

ECOLOGY ASSESSMENT/DESCRIPTION OF JURISDICTIONAL  
WETLANDS, NON-WETLAND WATERS OF THE U.S., AND  
PROTECTED SPECIES SURVEY

**WIDENING AND RECONSTRUCTION OF US 441/SR 24  
GDOT PROJECT EDS-441(42)(43)  
P.I. 222560, 122660  
MORGAN AND OCONEE COUNTIES, GEORGIA**

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## **Executive Summary**

Project EDS-441(42)(43) in Morgan and Oconee Counties would improve US 441 from two to four lanes with a grass median from Madison to Watkinsville. Most of the project consists of widening the existing right-of-way. However, new location alignments bypass the City of Bishop and the City of Farmington. The total required right-of-way width for the roadway is 250 feet with some sections requiring 325 feet. The proposed project would have no effects to protected species, their habitat or unique habitat.

This report is a combination of two existing ecology surveys (GDOT and Earth Tech Inc.) and a third ecology survey (PBS&J) of two new location alignments (western and eastern) of the project that bypass the City of Bishop. The proposed project with the western alignment of the Bishop bypass would impact approximately 7,819 linear feet of streams, 21.96 acres of wetlands and 1.81 acres of ponds. Compensatory mitigation required for the proposed stream impacts is 43,846.6 credits and 179.79 credits for wetland and pond impacts. The proposed project with the eastern alignment of the Bishop bypass would impact approximately 7,754 linear feet of streams, 19.92 acres of wetlands and 1.94 acres of ponds. Compensatory mitigation required for the proposed stream impacts is 43,233.1 credits and 162.86 credits for wetland and pond impacts.

## TABLE OF CONTENTS

Section 1. Project Description.....	3
Section 2. Ecology .....	4
2.1 Habitat Description .....	4
2.2 Potential Impacts to Neotropical/Migratory Bird Species .....	6
2.3 Essential Fish Habitat .....	7
Section 3. U.S. Army Corps of Engineers Jurisdictional Delineation .....	8
3.1 Jurisdictional Findings .....	8
3.2 Georgia Erosion and Sedimentation Control Act .....	19
Section 4. Federally Protected Species Survey.....	19
Section 5. Executive Order 13112: Invasive Pest Species.....	20
Section 6. Avoidance/Minimization .....	21
Section 7. Mitigation.....	23
REFERENCES .....	24

### Appendix 1- Tables

- Table 1: State and Federal Protected Species List
- Table 2: Summary of Stream Characteristics and Estimated Length of Impact
- Table 3: Adverse Impact Factors for Riverine Systems Worksheet
- Table 4: Summary of Wetland Characteristics and Estimated Area of Impact
- Table 5: Wetlands and Open Waters Mitigation Worksheet

### Appendix 2 - Figures

- Figure 1: Location Map
- Figure 2: Natural Communities Map
- Figure 3: US Waters Map
- Figure 4: Soils Map

### Appendix 3 - Photographs

- Waters of the U.S. Photographs (new alignments only)

### Appendix 4 - Correspondence

- Protected Species

### Appendix 5 - Wetland Data Forms

### Appendix 6 - Special Provision

## Section 1. Project Description

Project EDS-441(42)(43) in Morgan and Oconee Counties would improve US 441 from two to four lanes with a grass median from Madison to Watkinsville. Most of the project consists of widening the existing right-of-way on one side. However, a substantial length of new location is necessary to bypass Bishop and Farmington. The total required right-of-way width for the roadway is 250 feet with some sections requiring 325 feet. The proposed project begins at the Madison Bypass (just north of US 278 intersection) on the north side of Madison in Morgan County (Latitude 33°36'30", Longitude 83°26'56"). For the most part, the project follows US 441 in a northerly direction with widening occurring on either the east or west sides of the existing highway. Several stretches are on new location to avoid significant historical or archaeological features. Southwest of Farmington, a bypass would be constructed on new location. The proposed alignment would cross over existing US 441 north of Farmington and continue on new location to the east of Bishop. The bypass ties back into existing US 441 approximately 1.3 miles north of Bishop (Latitude 33°50'26", Longitude 83°25'38"). Total project length is approximately 17 miles.

The southern three-quarters of the project from the beginning to the Farmington-Bishop Bypass was surveyed by GDOT ecologists in 1998 for wetlands and endangered species. The Farmington-Bishop Bypass, which is a new location alignment was surveyed by Earth Tech ecologists in 2001 and 2003. GDOT biologists had not previously surveyed this portion of the alignment. In addition, Earth Tech resurveyed the first section to quantify streams and invasive species that GDOT had not identified in 1998.

The 2006 PBS&J ecology survey included two new location alignments (western and eastern) that bypass the City of Bishop. These two alignments begin just northwest of Farmington on Freeman Creek Road and coincide with each other as they run northeast and cross over existing 441 just north of Farmington. The two alignments then split and run northeast on opposite sides of CR 110/Old Farmington Road until they reach the Greenbrier Creek Crossing on CR 110/Old Farmington Road. The alignments then turn and overlap each other as they run north up the east side of Greenbrier Creek. Just south of CR127/Astondale Road, the alignments split apart to a maximum of 50 feet until joining back together just before reaching CR 110/Astondale Road. Just north of CR 127/Astondale Road, the alignments split apart to a maximum of 450 feet until joining back together just before reaching CR 265/Old Bishop Road. The two new proposed alignments end at CR 265/Old Bishop Road east of Greenbrier Creek. All wetlands and streams found in these new alignments will replace those described in the Earth Tech survey for that portion of the new location section.

## Section 2. Ecology

The 2006 PBS&J survey was conducted for two new proposed alignments through the new location portion of the project and was completed on April 19-21, 2006 by PBS&J ecologists Eric Martin and Austin Meadows.

### 2.1 Habitat Description

The eight-digit Natural Resource Conservation Service (NRCS) Sub-Watershed Management Unit (HUC) for the project area is 03070101. The project corridor is in the Upper Oconee Watershed in the Oconee River Basin. The approximate latitude/longitude near the middle of the project corridor is: 33° 43' 21.45" N / 83° 25' 54.68" W. There are 14 wetlands, 6 ponds, 6 intermittent streams and 18 perennial streams located within or adjacent to the proposed right-of-way (Figures 3a-3e).

An NRCS Soil Survey for Oconee County was used as a reference during the April 2006 survey. A map of the soils within and adjacent to the project corridor has been included with this report (Figure 4). The dominant soil types in Oconee County include: Cecil sandy loam, Davidson clay loam and sandy loam, Madison sandy loam and sandy clay loam, and Pacolet sandy loam and sandy clay loam. Colfax, Congaree, Chewacla, Worsham, and Wehadkee soils that are found in drainage ways, depressions, and flood plains are listed on the local hydric soils list (NRCS 1991).

A variety of habitats/ecological communities occur along the entire project corridor including silvicultural pine stands, mixed pine-hardwood forests, clear-cut/residential/commercial areas, agricultural areas, and bottomland hardwood forests. According to the 1998 GDOT ecology report, 14 percent of the project occurs on clear-cut/residential/commercial areas, 48 percent occurs on agricultural areas, and 38 percent occurs on mixed pine-hardwood, silvicultural pine, and bottomland hardwood forests. These percentages represent the entire project corridor before multiple changes to the Bishop bypass new location alignment were made. A habitat description and percent composition of the new alignments for the Bishop bypass are listed below.

The dominant habitats/ecological communities identified within the two new proposed alignments through new location include mixed pine-hardwood forests, agricultural/pasture land, silvicultural pine stands, old field, residential, and hardwood forests (Figure 2a-2b). These communities are described below.

#### *Mixed Pine-Hardwood Community*

The Mixed Pine-Hardwood Community (MPHC) was observed in approximately 20 percent of the new location alignments. Dominant woody vegetation in these areas included loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), water oak (*Quercus nigra*), winged elm (*Ulmus alata*), American elm (*Ulmus americana*), eastern red cedar (*Juniperus virginiana*), tulip poplar (*Liriodendron tulipifera*), common greenbrier (*Smilax rotundifolia*), Chinese privet (*Ligustrum sinense*), southern magnolia (*Magnolia grandiflora*), sourwood (*Oxydendrum arboreum*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), flowering dogwood (*Cornus florida*), smooth sumac (*Rhus glabra*), blueberry (*Vaccinium* spp.), mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), blackberry (*Rubus* spp.), chinaberry (*Melia azedarach*), red mulberry (*Morus rubra*), muscadine (*Vitis rotundifolia*), Virginia creeper (*Parthenocissus quinquefolia*), beautyberry (*Callicarpa americana*), and Georgia buckeye (*Aesculus sylvatica*). This community provides significant value as a stream buffer for aquatic species and provides shelter and nesting and foraging habitat for numerous mammals, reptiles, amphibians, and native birds.

#### *Agricultural/ Pasture Community*

The Agricultural/Pasture Community was observed in approximately 20 percent of the new location alignments. This habitat consists of actively grazed fields, fields in hay production, and areas that are recently abandoned or fallow but have not yet developed into an old-field community. Plant species include fescue (*Festuca* sp.), Italian ryegrass (*Lolium multiflorum*), Bermuda grass (*Cynodon dactylon*), Bahia grass (*Paspalum notatum*), broomsedge (*Andropogon virginicus*) and other weedy species. This community provides little wildlife habitat.

#### *Pine Silvicultural Community*

The Pine Silviculture Community was observed in less than 1 percent of the new location alignments. Dominant woody vegetation in these areas includes several species of pine including loblolly pine and also contains sweetgum, red maple, Chinese privet, and common greenbrier. This community provides little benefit to wildlife and some value when established as a stream buffer.

#### *Old Field Community*

The Old Field Community was observed in approximately 30 percent of the new location alignments. Given time, abandoned farmland and pasture will develop into an old-field community. Low shrubs and herbs dominate this community type. Plant species include broomsedge, rabbit tobacco (*Gnaphalium obtusifolium*), ragweed (*Ambrosia artemisiifolia*), lespedeza (*Lespedeza* spp.) and other weedy species. Mammals commonly utilize the old-field

community type. Because this habitat type provides good cover and foraging habitat, birds are usually abundant.

### *Residential Community*

The Residential Community was observed in less than 1 percent of the new location alignments. The developed residential areas and maintained right-of-way areas are mowed on a regular basis and do not provide valuable wildlife habitat. Common vegetation includes turf grasses, various weeds, and scattered trees. Edges and fencerows may provide habitat for small mammals and birds.

