. 40 in Barberville.

As a result of the study's progression, a third alternative, Alternative C, was developed. Alternative C begins at the intersection of Levy Hammock Road and S.R. 40, and travels east along the northern side of S.R. 40 until reaching the intersection of S.R. 19. At S.R. 19, Alternative C crosses to the south side of S.R. 40, and continues eastward on the south side of the road until reaching the intersection with U.S. 17.

See *Corridor Planning Study-Technical Memorandum S.R. 40* for the alternatives concept plans and trail locations.

1.3. DESIGN CRITERIA

Proposed drainage design and strategies due to the trail installation should comply with the local, state and federal drainage design criteria. Below is a list of the criteria expected to impact any trail alternative:

- St. Johns Water Management District
 - Environmental Resource Permit (ERP) should be obtained if trail construction impacts are not exempt or above the permit thresholds for the water quantity, water quality, and wetlands.
- FDOT Design Manual and Drainage Design Guide
- National Pollutant Discharge Elimination System (NPDES)
 - Storm water Pollution Prevention Plan (SWPPP) should be developed and submitted.

2. EXISTING CONDITIONS

2.1. DRAINAGE FEATURES

The proposed trail alignment is located within two separate hydrologic basins, as shown in Figure 1 where sub-basins are included. The west section between Levy Hammock Road and NG 86-G road is within the Oklawaha Basin, and the east section is located within the Upper St. Johns Basin. Both basins flow to the Lower St. Johns River with a confluence at Palatka. Each of these two basins is broken down into several sub-basins, which include (from west to east): Ham Dam Lake, Halfmoon Lake, Juniper Creek, Morman Branch, Jumping Gully, Blue Creek, St. Johns River, Stone Pond Outfall, and two unnamed branches. Storm runoff from the trail site drains to these branches through sheet flow in the existing condition. The topographic map of the study area is provided in Figure 2. Existing culverts are listed in Table 1.

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Table 1 | Existing Culverts and Cross Drains

| Mile Post (MP) | Structure Type | Number of Structures/Barrels | Diameter (in) | Span (ft) | Rise (ft) | Length (ft) |
|------------------------------|--------------------------------|------------------------------|---------------|-----------|-----------|-------------|
| Marion County | | | | | | |
| 20.183 | Concrete Pipe | 2 | 24 | | | 66 |
| 27.913 | Concrete Pipe | 1 | 24 | | | 60 |
| 29.731 | Concrete Pipe | 2 | 24 | | | 66 |
| Lake County | | | | | | |
| 0.255 | Concrete Pipe | 1 | 24 | | | 100 |
| 1.046 | Concrete Pipe | 1 | 24 | | | 89 |
| 1.364 | Concrete Pipe | 1 | 24 | | | 111 |
| 2.237 | Concrete Pipe | 1 | 36 | | | 95 |
| 3.074 | Concrete Pipe | 1 | 24 | | | 81 |
| 3.379 | Concrete Pipe | 1 | 24 | | | 85 |
| 4.906 | Concrete Box Culvert | 2 | | 4 | 6 | 75 |
| 5.988 | Concrete Pipe | 1 | 30 | | | 82 |
| 6.887 | Concrete Pipe | 1 | 24 | | | 78 |
| 7.219 | Concrete Pipe | 1 | 30 | | | 112 |
| 7.318 | Concrete Pipe | 1 | 24 | | | 96 |
| Volusia County | | | | | | |
| 0.703 | Concrete Pipe | 2 | 24 | | | 66 |
| 1.095 | Concrete Pipe | 1 | 30 | | | 66 |
| 1.949 | Concrete Box Culvert | 1 | | 8 | 2 | 66 |
| 3.248 (begin) 3.254 (end) | Box Culvert greater than 20 ft | 1 | | | | 31.7 |
| 4.285 | Concrete Box Culvert | 2 | | 8 | 2 | 60 |
| 5.263 (begin) 5.273 (end) | Box Culvert greater than 20 ft | 1 | | | | 52.8 |

Source: Straight Line Diagrams

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2.2. WETLAND AND FLOODPLAIN

The wetlands and floodplains analyses were performed in GIS using FEMA and National Wetlands Inventory (NWI) data, and the resulting map is shown in Figure 3. Within the study area, several rivers, creeks, lakes, and natural lakes have been located. The presence of wetlands may result in impacts to the surrounding environment and any conservation areas. The trail will cross numerous floodplains, particularly the segment between S.R. 19 and the St. Johns River, according to the Federal Emergency Management Agency (FEMA) Flood Maps. Most of the floodplains are designated as Zone A, which indicates 100-year flood elevation is not determined. The floodplains associated with Halfmoon Lake and the St. Johns River are classified as Zone AE with a known flood elevation.

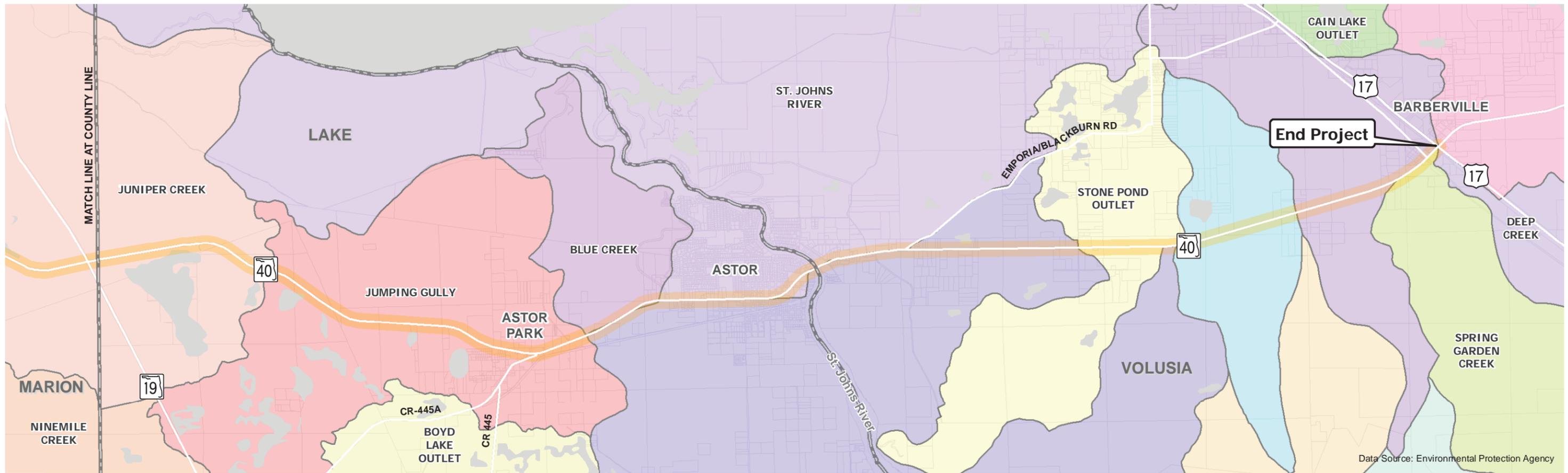
Tables 2 and 3 reiterate the acreages of impact to the existing condition as described in the *Corridor Planning Study-Technical Memorandum S.R. 40*.

Table 2 | Wetland Impacts

| | Alternative A | Alternative B | Alternative C |
|--------------------------------------|------------------|------------------|------------------|
| Acreage of Potential Wetland Impacts | 1.4 | 0.5 | 3.0 |

Table 3 | Floodplain Impacts

| | Alternative A | Alternative B | Alternative C |
|---|------------------|------------------|------------------|
| Acreage of Potential Floodplain Impacts | 6.1 | 6.1 | 6.1 |