### *Hardwood Community*

The Hardwood Community (HC) was observed in approximately 30 percent of the new location alignments. This community was most prevalent near streams and wetland areas. The composition of the hardwood forest community is dependent upon landscape position and moisture regime. On the dryer sites, the dominant overstory consists of a variety of oaks including white oak, rock chestnut oak (*Quercus prinus*), turkey oak (*Quercus laevis*), and scarlet oak (*Quercus coccinea*), American beech, and hickories (*Carya* spp.). The understory contains dogwood, blueberries, and sourwood. On the more mesic (wetter) soils, northern red oak (*Quercus rubra*), southern red oak (*Quercus falcata*), red maple, blackgum (*Nyssa sylvatica*), sweetgum, and tulip-poplar are also present in the overstory. Common shrubs include blueberry, possum haw (*Viburnum nudum*), and other *Viburnum* species. Muscadine is also common. This community provides significant value as a stream buffer for aquatic species and provides shelter, nesting, and foraging habitat for numerous mammals, reptiles, amphibians, and native birds.

## **2.2 Potential Impacts to Neotropical/Migratory Bird Species**

As directed under Executive Order 13186, in furtherance of the Migratory Bird Treaty Act (16 U.S.C. 703-711), actions must be taken to avoid or minimize impacts to migratory bird resources and to prevent or abate the detrimental alteration of the environment for the benefit of migratory birds, as practicable. The Migratory Bird Treaty act protects over 1,500 migratory bird species (see 50 C.F.R. 10.13, List of Migratory Birds) in the U.S. and its territories.

GDOT identifies tracts of contiguous habitat of 100 or more acres which would be impacted by the proposed project. The 100 acres is considered a sufficient size to allow the sensitive species to avoid predation and parasitism from species which will only penetrate a certain distance within a given habitat. In addition, GDOT surveys under bridges and large culverts which would

be reconstructed or removed as part of a proposed project. If birds, such as the barn swallow (*Hirundo rustica*), are observed nesting under the bridge or culvert, demolition or reconstruction of that structure will be scheduled to take place at a time when the nests are not being used.

Upland forests and hardwood bottomlands, which could provide foraging and nesting habitat for migratory birds, would be impacted by this project. Construction of this roadway through these habitats would fragment them by removing the vegetation within the proposed right-of-way, create an edge effect along the natural habitat boundaries, and increase the possibility of bird mortality. The creation of an edge effect would provide an opportunity for predators and invasive species to penetrate the remaining forests. Birds that require large tracts of undisturbed land to nest would lose potential nesting habitat within the proposed right-of-way. However, birds which prefer forest edge habitats would probably increase in population along the proposed roadway. The proposed project may affect migratory bird species; therefore, construction and demolition activities should be designed to minimize these impacts.

The majority of the landscape within the two alignments on new location is composed of open pasture areas, interspersed with woodlands. This landscape is generally unsuitable for neotropical/migratory birds, since these species prefer contiguous blocks of mature forest. Therefore, the new location portion of this project should not have a significant effect on neotropical/migratory bird populations.

Neither of the two previous ecology reports mentioned whether or not bridge crossings and large culverts were surveyed for the presence of nesting birds and bats. Three existing bridge crossings including Hard Labor Creek, Big Sandy Creek, and the Apalachee River occur within the project corridor. On June 19, 2006 these three bridges were surveyed for the presence of nesting birds and bats. All three bridges had active bird nests, and several barn swallows were seen flying around the bridges. No bats or evidence of bats were observed. The proposed project may affect migratory bird species; therefore, a special provision will be adhered to (Appendix 6). This provision limits construction and demolition activities to a period of time when the birds would not be utilizing nests under bridges and culverts.

### **2.3 Essential Fish Habitat**

Section 303 (a) (7) of the Magnuson-Stevens Act (16 U.S.C. § 1801 *et seq.* as amended by the Sustainable Fisheries Act in 1996) defined Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This regulation was passed to help mandate the identification and protection of important marine and

anadromous fish habitat. In Georgia, EFH has been defined in Camden, Glynn, McIntosh, Liberty, Bryan, and Chatham Counties. The project area is not located in any of these counties, and EFH was not encountered during this project.

### **Section 3. U.S. Army Corps of Engineers Jurisdictional Delineation**

The proposed project area was reviewed for the presence of wetlands and waters of the U.S. in accordance with the provisions of Executive Order 11990, the Clean Water Act, and subsequent federal regulations. For jurisdictional purposes, waters of the U.S. are defined in 33 CFR 328.3(a). Waters include intermittent and perennial streams, rivers, lakes, natural ponds, and wet meadows that contain evidence of ordinary high water. The term “ordinary high water” is defined as “that line on the shore established by the fluctuations of water indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas” (33 CFR 328.3(e)). The areas in the project corridor that displayed one or more of the above waters of the U.S. characteristics were reviewed to determine USACE jurisdiction. Also for jurisdictional purposes, wetlands have been defined by the USACE as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (33 CFR 328.3(b) and 40 CFR 230.3 (t)). The areas in the project corridor that displayed one or more wetland characteristics were reviewed to determine the presence of USACE jurisdiction. The wetland characteristics included: 1) prevalence of hydrophytic vegetation, 2) permanent or periodic inundation or saturation, and 3) hydric soils.

Following an in-office review of the National Wetland Inventory (NWI) maps and U.S. Geological Survey (USGS) Quadrangle maps, a pedestrian survey of the project area was made to investigate the suspect areas and to delineate all wetlands and waters of the U.S.

#### **3.1 Jurisdictional Findings**

The following section is a complete listing of all USACE jurisdictional areas throughout the entire project corridor. Wetland description data for the southern portion of the project, south of the Farmington/Bishop bypass, was taken from the 1998 GDOT ecology report. Wetland description data for the two wetlands at the northernmost end of the project were also taken from the 1998 GDOT ecology report. Stream description data for this southern portion of the project

was taken from a 2005 ecology report prepared by Earth Tech Inc. Stream and wetland data for the two new alignments on new location is taken from the April 19-21, 2006 survey conducted by PBS&J. Stream and wetland data for the small portion of new location that runs north from existing 441 to Freemans Creek Road and for the small portion that runs north from Old Bishop Road, just west of Hardigree-Bell Road, and ties back in to existing 441 was taken from the 2005 Earth Tech ecology report. All streams and wetlands are numbered sequentially from the beginning of the project in Morgan County. Since the initial fieldwork by GDOT biologist in 1998, shifts in alignment have eliminated a number of impacts described in previous draft reports (Areas 4, 5, 11, 12, and 17). Eliminated impacts are not discussed in this report. New impacts from these alignment shifts have been identified, and in this report the new impacts are identified by the addition of consecutive alphabetical letters to the prior numbered impact that occurred along the alignment. The eliminated impacts appear as gaps in the numbering for this report.

There are areas where the two new location alignments coincide with each other and have only one impact and areas where they split or differ in width and have different impacts. In areas where they have different impacts to the same jurisdictional water, the western alignment impacts will be listed separately from the eastern alignment impacts.

Under the new western alignment on new location, impacts to approximately 23.77 acres to 13 jurisdictional wetlands and 5 ponds would occur as a result of the project. Impacts to waters of the U.S. include approximately 3,397 linear feet of perennial stream and approximately 4,422 linear feet of intermittent stream to widen and reconstruct the road (Tables 2 and 4).

Under the new eastern alignment on new location, impacts to approximately 21.86 acres to 13 jurisdictional wetlands and 6 ponds would occur as a result of the project. Impacts to waters of the U.S. include approximately 3,192 linear feet of perennial stream and approximately 4,562 linear feet of intermittent stream to widen and reconstruct the road (Tables 2 and 4).

Stream 1 is a large, perennial stream named Hard Labor Creek that is 20 feet wide with banks approximately 6 feet high (Figure 3a). Substrate is cobble, gravel, and sand. The banks are vegetated with scrub vegetation and small trees. The riparian area is hardwood forest and includes Wetland 2. This stream is characterized as somewhat impaired due to channelization at the US 441 bridge crossing. The proposed project would not impact Stream 1 (bridged).

Wetland 2 is a medium quality, bottomland hardwood forest wetland adjacent to Hard Labor Creek (Figure 3a). Wetland hydrology indicators include inundation, saturation in the upper 12 inches, drainage patterns in wetland, and a FAC-Neutral test. Vegetation includes black gum, red maple, river birch (*Betula nigra*), water oak, box elder (*Acer negundo*), green ash (*Fraxinus*

*pennsylvanica*), sweet gum, eastern cottonwood (*Populus deltoides*), giant cane grass (*Arundinaria gigantea*), and soft bulrush (*Scirpus validus*). The proposed project would adversely impact approximately 2.27 acres of Wetland 2.

Stream 3 is an unnamed, perennial tributary to Hard Labor Creek that is 6 feet wide with banks approximately 2 feet high (Figure 3a). It is located in Wetland 2 on the west side of US 441 and empties into Hard Labor Creek about 20 feet upstream of the US 441 bridge. Substrate is coarse sand. The banks are vegetated with herbaceous and woody vegetation and the surrounding area is hardwood forest. Beaver activity was noted along the stream. This stream is characterized as somewhat impaired due to sediment deposits. The proposed project would adversely impact approximately 200 linear feet of Stream 3. The proposed project would also encroach on the longitudinal buffer of Stream 3 and require a stream buffer variance.

Stream 6 is an unnamed, intermittent tributary to Big Sandy Creek that is 2 feet wide with banks approximately 2 feet high (Figure 3a). Substrate is sand and silt. The stream is below a large farm pond that is partially within the alignment. The stream is in active pasture on both sides of US 441 and is heavily impacted by cattle. The banks are vegetated with herbaceous and scrub vegetation and the surrounding area is predominantly pasture. This stream is characterized as somewhat impaired due to the cattle access, lack of riparian vegetation, US 441 culvert, and downstream channelization. The proposed project would adversely impact approximately 302 linear feet of Stream 6.

Wetland 7 is a medium quality, bottomland hardwood forest riparian wetland of Big Sandy Creek (Figure 3a-3b). Wetland hydrology indicators include inundation, saturation in the upper 12 inches, water marks, drift lines, drainage patterns in wetland, oxidized root channels, and a FAC-Neutral test. Vegetation includes water oak, red maple, green ash, tulip poplar, soft bulrush, river birch, box elder, sweet gum, and Chinese privet. The proposed project would adversely impact approximately 13.26 acres of Wetland 7.