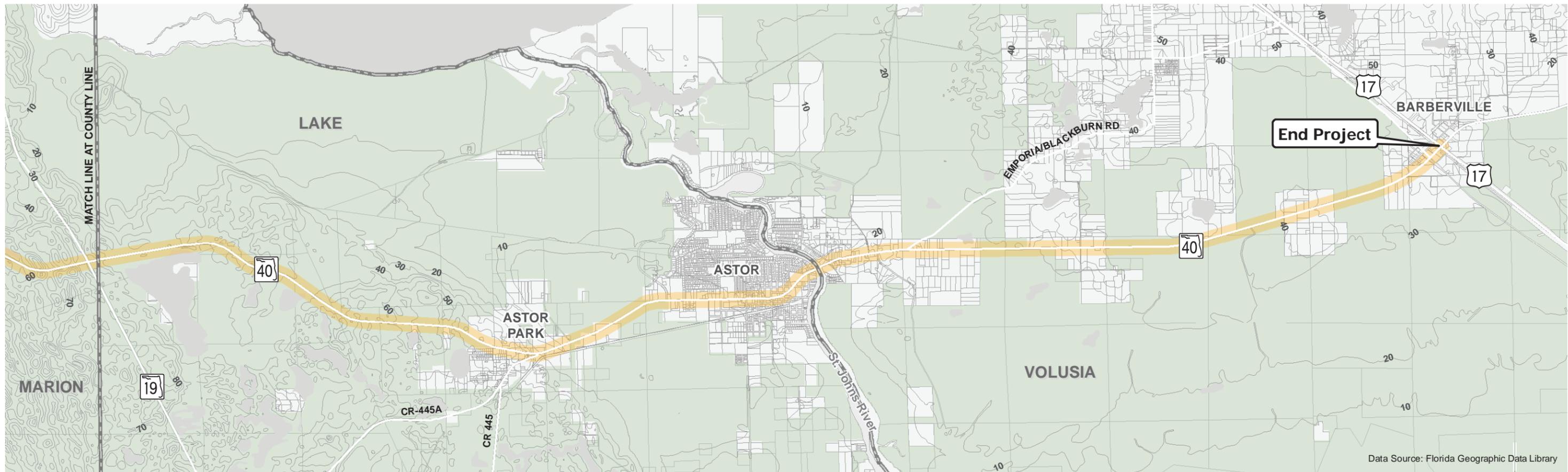
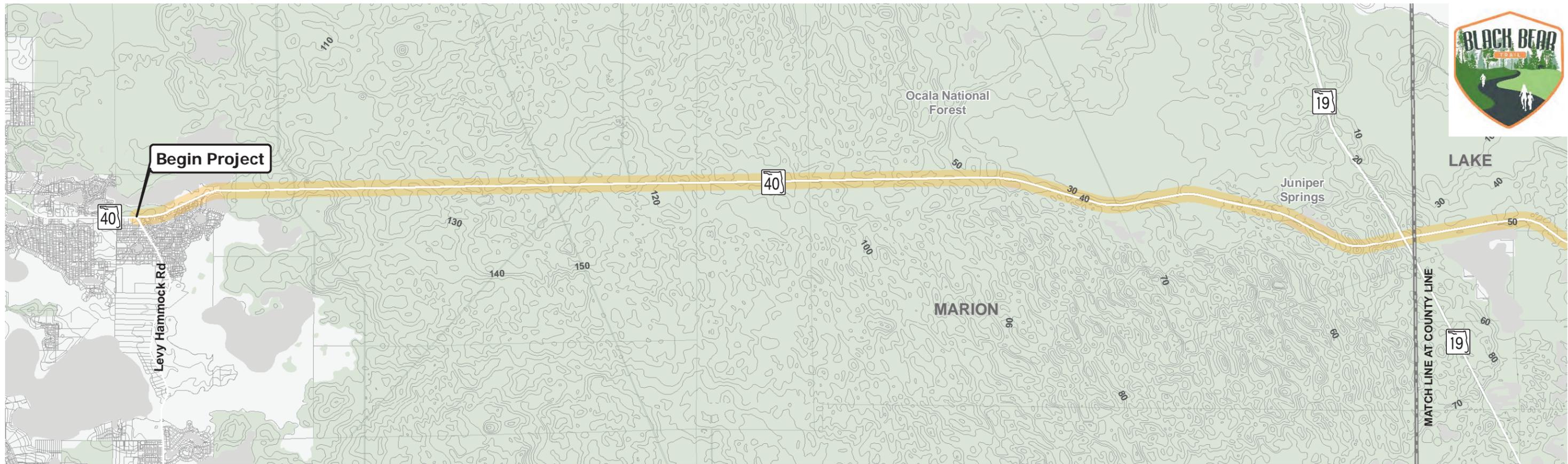


Data Source: Environmental Protection Agency



- Drainage Basin (each basin represented by a different color)
- Watershed
- Study Corridor(s)

Drainage Basins
S.R. 40 Black Bear Trail Corridor Planning Study
 Figure 1

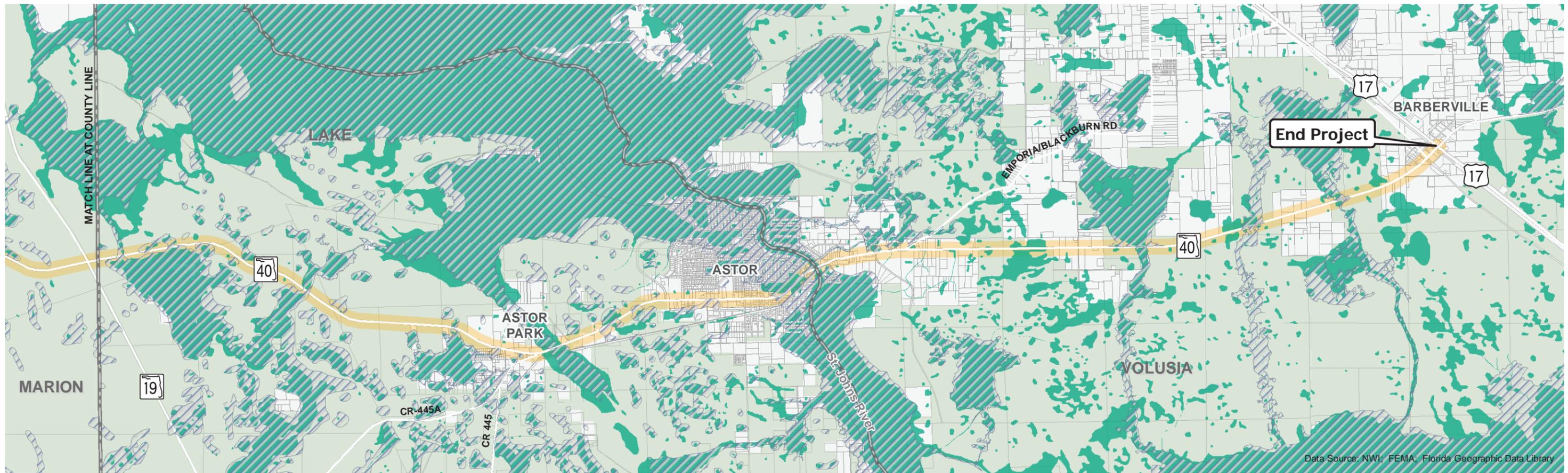


Data Source: Florida Geographic Data Library



- 10 Foot Contour
- Study Corridor(s)
- Conservation Area

Topographic Map
S.R. 40 Black Bear Trail Corridor Planning Study
 Figure 2



Data Source: NWI; FEMA; Florida Geographic Data Library



- Floodplain
- Conservation Area
- Wetland
- Study Corridor(s)

Wetlands & Floodplains
S.R. 40 Black Bear Trail Corridor Planning Study
 Figure 3

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2.3. AQUATIC PRESERVES / OUTSTANDING FLORIDA WATERS

The study has no involvement with Florida's aquatic preserves. The following water bodies have been classified as Outstanding Florida Waters by the U.S. EPA:

- Juniper Creek
- Alexander Springs Creek
- Lake Dexter
- Lake Woodruff
- Lake Disston

No impacts to the Outstanding Florida Waters are anticipated with any of the proposed build alternatives.

2.4. WILD AND SCENIC RIVERS

Juniper Springs Creek is classified as a Wild and Scenic River by the U.S. Department of Agriculture Forestry Service. The creek is located on the north side of S.R. 40 to the east of Forest Road 33 within Marion County.

2.5. COASTAL ZONE CONSISTENCY / COASTAL BARRIER RESOURCES

According to, and administrated by the National Oceanic and Atmospheric Administration (NOAA), the National Coastal Zone Management Program is a voluntary partnership between the federal government and coastal states and territories that works to address some of today's more pressing coastal issues. Neither Lake nor Marion Counties are subject to the National Coastal Zone Management program. Volusia County is subject to the National Coastal Zone Management program, but the managed locations are outside of the study area.