Stream 8 is a large, perennial stream named Big Sandy Creek that is 30 feet wide with banks approximately 6 feet high (Figure 3a). Substrate is sand and gravel. The banks are vegetated with hardwoods and scrub vegetation and the surrounding area is a mix of hardwood forest and pasture. Wetland 07 borders the stream and US 441 in this area. This stream is characterized as somewhat impaired due channelization at the US 441 bridge. The proposed project would not impact Stream 8 (bridged).

Stream 9 is a perennial stream named Beaverdam Creek that is 8 feet wide with banks approximately 4 feet high (Figure 3b). The substrate is sand and silt. The banks are steep and sparsely vegetated with herbaceous and scrub vegetation. The surrounding area is hardwood

forest. Beaver activity was noted along the stream. This stream is characterized as somewhat impaired due to sediment deposits and bank erosion. The proposed project would adversely impact approximately 60 linear feet of Stream 9. The proposed project would also encroach on the longitudinal buffer of Stream 9 and require a stream buffer variance.

Stream 10 is an intermittent, unnamed tributary to Big Sandy Creek that is 10 feet wide with banks approximately 3 feet high (Figure 3b). This stream has been channelized into a roadside ditch on the east side of US 441. Historically the stream appears to have flowed into Beaverdam Creek. The substrate is mostly sand. The banks are vegetated with scrub vegetation and the surrounding area is pasture and mixed pine-hardwood forest. This stream is characterized as somewhat impaired due to significant channelization, lack of riparian vegetation, and sediment deposits. The proposed project would adversely impact approximately 2,900 linear feet of Stream 10. The proposed project would also encroach on the longitudinal buffer of Stream 10 and require a stream buffer variance.

Stream 13 is the upper reach of Long Creek, a tributary of the Apalachee River (Figure 3b). Within the proposed alignment the stream is intermittent with a width of 1-foot and banks 0.5 feet high. Substrate is sand and silt. The stream is entirely within an active pasture and is severely trampled. This stream is characterized as somewhat impaired due to the cattle access and lack of riparian vegetation. The proposed project would adversely impact approximately 340 linear feet of Stream 13.

Stream 14 is an unnamed tributary of the Apalachee River with a width of 3 feet and banks approximately 2 feet high (Figure 3b). Below US 441 the stream becomes more entrenched. Substrate is sand and gravel. The banks are well vegetated with herbaceous and woody vegetation and the surrounding area is hardwood forest and pine forest. This stream is characterized as somewhat impaired due to the US 441 culvert, heavy sedimentation, and downstream entrenchment. The proposed project would adversely impact approximately 630 linear feet of Stream 14. The proposed project would also encroach on the longitudinal buffer of Stream 14 and require a stream buffer variance.

Stream 15 is a large, perennial stream named the Apalachee River (Figure 3b). The river is 80 feet wide with banks approximately 8 feet high. Substrate is cobble and bedrock. The banks are well vegetated with herbaceous and woody vegetation, and the surrounding area is hardwood forest and pine forest. This river is characterized as somewhat impaired due to channelization at the US 441 bridge. In addition, the Apalachee River is listed on the 303(d) list. The proposed project would not impact Stream 15 (bridged).

Wetland 16 is a medium quality, bottomland hardwood forest wetland adjacent to the Apalachee River (Figure 3b). Vegetation includes water oak, red maple, green ash, box elder, sweet gum, and Chinese privet. No other wetland data was available for this report. The proposed project would adversely impact approximately 0.04 acre of Wetland 16.

Pond 18 is a permanently flooded pond located in a wooded/pasture area on the east side of existing US 441 (Figure 3c). This is the only information available on this impoundment. The proposed project would adversely impact approximately 0.25 acre of Pond 18.

Wetland 19 is a medium quality, bottomland hardwood forest wetland above the headwaters of Freeman Creek (Figure 3c). Vegetation includes water oak, red maple, black gum, box elder, sweet gum, American hornbeam (*Carpinus caroliniana*), American elm, elderberry (*Sambucus canadensis*), and panicum grass (*Panicum* sp.). No other wetland data was available for this report. The proposed project would adversely impact approximately 0.15 acre of Wetland 19.

Stream 20 is a perennial, unnamed tributary to Freeman Creek that is 2 feet wide with banks approximately 2 feet high (Figure 3c). The stream begins on the west side of US 441. The substrate is sand and gravel. The banks are vegetated with woody vegetation and the surrounding area is hardwood forest and pasture. This stream is characterized as somewhat impaired due to the US 441 culvert, entrenchment, and sediment deposits. The proposed project would adversely impact approximately 112 linear feet of Stream 20.

Pond 20a is a permanently flooded pond located in a wooded/residential area on the west side of the US 441 new location alignment (Figure 3c). The pond is fed by the headwaters of an unnamed tributary to Freeman Creek. This is the only information available on this impoundment. The proposed project would adversely impact approximately 0.49 acre of Pond 20a.

Stream 20b is a perennial, unnamed tributary to Freeman Creek that is 3 feet wide with banks approximately 1-foot high (Figure 3c). The stream begins east of the project boundary and flows into a recently constructed farm pond (Pond 20c). The substrate is sand and bedrock. The banks are vegetated with herbaceous vegetation with the buffer area removed during construction of the pond. This stream is characterized as somewhat impaired because of the recent construction activity, loss of deep-rooted riparian buffer and sediment deposits. The proposed project would adversely impact approximately 180 linear feet of Stream 20b.

Pond 20c is a permanently flooded pond located in a wooded area within the US 441 new location alignment (Figure 3c). The pond is fed by the headwaters of an unnamed tributary to

Freeman Creek. This is the only information available on this impoundment. The proposed project would adversely impact approximately 0.34 acre of Pond 20c.

Pond 21 is an approximately 0.53 acre spring fed pond that drains to form Stream 22 (Figure 3c-3d). The landowner uses the pond for recreation/fishing (Photograph 1). The pond is high quality, had low turbidity and is surrounded by a MPHC. The fringe vegetation is primarily soft bulrush and water lilies (*Nymphaea odorata*). The proposed project would adversely impact approximately 0.18 acre of Pond 21.

Stream 22 is a small, perennial, 1st order stream with sand and silt substrate (Figure 3c-3d). This stream begins at the outflow of Pond 21 and had the following channel dimensions: 5- to 7-foot channel width, 3- to 5-foot channel depth, 3- to 4-foot bankfull width, 1- to 2-foot bankfull depth, and less than 1-foot water depth (Photograph 2). Stream 22 is a moderate quality stream with low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide. The riparian zone is made up of a MPHC (30-100+ years old) that is described in Section 2.1 of this report. The proposed project would adversely impact approximately 100 linear feet of Stream 22.

Stream 23 is a small, perennial, 1st order stream with clay and silt substrate (Figure 3c-3d). This stream begins at the outflow of Pond 24 and had the following channel dimensions: 8- to 10-foot channel width, 1- to 2-foot channel depth, 10-foot bankfull width, 2-foot bankfull depth, and less than 1-foot water depth (Photograph 3). Stream 23 is downhill from a dry upland pond that used to be a toxic waste dump site for carbon tetrachloride used in cottonseed de-linting. It appears that this waste is leaching into Stream 23 and the adjacent wetland (Wetland 25). This somewhat impaired stream had a strong chemical odor, low flow, high turbidity, stable banks and riparian vegetation that is greater than 100 feet wide. The riparian zone is made up of a MPHC (10-40+ years old) that is described in Section 2.1 of this report. Additional riparian vegetation includes hazel alder (*Alnus serrulata*), giant cane grass, and black willow (*Salix nigra*). The proposed project would adversely impact approximately 230 linear feet of Stream 23.

Pond 24 is an approximately 0.66 acre farm/recreation pond that drains to form Stream 23 (Figure 3c-3d). The pond is moderate quality, had moderate turbidity and is surrounded by a maintained lawn and hardwood community (Photograph 4). The fringe vegetation is primarily maintained grasses. The proposed project would adversely impact approximately 0.17 acre of Pond 24.

Wetland 25 is a small, riparian wetland adjacent to Stream 23 (Figure 3c-3d). Wetland hydrology indicators include inundated pockets, saturation in the upper 12 inches, water stained leaves, wetland drainage patterns, and a 10 inch depth to free water in the pit. Vegetation

includes giant cane grass, black willow, hazel alder, sweetgum, water oak, blackberries, tulip poplar, soft bulrush, red maple, and pignut hickory. Current impacts to this wetland are major; recovery would require major enhancement. There appears to be seepage of toxic waste into this wetland from an uphill toxic waste site. The proposed project would adversely impact approximately 0.12 acre of Wetland 25.

Stream 26 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, clay, and silt substrate (Figure 3d). This stream had the following channel dimensions: 4- to 8-foot channel width, 3- to 6-foot channel depth, 3-foot bankfull width, 1- to 2-foot bankfull depth, and less than 0.5-foot water depth (Photographs 5,6). Multiple springs enter Stream 26 as it flows towards Greenbrier Creek. Stream 26 is a high quality stream with good sinuosity, low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide. The riparian zone is made up of a HC (10-70+ years old) that is described in Section 2.1 of this report. Additional riparian vegetation includes cinnamon fern (*Osmunda cinnamomea*), southern dewberry (*Rubus trivialis*), ebony spleenwort (*Asplenium platyneuron*), netted chain fern (*Woodwardia areolata*), hawthorn (*Crataegus* sp.), green ash, soft bulrush, and wild azalea (*Rhododendron canescens*). The western alignment for the proposed new location would adversely impact approximately 370 linear feet of Stream 26. This alignment would also encroach upon the Stream 26 buffer and require a stream buffer variance.

Stream 27 is a small, intermittent, spring fed stream with sand and detritus substrate (Figure 3d). This stream had the following channel dimensions: 4- to 5-foot channel width, 2.5-foot channel depth, 3- to 4-foot bankfull width, 1-foot bankfull depth, and less than 0.5-foot water depth (Photograph 7). Stream 27 is a high quality stream with low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide on the south side and less than 30 feet wide on the north side of the stream. The riparian zone is made up of a HC (10-70+ years old) that is described in Section 2.1 of this report. Additional riparian vegetation includes giant cane grass. Approximately 450 feet east of existing Old Farmington Road, Stream 27 begins flowing underground. The eastern alignment for the proposed new location would adversely impact approximately 200 linear feet of Stream 27.