2.6. STRUCTURES

One existing structure is located within the study area, the S.R. 40 Bridge over the St. Johns River (Bridge No. 110077), as shown in Figure 4. The S.R. 40 Bridge over the St. Johns River was built in 1980. The bridge is owned by the State of Florida and is not programmed for rehabilitation (repairs) or replacement.

The trail will continue over the bridge without modifications to the structure as the existing structure has sufficient room to accommodate the proposed trail. Typical Section

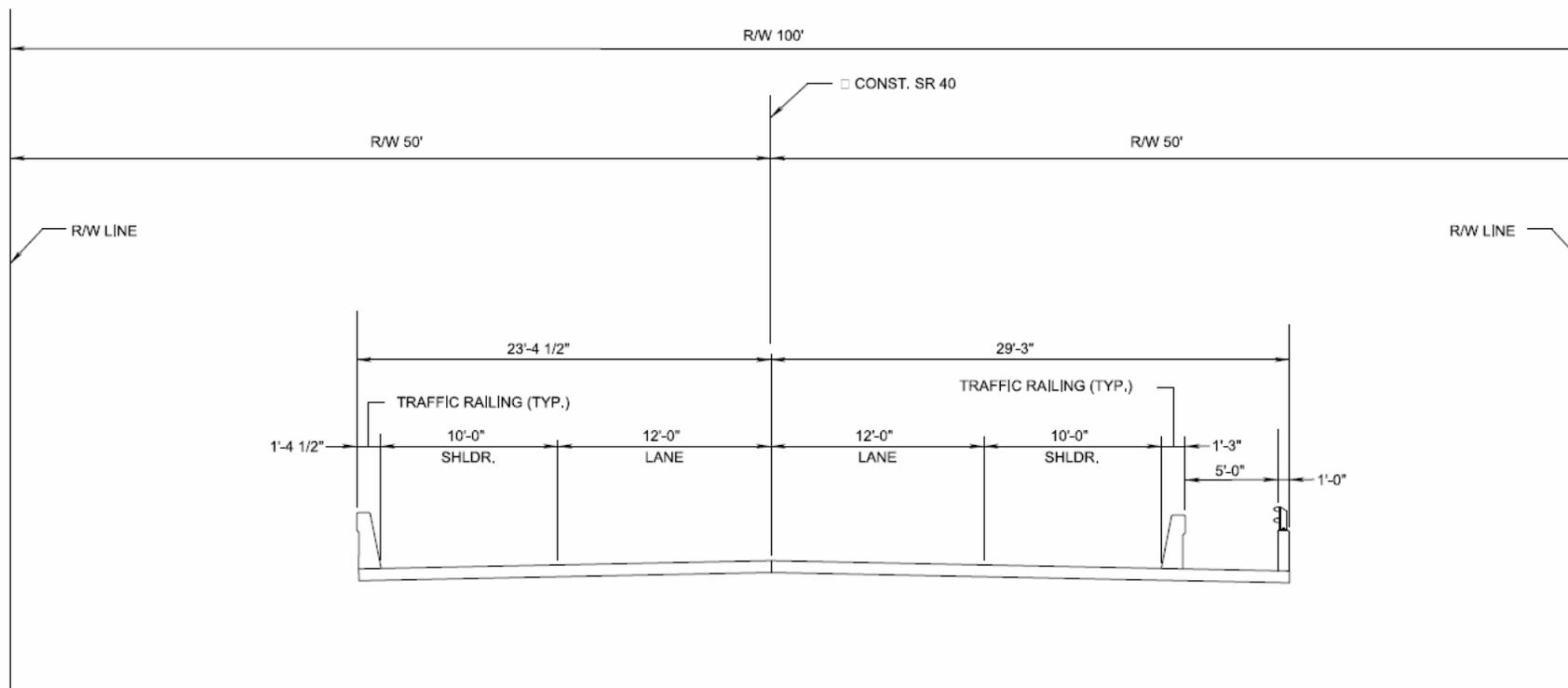
The existing bridge typical section, as shown in Figure 5, consists of two approximately ten-foot travel lanes and ten-foot outside shoulders with concrete traffic railings along both sides of the structure. The right side also contains a five-foot sidewalk. The overall bridge width is 52 feet.