Wetland 28 is a small, headwater wetland of Stream 27 (Figure 3d). Wetland hydrology indicators include inundation, saturation in the upper 12 inches, wetland drainage patterns, and a less than 2 inch depth to free water in the pit. Vegetation includes giant cane grass, hazel alder, sweetgum, netted chain fern, soft bulrush, wild azalea, and blueberry. Current impacts to this wetland are minor; recovery would require minor enhancement. The eastern alignment for the proposed new location would adversely impact approximately 0.12 acre of Wetland 28.

Wetland 29 is a large, riparian wetland of Stream 26 (Figure 3d). Wetland hydrology indicators include inundated pockets, saturation in the upper 12 inches, wetland drainage patterns, water stained leaves, local soil survey data, and a 4 inch depth to free water in the pit. Vegetation includes hazel alder, black willow, elderberry, false nettle (*Boehmeria cylindrica*), Japanese stilt grass (*Microstegium vimineum*), Chinese privet, red maple, soft bulrush, and netted chain fern. Current impacts to this wetland are minor; recovery could occur without assistance. The western alignment for the proposed new location would adversely impact approximately 0.92 acre of Wetland 29.

Stream 30 is a medium sized, perennial stream named Greenbrier Creek with sand, gravel, and silt substrate (Figure 3d). This stream had the following channel dimensions: 30- to 40-foot channel width, 8- to 10-foot channel depth, 20- to 30-foot bankfull width, 3- to 4-foot bankfull depth, and less than 2-foot water depth (Photograph 8). Stream 30 is a high quality stream with moderate turbidity, stable banks and riparian vegetation that is less than 30 feet wide. The riparian zone is made up of mixed hardwoods on the northwest side of Old Farmington Road and old field vegetation on the southeast side of Old Farmington Road. The western alignment for the proposed new location would adversely impact approximately 300 linear feet of Stream 30. The eastern alignment for the proposed new location would adversely impact approximately 450 linear feet of Stream 30.

Stream 31 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, silt, and clay substrate (Figure 3d). This stream had the following channel dimensions: 6- to 9-foot channel width, less than 1-foot channel depth, 5- to 6-foot bankfull width, less than 1-foot bankfull depth, and less than 0.5-foot water depth (Photograph 9). Stream 31 is a moderate quality stream with low turbidity, stable banks and riparian vegetation that is greater than 100 feet on the north side of the stream and less than 50 feet wide on the south side. The riparian zone is made up of red maple, water oak, hazel alder, black willow, sweetgum, and American holly (10-25+ years old). Cattle access from an adjacent farm is mostly restricted for the portion of this stream near the proposed project. The western alignment for the proposed new location would adversely impact approximately 250 linear feet of Stream 31. The eastern alignment for the proposed new location would adversely impact approximately 325 linear feet of Stream 31.

Wetland 32 is a large, riparian wetland of Stream 31 that transitions from a forested wetland to a scrub/shrub wetland as it continues north of Stream 31 along Greenbrier Creek (Figure 3d). Wetland hydrology indicators include inundated pockets, saturation in the upper 12 inches, wetland drainage patterns, water stained leaves, and a 4 inch depth to free water in the pit. Vegetation includes hazel alder, black willow, elderberry, false nettle (*Boehmeria cylindrica*), Japanese stilt grass (*Microstegium vimineum*), red maple, soft bulrush, and netted chain fern. Vegetation in the scrub/shrub area included wool grass, lizard's tail (*Saururus cernuus*), soft

bulrush, black willow, and hazel alder. Current impacts to this wetland are minor; recovery could occur without assistance. The western alignment for the proposed new location would adversely impact approximately 1.54 acres of Wetland 32. The eastern alignment for the proposed new location would adversely impact approximately 1.44 acres of Wetland 32.

Stream 33 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, silt, and gravel substrate (Figure 3d). This stream had the following channel dimensions: 8- to 10-foot channel width, 3- to 5-foot channel depth, 4- to 8-foot bankfull width, 2- to 3-foot bankfull depth, and less than 1-foot water depth (Photograph 10). Stream 33 is a high quality stream with good sinuosity, low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide on both sides. The riparian zone is made up of a HC (10-50+ years old) that is described in Section 2.1 of this report. The western alignment for the proposed new location would adversely impact approximately 260 linear feet of Stream 33. The eastern alignment for the proposed new location would adversely impact approximately 430 linear feet of Stream 33.

Stream 34 is a small, intermittent, 1st order stream with sand, silt, and bedrock substrate (Figure 3d). This stream begins at the outflow of Pond 35 and had the following channel dimensions: 6- to 7-foot channel width, 1.5- to 2.5-foot channel depth, 4- to 5-foot bankfull width, 1-foot bankfull depth, and less than 1-foot water depth (Photograph 11). Stream 34 is a moderate quality stream with low turbidity, stable banks and riparian vegetation that is less than 30 feet wide on both sides. The riparian zone is made up of blackberry, Chinese privet, sweetgum, and black cherry (5-10+ years old). The western alignment for the proposed new location would adversely impact approximately 250 linear feet of Stream 34. The eastern alignment for the proposed new location would adversely impact approximately 190 linear feet of Stream 34.

Pond 35 is an approximately 0.97 acre recreational pond that drains to form Stream 34 (Figure 3d). The pond is moderate quality, had moderate turbidity and is surrounded by a maintained lawn. No picture is available for this pond due to a landowner demand to stay off the property. The eastern alignment for the proposed new location would adversely impact approximately 0.13 acre of Pond 35.

Stream 36 is a small, perennial, 1st order tributary to Greenbrier Creek with sand and silt substrate (Figure 3d). This stream had the following channel dimensions: 6- to 9-foot channel width, 2- to 3.5-foot channel depth, 5- to 6-foot bankfull width, 1- to 2-foot bankfull depth, and less than 1-foot water depth (Photograph 12). Stream 36 is a moderate quality stream with low turbidity and moderately stable banks. There is little to no riparian vegetation on the banks of this stream except a maintained lawn and a few sparse hardwoods (10-40+ years old). The western alignment for the proposed new location would adversely impact approximately 350

linear feet of Stream 36. The eastern alignment for the proposed new location would adversely impact approximately 300 linear feet of Stream 36.

Stream 37 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, clay, and gravel substrate (Figure 3d). This stream had the following channel dimensions: 9- to 11-foot channel width, 3- to 5-foot channel depth, 5- to 6-foot bankfull width, 2- to 3-foot bankfull depth, and less than 1-foot water depth (Photograph 13). Stream 37 is a high quality stream with low turbidity, stable banks, and riparian vegetation that is greater than 100 feet wide on both sides. The riparian zone is made up of a HC (10-60+ years old) that is described in Section 2.1 of this report. The western alignment for the proposed new location would adversely impact approximately 250 linear feet of Stream 37. The eastern alignment for the proposed new location would also adversely impact approximately 250 linear feet of Stream 37.

Stream 38 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, silt, and clay substrate (Figure 3d). This stream had the following channel dimensions: 5- to 7-foot channel width, 1- to 1.5-foot channel depth, 4- to 5-foot bankfull width, less than 1-foot bankfull depth, and less than 1-foot water depth (Photograph 14). Stream 38 is a high quality stream with low turbidity, stable banks, and riparian vegetation that is greater than 100 feet wide on both sides. The riparian zone is made up of a large riparian wetland and an upland HC (10-50+ years old) that is described in Section 2.1 of this report. The western alignment for the proposed new location would adversely impact approximately 430 linear feet of Stream 38. The eastern alignment for the proposed new location would adversely impact approximately 250 linear feet of Stream 38.

Wetland 39 is a large, riparian wetland of Stream 38 (Figure 3d). Wetland hydrology indicators include inundation, wetland drainage patterns, oxidized root channels, water stained leaves, and a less than 2 inch depth to free water in the pit. Vegetation includes lizard's tail, giant cane grass, hazel alder, netted chain fern, red maple, and common greenbrier. This is a fully functional, high quality wetland. The western alignment for the proposed new location would adversely impact approximately 1.48 acres of Wetland 39. The eastern alignment for the proposed new location would adversely impact approximately 0.34 acre of Wetland 39.

Wetland 40 is a small pond that is frequently dry (Figure 3d-3e). A personal communication with the former landowner (Mr. Gene Dillinger) revealed that a drainage ditch that used to feed the pond has been diverted, resulting in decreased ponding. Wetland hydrology indicators include saturation in the upper 12 inches, oxidized root channels, and water-stained leaves. Herbaceous species dominating this wetland include soft bulrush, knotweed (*Polygonum* sp.), and various unknown grasses. This is a medium quality wetland. The proposed project would adversely impact approximately 0.38 acre of Wetland 40.

Wetland 41 is an upland depression in a pasture (Figure 3d-3e). The wetland is grazed and is drained by a small ditch. Wetland hydrology indicators include oxidized root channels. Species present include barnyard grass, Bahia grass, dog fennel (*Eupatorium capillifolium*), and various pasture grasses. This is a low quality wetland due to disturbance, small size, and minimal hydrology. The proposed project would adversely impact approximately 0.44 acre of Wetland 41.

Wetland 42 is a hardwood wetland that fringes Stream 43 (Figure 3d-3e). The wetlands are influenced by beaver impoundments at the source of Stream 43 and further downstream. Wetland hydrology indicators include wetland drainage patterns. Species present include tulip poplar, red maple, sweetgum, Chinese privet, Japanese grass, netted chain fern, and common greenbrier. This is a high quality wetland. The proposed project would adversely impact approximately 0.44 acre of Wetland 42.

Stream 43 is a perennial, unnamed tributary to Greenbriar Creek that is spring fed and is 3 feet wide with banks 1-foot high (Figure 3d-3e). The substrate is sand and gravel, and the surrounding vegetation is wetland hardwood forest (Wetland 42). The source of the stream is a spring located within the proposed alignment that has been excavated to form a shallow pool. Cattle have free access to the stream and have trampled the banks in some areas. The stream is characterized as somewhat impaired due to the past excavation and the cattle access. The proposed project would adversely impact approximately 130 linear feet of Stream 43.

Wetland 44 is a medium quality, scrub/shrub wetland above the headwaters of Greenbrier Creek (Figure 3d-3e). Vegetation includes giant cane grass, red maple, water oak, sweetgum, and Japanese honeysuckle. No other wetland data was available for this report. The proposed project would adversely impact approximately 0.51 acre of Wetland 44.