Figure 4 | St. Johns River Bridge



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Figure 5 | S.R. 40 Bridge Typical Section



TYPICAL SECTION
SR 40 OVER ST. JOHNS RIVER

Source: Florida Department of Transportation As-Built Plan Sets

3. PROPOSED DRAINAGE CONDITIONS

There are two right-of-way (ROW) conditions classified for this report, non-constrained and constrained. The sections of S.R. 40 that are not separated from adjacent land by a physical barrier (i.e. fence or wall) are classified as non-constrained areas. Constrained areas are separated from adjacent land by a physical barrier and limit the possibility of easements to accommodate drainage modifications. Cross section concepts for these two ROW conditions are provided in the *Corridor Planning Study-Technical Memorandum S.R. 40*.

3.1. NON-CONSTRAINED DRAINAGE MODIFICATIONS

The existing ROW in these areas along the S.R. 40 alignment are sufficiently wide to minimize the need for adjacent easements. When identifying potential easements, the presence of utilities and varying existence of roadside ditches should be considered. With or without easements, considerations should be made in regards to maintaining existing flow patterns.

Strategies for reducing offsite impacts from the trail improvements include the use of gravity wall or establishing a raised vegetative bank at the outer edge of the trail. These barriers will help channel the trail runoff via sheet flow towards the new or existing linear ditch and minimize direct flow offsite. To maintain existing offsite flow patterns towards the roadway, the embankment would become flush with the wetland or existing surface elevation and the offsite sheet flow may continue unimpeded across the trail towards the ditch. Ideally, these flow pattern accommodations should primarily use sheet flow to avoid erosion and ponding issues.

A new or modified existing roadside ditches adjacent to the trail should be installed to maintain the overall existing flow pattern. Any existing side drains such as Figure 6 and cross drains should be extended, and new structures installed in conjunction with ditch modifications. All these modification should accommodate the additional runoff resulting from the trail surface.

Figure 6 | S.R. 40 Existing MES Side Drain



3.2. CONSTRAINED DRAINAGE MODIFICATIONS

Areas with a very constrained ROW may have an existing ditch and utilities present along the proposed trail alignment. These existing ditches as seen in Figure 7, will be connected to a closed drainage system with cross drains, directing flow to the opposite existing roadside ditch. That existing ditch may require modification to accommodate the increased runoff volume. Alternatively, if the water table permits, use of French drains may be utilized.

Figure 7 | S.R. 40 Existing Ditch Very Constrained ROW



3.3. STRATEGIES TO MITIGATE WETLAND IMPACTS

Wetland impacts are of primary concern in the non-constrained areas of the S.R. 40 alignment. Several mitigation strategies may be applied individually or in conjunction with each other, depending on implementation costs and limiting factors such as water table elevation.

Direct impacts to the wetlands include construction or modification of existing ditches, fill, dredging, and modification of the wetland boundaries resulting from the trail construction. As discussed Section 3.1, the use of a gravity wall or similar will minimize impacts to the wetland. Use of boardwalk trail can also limit the wetland impacts in locations such as those seen in Figure 8.

Indirect impacts include introduction of potential pollutants, increased runoff, a higher probability of ponding, and fluctuating water level elevations as a result of the trail improvements. The severity of each impact should be considered. Any indirect impact should comply and align with any applicable ordinances or proposed conservation or developmental plans set forth by the St. Johns Water Management District, particularly in regards to the Ocklawaha and St. Johns basins.

3.4. STRATEGIES TO MITIGATE FLOODPLAIN IMPACTS

Sections of boardwalk or similar can be utilized in locations over floodplains to mitigate floodplain impacts.

Figure 8 | S.R. 40 Potential Boardwalk location across Existing Culvert



3.5. CULVERT MODIFICATIONS

In order to accommodate runoff from the paved trail along the S.R. 40 alignment, the crossing culverts under S.R. 40 are anticipated to be extended. In locations where culverts cannot be extended or modified, a new culvert will have to replace the existing culvert at these trail locations. Major culverts are located at Juniper Creek, Jumping Gully, Stone Pond Outfall, and two unnamed branches. The trail will also cross over the St. Johns River in Astor, no modification is anticipated at the bridge crossing.