Stream 45 is the upper reach of Greenbriar Creek and is 3 feet wide with banks 2.5 feet high (Figure 3d-3e). The stream flows under US 441 and has some sediment deposits. The stream substrate is sand, gravel, and silt. The stream is characterized as somewhat impaired due to the road culvert, channelization, and narrow riparian area downstream of US 441. The proposed project would adversely impact approximately 175 linear feet of Stream 45.

Wetland 46 is a medium quality, scrub/shrub wetland above the headwaters of Greenbrier Creek (Figure 3d-3e). Vegetation includes water oak, sweetgum, and American hornbeam. No other wetland data was available for this report. The proposed project would adversely impact approximately 0.79 acre of Wetland 46.

### 3.2 Georgia Erosion and Sedimentation Control Act

The proposed project may encroach upon some stream buffers that must be maintained along any state water. Since the streams within the project corridor are not classified as “trout streams” as defined by the Georgia Water Quality Control Act, the designated stream buffer width is 25 feet for this project corridor. After reviewing the 2005 Ecology Report and project plans, it was determined that the 25-foot buffer of streams 3, 9, 10, 14, and 26 would be impacted by the proposed project (Figure 3). Encroachment upon these stream buffers may be reduced or avoided prior to final design approval.

During the 2006 ecology survey, Global Positioning Satellite (GPS) coordinates were recorded for Stream 26 at various locations along the top of the stream bank: 1) southernmost point where the stream is formed by springs (N 33° 47.648', W 83° 25.097'); 2) downstream point where stream bends away from Old Farmington Rd. (N 33° 47.643', W 83° 25.088'); 3) downstream point where stream now flows parallel to Old Farmington Rd. (N 33° 47.629', W 83° 25.079'); 4) downstream point where stream continues to flow parallel to Old Farmington Rd. (N 33° 47.614', W 83° 25.075'); 5) downstream point where stream flows under fence and is now accessible to cattle (N 33° 47.658', W 83° 25.054'); 6) downstream point where stream becomes braided as it flows through Wetland 29 to Greenbrier Creek (N 33° 47.702', W 83° 25.037'); 7) downstream point where stream flows into Greenbrier Creek (N 33° 47.744', W 83° 25.011'). The western alignment of the new location would encroach upon the Stream 26 buffer (Photograph 6).

### Section 4. Federally Protected Species Survey

In Morgan and Oconee Counties, the following bird is listed by the U.S. Fish and Wildlife Service (USFWS) and/or the Georgia Department of Natural Resources (GDNR) as federally threatened, endangered, or a candidate species: bald eagle (*Haliaeetus leucocephalus*).

Both the 1998 GDOT report and the 2005 Earth Tech Inc. report list the federally endangered red-cockaded woodpecker (*Picoides borealis*) as occurring in Morgan/Oconee Counties. Currently, this species is not listed by the USFWS or the GDNR as occurring in either Morgan or Oconee Counties, Georgia. This bird has a fragmented distribution, with the nearest population to the project corridor located in the Oconee National Forest. The proposed range of this species is shown just reaching into the southern tip of Morgan County, but there are no known occurrences of this bird in the county.

On March 15<sup>th</sup>, 2006, a letter was sent to the Georgia Department of Natural Resources (GDNR) for a list of plant and animal species from their Natural Heritage Database that occurs within 3 miles of the two new alignments for the Bishop Bypass. On March 17<sup>th</sup>, 2006, the GDNR sent a

response letter indicating that no state or federally protected species have been recorded within 3 miles of the site (Appendix 4). Correspondence (Log # NG-06-441-MORG), dated April 4<sup>th</sup>, 2006, received from USFWS reported that they do not have any site specific species information near the project (Appendix 4).

Bald eagle, *Haliaeetus leucocephalus*

The bald eagle is federally listed as a threatened species. Mature adults have a white head, white tail, and a large bright yellow bill; elsewhere, the plumage is dark. They range in height from 31 inches to 37 inches with a wingspan of 70 inches to 90 inches. The bald eagle spends most of its life in and around major inland waterways and estuarine systems. Preferred nesting habitat consists of quiet coastal areas, rivers or lakeshores with large, tall trees. Man-made reservoirs have provided excellent habitat.

No eagle nests or eagles were seen during the field survey. There is no potential bald eagle habitat present in the project area. According to the GNHP database, the bald eagle is not known to occur within three miles of the project area. The effect determination due to project construction and operation is: no effect to the bald eagle.

A field survey for threatened and endangered species and their habitats within the two new alignments for the Bishop Bypass was accomplished on April 19-21, 2006. None of these species or their habitat was observed within the proposed right-of-way. Therefore, the project would have no effect on any of these species or their habitats. Critical habitat for all listed species, as defined by the USFWS, is not designated in the State of Georgia.

Both the 1998 GDOT report and the 2005 Earth Tech report indicate that no listed species were found, nor was any appropriate habitat observed within the project corridor. No critical habitat for federally listed species, as defined by the U.S. Fish and Wildlife Service, is present in the project area.

### **Section 5. Executive Order 13112: Invasive Pest Species**

A survey for populations of invasive species that may be spread during construction was conducted for this project. The invasive species for which the survey was conducted have been identified by GDOT as having the highest priority due to environmental and economic impacts caused by those species. Both the selected species and the management practices specified will be re-evaluated and revised as appropriate as more information is obtained.

Nine invasive species identified by GDOT were identified within the project right-of way: kudzu (*Pueraria montana*), mimosa (*Albizia julibrissin*), Chinese privet, Japanese honeysuckle (*Lonicera*

*japonica*), autumn olive (*Elaeagnus umbellata*), Japanese wisteria (*Wisteria floribunda*), Johnson grass (*Sorghum halepense*), multiflora rose (*Rosa multiflora*), and tree of heaven (*Ailanthus altissima*).

The GDOT would take measures during project construction to prevent or minimize the spread of these species as appropriate for the time of the year. These measures would include removal and disposal of vegetative parts in the soil that may reproduce by root raking prior to moving the soil, burning on site any such parts and aboveground parts that bear fruit, controlling or eradicating infestations prior to construction, cleaning of vehicles and other equipment prior to leaving the infested site. The measures used would be those that are appropriate for the particular species and the specific site conditions that exist in the project, as described in Georgia Standard Specifications Section 201, Clearing and Grubbing of Right-Of-Way.

### **Section 6. Avoidance/Minimization**

There are 14 wetlands, 6 ponds, 6 intermittent streams and 18 perennial streams located within or adjacent to the proposed right-of-way (Figures 3a – 3e). Shifting the proposed alignment would result in equivalent impacts to most streams within the project corridor because they cross the project corridor at approximately perpendicular angles. It should be noted that at the time of this report, final cut and fill lines have not been set. Impacts quantified by this report were based on the proposed right-of-way widths included in the layout provided by GDOT in February 2006. When all three new location alignments east of Bishop, Georgia are compared, the eastern alignment surveyed in 2006 would have the least impact to streams and wetlands.

#### 2005 Ecology Report

The 2005 report prepared by Earth Tech indicated that the proposed project would impact approximately 7,869 linear feet of streams, 21.62 acres of wetlands and 1.94 acres of ponds. Streams 10 and 14 were listed as having longitudinal buffer encroachments. No avoidance measures were recommended for Stream 14.

Stream 10 was reported as having been channelized into a roadside ditch. Shifting the alignment to the west would create a buffer encroachment on Stream 9, a higher quality stream. No avoidance measures were recommended for Stream 10.

#### 2006 Ecology Report

The proposed project with the western alignment of the Bishop bypass would impact approximately 7,819 linear feet of streams, 21.96 acres of wetlands and 1.81 acres of ponds. The

proposed project with the eastern alignment of the Bishop bypass would impact approximately 7,754 linear feet of streams, 19.92 acres of wetlands and 1.94 acres of ponds.

The western alignment of the Bishop bypass would longitudinally encroach upon approximately 100 to 200 linear feet of stream 26 in an upland section of the stream and approximately 250 to 350 feet within Wetland 29. If the proposed shoulder slopes on the west side of the road were reduced and the alignment was shifted slightly to the east, a longitudinal buffer encroachment may be avoided. If the proposed eastern alignment was used at this location, the longitudinal buffer encroachment at Stream 26 would be avoided.

If the eastern alignment was shifted further east so that it crossed Hardigree-Bell Road and merged with existing 441 closer to the town of Watkinsville, Wetlands 28, 32 and 39 could possibly be avoided.

This project may result in possible erosion and increased siltation to wetlands and streams. Standard construction erosion and sedimentation control devices would be installed to minimize environmental harm. Additional measures to minimize harm to wetlands, water quality, wildlife and fish and game habitat include:

- a) preservation of roadside vegetation beyond the limits of construction where possible;
- b) early re-vegetation of disturbed areas to hold soil movement to a minimum;
- c) the use of slope drains, detention/retention structures, surface, subsurface, and cross drains designed as appropriate or needed so that discharge would occur in locations and in such a manner that surface and subsurface water quality would not be affected (the outlets may require aprons, bank protection, silt basins, and energy dissipaters);
- d) inclusion of features for the control of predicted erosion and water pollution in the construction plans, specifications, and contract pay items (Georgia Standard Specifications, Sections 161 through 171 and 700 through 715, and the 1997 Supplemental Specifications modifying the same identify the pollution control measures that may be used);
- e) the dumping of chemicals, fuels, lubricants, bitumens, raw sewage, or other harmful waste into or alongside of streams or impoundments, or into natural or manmade channels leading thereto, would be prohibited; and

- f) compliance with terms of the National Pollutant Discharge Elimination System (NPDES) permit for construction activities to include preparation and submittal of project Notice of Intent (NOI) and Notice of Termination (NOT). The NPDES permit also requires preparation and implementation of an Erosion, Sedimentation, and Pollution Control Plan and a Comprehensive Monitoring Program. Best management practices outlined in the Erosion, Sedimentation, and Pollution Control Plan must be consistent with, and no less stringent than, practices set forth in the Manual for Erosion and Sedimentation Control in Georgia.

### **Section 7. Mitigation**

All temporary impacts have been considered permanent impacts. Impacts quantified by this report were based on the proposed Right of Way widths included in the layout provided by GDOT in February 2006. Impacts to streams caused by improvements to the existing roadway are listed as piping, except when the stream runs parallel to the road. In this case, the impact is listed as fill. All impacts to streams, wetlands, and ponds on new location are listed as fill.

#### Bishop Bypass Western Alignment

The proposed project with the western alignment of the Bishop bypass would impact approximately 7,819 linear feet of streams, 21.96 acres of wetlands and 1.81 acres of ponds. Compensatory mitigation required for the proposed stream impacts is 43,846.6 credits (Table 3). Compensatory mitigation required for the proposed wetland and pond impacts is 179.79 credits (Table 5).

#### Bishop Bypass Eastern Alignment

The proposed project with the eastern alignment of the Bishop bypass would impact approximately 7,754 linear feet of streams, 19.92 acres of wetlands and 1.94 acres of ponds. Compensatory mitigation required for the proposed stream impacts is 43,233.1 credits (Table 3). Compensatory mitigation required for the proposed wetland and pond impacts is 162.86 credits (Table 5).

## REFERENCES

Cowardin, Lewis M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the U.S. U.S. Fish and Wildlife Service.

Ecological Assessment for US441 Widening, GDOT PROJECT EDS-441(42)(43); P.I. 222560, 122660; Morgan and Oconee Counties, GA; Earth Tech Associates, Inc., June 2005.

Ecological Assessment for US441 Widening, GDOT PROJECT EDS-441(42)(43); P.I. 222560, 122660; Morgan and Oconee Counties, GA; GDOT Office of Environment/Location., June 1998.

Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiments Station, Vicksburg, MS.

Georgia Natural Heritage Program. 2006. Locations of Special Concern Animals, Plants, and Natural Communities in Morgan and Oconee Counties, Georgia. Georgia Department of Natural Resources; <http://georgiawildlife.dnr.state.ga.us/content/specieslocationbycounty>.

Munsell Color. 1992. Munsell soil color charts. MacBeth Division, Kollmorgen Instruments Corporation, Baltimore, MD.

Natural Resources Conservation Service (NRCS). 1968. Soil survey of Clarke and Oconee Counties, Georgia. U.S. Department of Agriculture

Natural Resources Conservation Service (NRCS). 1965. Soil survey of Morgan County, Georgia. U.S. Department of Agriculture

NatureServe. 2004. Data search by scientific name, last updated October 2004. [www.natureserve.org/explorer/NatureServe?init=Species](http://www.natureserve.org/explorer/NatureServe?init=Species)

Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: Southeast (Region 2). U.S. Department of the Interior, Fish & Wildlife Service, Research and Development, Washington, D.C. Biological Report 88 (26.2).

Soil Conservation Service (SCS). 1991. Hydric soils of the U.S. In cooperation with the National Technical Committee for Hydric Soils. U.S. Department of Agriculture, Washington, D.C.

U.S. Army Corps of Engineers (USACE). 1992. Clarification and interpretation of the 1987 manual. Environmental Laboratory. Vicksburg, MS.

U.S. Fish and Wildlife Service (USFWS). 2004. Listed species in Morgan and Oconee Counties (updated May 2004). <http://www.fws.gov/r4gafo/angered/counties/>

## APPENDIX 1. TABLES

TABLE 1: Federally and State Protected Species Summary

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	STATE STATUS	HABITAT	HABITAT PRESENT
BALD EAGLE	<i>Haliaeetus leucocephalus</i>	THREATENED	ENDANGERED	Inland waterways and estuarine areas.	NO

TABLE 2: Summary of Stream Characteristics and Estimated Length of Impact

Stream #/ Name	2005 Report Stream #/Name	Drainage Association	Lost Type	HUC #	Stream Description	On 303d List?	Impact Area (linear feet)	
							Temporary (within ROW, but outside C/L)	Permanent (length within proposed ROW)
Stream 1	Stream 1	Hard Labor Creek	Perennial	03070101- 1303	Stream 1 is a large, perennial stream named Hard Labor Creek that is 20 feet wide with banks about 6 feet high. Substrate is cobble, gravel, and sand. The banks are vegetated with scrub vegetation and small trees. The riparian area is hardwood forest and includes Wetland 2. This stream is characterized as somewhat impaired due to channelization at the US 441 bridge crossing.	No	N/A	N/A (bridge)
Stream 3	Stream 3	Hard Labor Creek	Perennial	03070101- 1303	Stream 3 is an unnamed, perennial tributary to Hard Labor Creek that is 6 feet wide with banks about 2 feet high. It is located in Wetland 2 on the west side of US 441 and empties into Hard Labor Creek about 20 feet upstream of the US 441 bridge. Substrate is coarse sand. The banks are vegetated with herbaceous and woody vegetation and the surrounding area is hardwood forest. Beaver activity was noted along the stream. This stream is characterized as somewhat impaired due to sediment deposits.	No	N/A	200 ft / fill
Stream 6	Stream 6	Big Sandy Creek	Intermittent	03070101- 1306	Stream 6 is an unnamed, intermittent tributary to Big Sandy Creek that is 2 feet wide with banks about 2 feet high. Substrate is sand and silt. The stream is below a large farm pond that is partially within the alignment. The stream is in active pasture on both sides of US 441 and is heavily impacted by cattle. The banks are vegetated with herbaceous and scrub vegetation and the surrounding area is predominantly pasture. This stream is characterized as somewhat impaired due to the cattle access, lack of riparian vegetation, US 441 culvert, and downstream channelization.	No	N/A	302 ft / culvert
Stream 8	Stream 8	Big Sandy Creek	Perennial	03070101- 1306	Stream 8 is a large, perennial stream named Big Sandy Creek that is 30 feet wide with banks about 6 feet high. Substrate is sand and gravel. The banks are vegetated with hardwoods and scrub vegetation and the surrounding area is a mix of hardwood forest and pasture. Wetland 07 borders the stream and US 441 in this area. This stream is characterized as somewhat impaired due to channelization at the US 441 bridge.	No	N/A	N/A (bridge)
Stream 9	Stream 9	Beaverdam Creek	Perennial	03070101- 1306	Stream 9 is a perennial stream named Beaverdam Creek that is 8 feet wide with banks about 4 feet high. The substrate is sand and silt. The banks are steep and sparsely vegetated with herbaceous and scrub vegetation. The surrounding area is hardwood forest. Beaver activity was noted along the stream. This stream is characterized as somewhat impaired due to sediment deposits and bank erosion.	No	N/A	60 ft / fill
Stream 10	Stream 10	Big Sandy Creek	Intermittent	03070101- 1306	Stream 10 is an intermittent, unnamed tributary to Big Sandy Creek that is 10 feet wide with banks about 3 feet high. This stream has been channelized into a roadside ditch on the east side of US 441. Historically the stream appears to have flowed into Beaverdam Creek. The substrate is mostly sand. The banks are vegetated with scrub vegetation and the surrounding area is pasture and mixed pine-hardwood forest. This stream is characterized as somewhat impaired due to significant channelization, lack of riparian vegetation, and sediment deposits.	No	N/A	2,900 ft / fill

Stream #/ Name	2005 Report Stream #/Name	Drainage Association	Lost Type	HUC #	Stream Description	On 303d List?	Impact Area (linear feet)	
							Temporary (within ROW, but outside C/L)	Permanent (length within proposed ROW)
Stream 13	Stream 13	Long Branch	Intermittent	03070101-0906	Stream 13 is the upper reach of Long Creek, a tributary of the Apalachee River. Within the proposed alignment the stream is intermittent with a width of 1 foot and banks 0.5 feet high. Substrate is sand and silt. The stream is entirely within an active pasture and is severely trampled. This stream is characterized as somewhat impaired due to the cattle access and lack of riparian vegetation.	No	N/A	340 ft / culvert
Stream 14	Stream 14	Apalachee River	Intermittent	03070101-0906	Stream 14 is an unnamed tributary of the Apalachee River with a width of 3 feet and banks about 2 feet high. Below US 441 the stream becomes more entrenched. Substrate is sand and gravel. The banks are well vegetated with herbaceous and woody vegetation and the surrounding area is hardwood forest and pine forest. This stream is characterized as somewhat impaired due to the US 441 culvert, heavy sedimentation, and downstream entrenchment.	No	N/A	630 ft / culvert
Stream 15	Stream 15	Apalachee River	Perennial	03070101-0906	Stream 15 is a large, perennial stream named the Apalachee River. The river is 80 feet wide with banks about 8 feet high. Substrate is cobble and bedrock. The banks are well vegetated with herbaceous and woody vegetation and the surrounding area is hardwood forest and pine forest. This river is characterized as somewhat impaired due to channelization at the US 441 bridge.	Yes	N/A	N/A (bridge)
Stream 20	Stream 20	Tributary to Freeman Creek	Perennial	03070101-0905	Stream 20 is a perennial, unnamed tributary to Freeman Creek that is 2 feet wide with banks about 2 feet high. The stream begins on the west side of US 441. The substrate is sand and gravel. The banks are vegetated with woody vegetation and the surrounding area is hardwood forest and pasture. This stream is characterized as somewhat impaired due to the US 441 culvert, entrenchment, and sediment deposits.	No	N/A	112 ft / fill
Stream 20b	Stream 20b	Tributary to Freeman Creek	Perennial	03070101-0905	Stream 20b is a perennial, unnamed tributary to Freeman Creek that is 3 feet wide with banks about 1 foot high. The stream begins east of the project boundary and flows into a recently constructed farm pond (Pond 20c). The substrate is sand and bedrock. The banks are vegetated with herbaceous vegetation with the buffer area removed during construction of the pond. This stream is characterized as somewhat impaired because of the recent construction activity, loss of deep-rooted riparian buffer and sediment deposits.	No	N/A	180 ft / fill
Stream 22	NONE	Tributary to Freeman Creek	Perennial	03070101-0905	Stream 22 is a small, perennial, 1st order stream with sand and silt substrate. This stream begins at the outflow of Pond 21 and had the following channel dimensions: 5- to 7-foot channel width, 3- to 5-foot channel depth, 3- to 4-foot bankfull width, 1- to 2-foot bankfull depth, and less than 1-foot water depth. Stream 22 is a moderate quality stream with low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide. The riparian zone is made up of a MPH (30-100+ years old).	No	N/A	100 ft / fill

Stream #/ Name	2005 Report Stream #/Name	Drainage Association	Lost Type	HUC #	Stream Description	On 303d List?	Impact Area (linear feet)	
							Temporary (within ROW, but outside C/L)	Permanent (length within proposed ROW)
Stream 23	Stream 20f	Tributary to Freeman Creek	Perennial	03070101- 0905	Stream 23 is a small, perennial, 1st order stream with clay and silt substrate. This stream begins at the outflow of Pond 24 and had the following channel dimensions: 8- to 10-foot channel width, 1- to 2-foot channel depth, 10-foot bankfull width, 2-foot bankfull depth, and less than 1-foot water depth. Stream 23 is downhill from a dry upland pond that used to be a toxic waste dump site for carbon tetrachloride used in cottonseed delimiting. It appears that this waste is leaching into Stream 23 and the adjacent wetland (Wetland 25). This somewhat impaired stream had a strong chemical odor, low flow, high turbidity, stable banks and riparian vegetation that is greater than 100 feet wide. The riparian zone is made up of a MPH (10-40+ years old).	No	N/A	230 ft / fill
Stream 26	NONE	Tributary to Greenbrier Creek	Perennial	03070101- 0704	Stream 26 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, clay, and silt substrate. This stream had the following channel dimensions: 4- to 8-foot channel width, 3- to 6-foot channel depth, 3-foot bankfull width, 1- to 2-foot bankfull depth, and less than 0.5-foot water depth. Multiple springs enter Stream 26 as it flows towards Greenbrier Creek. Stream 26 is a high quality stream with good sinuosity, low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide. The riparian zone is made up of a HC (10-70+ years old).	No	N/A	370 ft / fill Western Alignment
Stream 27	NONE	Tributary to Greenbrier Creek	Intermittent	03070101- 0704	Stream 27 is a small, intermittent, spring fed stream with sand and detritus substrate. This stream had the following channel dimensions: 4- to 5-foot channel width, 2.5-foot channel depth, 3- to 4-foot bankfull width, 1-foot bankfull depth, and less than 0.5-foot water depth. Stream 27 is a high quality stream with low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide on the south side and less than 30 feet wide on the north side of the stream. The riparian zone is made up of a HC (10-70+ years old).	No	N/A	0 ft Western Alignment
Stream 30	Stream 23	Greenbrier Creek	Perennial	03070101- 0704	Stream 30 is a medium sized, perennial stream named Greenbrier Creek with sand, gravel, and silt substrate. This stream had the following channel dimensions: 30- to 40-foot channel width, 8- to 10-foot channel depth, 20- to 30-foot bankfull width, 3- to 4-foot bankfull depth, and less than 2-foot water depth. Stream 30 is a high quality stream with moderate turbidity, stable banks and riparian vegetation that is less than 30 feet wide. The riparian zone is made up of mixed hardwoods on the northwest side of Old Farmington Road and old field vegetation on the southeast side of Old Farmington Road.	No	N/A	300 ft / fill Western Alignment
Stream 31	Stream 24	Tributary to Greenbrier Creek	Perennial	03070101- 0704	Stream 31 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, silt, and clay substrate. This stream had the following channel dimensions: 6- to 9-foot channel width, less than 1-foot channel depth, 5- to 6-foot bankfull width, less than 1-foot bankfull depth, and less than 0.5-foot water depth. Stream 31 is a moderate quality stream with low turbidity, stable banks and riparian vegetation that is greater than 100 feet on the north side of the stream and less than 50 feet wide on the south side. The riparian zone is made up of red maple, water oak, hazel alder, black willow, sweetgum, and American holly (10-25+ years old).	No	N/A	250 ft / fill Western Alignment

Stream #/ Name	2005 Report Stream #/Name	Drainage Association	Lost Type	HUC #	Stream Description	On 303d List?	Impact Area (linear feet)		
							Temporary (within ROW, but outside C/L)	Permanent (length within proposed ROW)	
Stream 33	Stream 25	Tributary to Greenbrier Creek	Perennial	03070101- 0704	Stream 33 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, silt, and gravel substrate. This stream had the following channel dimensions: 8- to 10-foot channel width, 3- to 5-foot channel depth, 4- to 8-foot bankfull width, 2- to 3-foot bankfull depth, and less than 1-foot water depth. Stream 33 is a high quality stream with good sinuosity, low turbidity, stable banks and riparian vegetation that is greater than 100 feet wide on both sides. The riparian zone is made up of a HC (10-50+ years old).	No	N/A	260 ft / fill Western Alignment	430 ft / fill Eastern Alignment
Stream 34	Stream 27	Tributary to Greenbrier Creek	Intermittent	03070101- 0704	Stream 34 is a small, intermittent, 1st order stream with sand, silt, and bedrock substrate. This stream begins at the outflow of Pond 35 and had the following channel dimensions: 6- to 7-foot channel width, 1.5- to 2.5-foot channel depth, 4- to 5-foot bankfull width, 1-foot bankfull depth, and less than 1-foot water depth. Stream 34 is a moderate quality stream with low turbidity, stable banks and riparian vegetation that is less than 30 feet wide on both sides. The riparian zone is made up of blackberry, Chinese privet, sweetgum, and black cherry (5-10+ years old).	No	N/A	250 ft / fill Western Alignment	190 ft / fill Eastern Alignment
Stream 36	Stream 30	Tributary to Greenbrier Creek	Perennial	03070101- 0704	Stream 36 is a small, perennial, 1st order tributary to Greenbrier Creek with sand and silt substrate. This stream had the following channel dimensions: 6- to 9-foot channel width, 2- to 3.5-foot channel depth, 5- to 6-foot bankfull width, 1- to 2-foot bankfull depth, and less than 1-foot water depth. Stream 36 is a moderate quality stream with low turbidity and moderately stable banks. There is little to no riparian vegetation on the banks of this stream except a maintained lawn and a few sparse hardwoods (10-40+ years old).	No	N/A	350 ft / fill Western Alignment	300 ft / fill Eastern Alignment
Stream 37	Stream 32	Tributary to Greenbrier Creek	Perennial	03070101- 0704	Stream 37 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, clay, and gravel substrate. This stream had the following channel dimensions: 9- to 11-foot channel width, 3- to 5-foot channel depth, 5- to 6-foot bankfull width, 2- to 3-foot bankfull depth, and less than 1-foot water depth. Stream 37 is a high quality stream with low turbidity, stable banks, and riparian vegetation that is greater than 100 feet wide on both sides. The riparian zone is made up of a HC (10-60+ years old).	No	N/A	250 ft / fill Western Alignment	250 ft / fill Eastern Alignment
Stream 38	Stream 35	Tributary to Greenbrier Creek	Perennial	03070101- 0704	Stream 38 is a small, perennial, 1st order tributary to Greenbrier Creek with sand, silt, and clay substrate. This stream had the following channel dimensions: 5- to 7-foot channel width, 1- to 1.5-foot channel depth, 4- to 5-foot bankfull width, less than 1-foot bankfull depth, and less than 1-foot water depth. Stream 38 is a high quality stream with low turbidity, stable banks, and riparian vegetation that is greater than 100 feet wide on both sides. The riparian zone is made up of a large riparian wetland and an upland HC (10-50+ years old).	No	N/A	430 ft / fill Western Alignment	250 ft / fill Eastern Alignment
Stream 43	Stream 39	Tributary to Greenbrier Creek	Perennial	03070101- 0704	Stream 43 is a perennial, unnamed tributary to Greenbrier Creek that is spring fed and is 3 feet wide with banks 1 foot high. The substrate is sand and gravel, and the surrounding vegetation is wetland hardwood forest (Wetland 42). The source of the stream is a spring located within the proposed alignment that has been excavated to form a shallow pool. Cattle have free access to the stream and have trampled the banks in some areas. The stream is characterized as somewhat impaired due to the past excavation and the cattle access.	No	N/A		130 ft / fill

Stream #/ Name	2005 Report Stream #/Name	Drainage Association	Lost Type	HUC #	Stream Description	On 303d List?	Impact Area (linear feet)		
							Temporary (within ROW, but outside C/L)	Permanent (length within proposed ROW)	
Stream 45	Stream 41	Greenbrier Creek	Perennial	03070101- 0704	Stream 45 is the upper reach of Greenbrier Creek and is 3 feet wide with banks 2.5 feet high. The stream flows under US 441 and has some sediment deposits. The stream substrate is sand, gravel, and silt. The stream is characterized as somewhat impaired due to the road culvert, channelization, and narrow riparian area downstream of US 441.	No	N/A	175 ft / culvert	
<b>Total Impacts:</b>							N/A	7819 ft based on western alignment	7754 ft based on eastern alignment

*\* All temporary impacts have been considered permanent impacts because no mapping defining the construction limits was available at the time this report was prepared. Impacts quantified by this report were based on the Proposed Right of Way widths included in the layout provided by GDOT in February 2006.*

**Table 3. Adverse Impact Factors for Riverine Systems Worksheet**

Factors	Options								
	Stream Type Impacted	Intermittent 0.1			Perennial Stream > 15' in width 0.4			Perennial Stream ≤ 15' in width 0.8	
Priority Area	Tertiary 0.5			Secondary 0.8			Primary 1.5		
Existing Condition	Fully Impaired 0.25			Somewhat Impaired 0.5			Fully Functional 1.0		
Duration	Temporary 0.05			Recurrent 0.1			Permanent 0.2		
Dominant Impact	Shade/Clear 0.05	Utility X-ing 0.4	Bank Armor 0.7	Detention (weir) 1.5	Stream X-ing (≤ 100') 1.7	Impound (dam) 2.7	Morphologic Change 2.7	Pipe (>100') 3.0	Fill 3.0
Scaling Factor (Based on # of linear feet impacted)	<100' 0	100-200' 0.05	201-500' 0.1	501-1000' 0.2	>1000' impact 0.4 for each 1000' of impacts (round impacts to the nearest 1000') (example: 2,200' of impact - scaling factor = 0.8; 2,800' of impact - scaling factor = 1.2)				

Reaches to Be Impacted	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7
	Stream 3	Stream 6	Stream 9	Stream 10	Stream 13	Stream 14	Stream 20
<b>Complete the Following for Each Reach to be Impacted</b>							
Simon Channel Evolution Stage							
Rosgen Stream Type/D50							
Criteria for Selecting Existing Condition for Each Reach	sediment deposition	cattle access, lack of riparian veg., channelization	sediment deposition, bank erosion	sediment deposition, lack of riparian veg., channelization	cattle access, lack of riparian veg.	heavy sedimentation, entrenched	sediment deposition, entrenchment
Bankfull Width and Depth							
Bankfull Indicators (attach photograph showing bankfull for each reach)							
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7
	Stream 3	Stream 6	Stream 9	Stream 10	Stream 13	Stream 14	Stream 20
<b>Factors</b>							
Stream Type Impacted	0.80	0.10	0.80	0.10	0.10	0.10	0.80
Priority Area	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Existing Condition	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Duration	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Dominant Impact	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Impact Type	Fill	Culvert	Fill	Fill	Culvert	Culvert	Fill
Scaling Factor	0.05	0.10	1.20	1.20	0.20	0.20	0.20
Sum of Factors M =	5.05	4.40	6.20	5.50	4.50	4.50	5.20
Feet Stream in Reach Impacted LF =	200	302	60	2,900	340	630	112
M X LF =	1,010.0	1,328.8	372.0	15,950.0	1,530.0	2,835.0	582.4

**Total Mitigation Credits Required = (M X LF) = see page 4**

**Table 3. Adverse Impact Factors for Riverine Systems Worksheet**

Factors	Options									
	Stream Type Impacted	Intermittent 0.1			Perennial Stream > 15' in width 0.4			Perennial Stream ≤ 15' in width 0.8		
Priority Area	Tertiary 0.5			Secondary 0.8			Primary 1.5			
Existing Condition	Fully Impaired 0.25			Somewhat Impaired 0.5			Fully Functional 1.0			
Duration	Temporary 0.05			Recurrent 0.1			Permanent 0.2			
Dominant Impact	Shade/Clear 0.05	Utility X-ing 0.4	Bank Armor 0.7	Detention (weir) 1.5	Stream X-ing (≤ 100') 1.7	Impound (dam) 2.7	Morphologic Change 2.7	Pipe (>100') 3.0	Fill 3.0	
Scaling Factor (Based on # of linear feet impacted)	<100' 0	100-200' 0.05	201-500' 0.1	501-1000' 0.2	>1000' impact 0.4 for each 1000' of impacts (round impacts to the nearest 1000') (example: 2,200' of impact - scaling factor = 0.8; 2,800' of impact - scaling factor = 1.2)					

Reaches to Be Impacted	Reach 8	Reach 9	Reach 10	Reach 11	Reach 12	Reach 13	Reach 14
	Stream 20b	Stream 22	Stream 23	Stream 26 - West Alternate	Stream 27 - East Alternate	Stream 30 - West Alternate	Stream 30 - East Alternate
<b>Complete the Following for Each Reach to be Impacted</b>							
Simon Channel Evolution Stage		III	VI	II	II	V	V
Rosgen Stream Type/D50							
Criteria for Selecting Existing Condition for Each Reach	sedi. deposition, recent construction, buffer quality	bank erosion is localized	Drains chemical waste pond, strong chemical odor	reach is not entrenched	reach is not entrenched	reach is mod. entrenched, bank erosion is localized	reach is mod. entrenched, bank erosion is localized
Bankfull Width and Depth		Width: 3-4 ft Depth: 1-2 ft	Width: 10 ft Depth: 2 ft	Width: 3 ft Depth: 1-2 ft	Width: 3-4 ft Depth: 1 ft	Width: 20-30 ft Depth: 3-4 ft	Width: 20-30 ft Depth: 3-4 ft
Bankfull Indicators (attach photograph showing bankfull for each reach)		change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation
	Reach 8	Reach 9	Reach 10	Reach 11	Reach 12	Reach 13	Reach 14
Factors	Stream 20b	Stream 22	Stream 23	Stream 26 - West Alternate	Stream 27 - East Alternate	Stream 30 - West Alternate	Stream 30 - East Alternate
Stream Type Impacted	0.80	0.80	0.80	0.80	0.10	0.40	0.40
Priority Area	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Existing Condition	0.50	0.50	0.50	1.00	1.00	0.50	0.50
Duration	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Dominant Impact	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Impact Type	Fill	Fill	Fill	Fill	Fill	Fill	Fill
Scaling Factor	0.20	0.20	0.20	1.20	1.20	1.20	1.20
Sum of Factors M =	5.20	5.20	5.20	6.70	6.00	5.80	5.80
Feet Stream in Reach Impacted LF =	180	100	230	370	200	300	450
M X LF =	936.0	520.0	1,196.0	2,479.0	1,200.0	1,740.0	2,610.0

**Total Mitigation Credits Required = (M X LF) = see page 4**

**Table 3. Adverse Impact Factors for Riverine Systems Worksheet**

Factors	Options								
	Stream Type Impacted	Intermittent 0.1			Perennial Stream > 15' in width 0.4			Perennial Stream ≤ 15' in width 0.8	
Priority Area	Tertiary 0.5			Secondary 0.8			Primary 1.5		
Existing Condition	Fully Impaired 0.25			Somewhat Impaired 0.5			Fully Functional 1.0		
Duration	Temporary 0.05			Recurrent 0.1			Permanent 0.2		
Dominant Impact	Shade/Clear 0.05	Utility X-ing 0.4	Bank Armor 0.7	Detention (weir) 1.5	Stream X-ing (≤ 100') 1.7	Impound (dam) 2.7	Morphologic Change 2.7	Pipe (>100') 3.0	Fill 3.0
Scaling Factor (Based on # of linear feet impacted)	<100' 0	100-200' 0.05	201-500' 0.1	501-1000' 0.2	>1000' impact 0.4 for each 1000' of impacts (round impacts to the nearest 1000') (example: 2,200' of impact - scaling factor = 0.8; 2,800' of impact - scaling factor = 1.2)				

Reaches to Be Impacted	Reach 15	Reach 16	Reach 17	Reach 18	Reach 19	Reach 20	Reach 21
	Stream 31 - West Alternate	Stream 31 - East Alternate	Stream 33 - West Alternate	Stream 33 - East Alternate	Stream 34 - West Alternate	Stream 34 - East Alternate	Stream 36 - West Alternate
<b>Complete the Following for Each Reach to be Impacted</b>							
Simon Channel Evolution Stage	I	I	III	III	II	II	II
Rosgen Stream Type/D50							
Criteria for Selecting Existing Condition for Each Reach	reach is not entrenched	reach is not entrenched	reach is not entrenched	reach is not entrenched	bank erosion is localized	bank erosion is localized	bank erosion is localized
Bankfull Width and Depth	Width: 5-6 ft Depth: <1 ft	Width: 5-6 ft Depth: <1 ft	Width: 4-8 ft Depth: 2-3 ft	Width: 4-8 ft Depth: 2-3 ft	Width: 4-5 ft Depth: 1 ft	Width: 4-5 ft Depth: 1 ft	Width: 5-6 ft Depth: 1-2 ft
Bankfull Indicators (attach photograph showing bankfull for each reach)	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation
	Reach 15	Reach 16	Reach 17	Reach 18	Reach 19	Reach 20	Reach 21
<b>Factors</b>	Stream 31 - West Alternate	Stream 31 - East Alternate	Stream 33 - West Alternate	Stream 33 - East Alternate	Stream 34 - West Alternate	Stream 34 - East Alternate	Stream 36 - West Alternate
Stream Type Impacted	0.80	0.80	0.80	0.80	0.10	0.10	0.80
Priority Area	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Existing Condition	1.00	1.00	1.00	1.00	0.50	0.50	0.50
Duration	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Dominant Impact	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Impact Type	Fill	Fill	Fill	Fill	Fill	Fill	Fill
Scaling Factor	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Sum of Factors M =	6.70	6.70	6.70	6.70	5.50	5.50	6.20
Feet Stream in Reach Impacted LF =	250	325	260	430	250	190	350
M X LF =	1675.0	2177.5	1742.0	2881.0	1375.0	1045.0	2170.0

**Total Mitigation Credits Required = (M X LF) = see page 4**

**Table 3. Adverse Impact Factors for Riverine Systems Worksheet**

Factors	Options								
	Stream Type Impacted	Intermittent 0.1			Perennial Stream > 15' in width 0.4			Perennial Stream ≤ 15' in width 0.8	
Priority Area	Tertiary 0.5			Secondary 0.8			Primary 1.5		
Existing Condition	Fully Impaired 0.25			Somewhat Impaired 0.5			Fully Functional 1.0		
Duration	Temporary 0.05			Recurrent 0.1			Permanent 0.2		
Dominant Impact	Shade/Clear 0.05	Utility X-ing 0.4	Bank Armor 0.7	Detention (weir) 1.5	Stream X-ing (≤ 100') 1.7	Impound (dam) 2.7	Morphologic Change 2.7	Pipe (>100') 3.0	Fill 3.0
Scaling Factor (Based on # of linear feet impacted)	<100' 0	100-200' 0.05	201-500' 0.1	501-1000' 0.2	>1000' impact 0.4 for each 1000' of impacts (round impacts to the nearest 1000') (example: 2,200' of impact - scaling factor = 0.8; 2,800' of impact - scaling factor = 1.2)				

Reaches to Be Impacted	Reach 22	Reach 23	Reach 24	Reach 25	Reach 26	Reach 27	Reach 28
	Stream 36 - East Alternate	Stream 37 - West Alternate	Stream 37 - East Alternate	Stream 38 - West Alternate	Stream 38 - East Alternate	Stream 43	Stream 45
<b>Complete the Following for Each Reach to be Impacted</b>							
Simon Channel Evolution Stage	II	III	III	I	I		
Rosgen Stream Type/D50							
Criteria for Selecting Existing Condition for Each Reach	bank erosion is localized	bank erosion is localized	bank erosion is localized	reach is not entrenched	reach is not entrenched	Cattle access, historic excavation	lack of riparian veg., channelization
Bankfull Width and Depth	Width: 5-6 ft Depth: 1-2 ft	Width: 5-6 ft Depth: 2-3 ft	Width: 5-6 ft Depth: 2-3 ft	Width: 4-5 ft Depth: <1 ft	Width: 4-5 ft Depth: <1 ft		
Bankfull Indicators (attach photograph showing bankfull for each reach)	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation	change in slope & vegetation		
	Reach 22	Reach 23	Reach 24	Reach 25	Reach 26	Reach 27	Reach 28
<b>Factors</b>	Stream 36 - East Alternate	Stream 37 - West Alternate	Stream 37 - East Alternate	Stream 38 - West Alternate	Stream 38 - East Alternate	Stream 43	Stream 45
Stream Type Impacted	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Priority Area	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Existing Condition	0.50	0.50	0.50	1.00	1.00	0.50	0.50
Duration	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Dominant Impact	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Impact Type	Fill	Fill	Fill	Fill	Fill	Fill	Culvert
Scaling Factor	1.20	1.20	1.20	1.20	1.20	1.20	0.05
Sum of Factors M =	6.20	6.20	6.20	6.70	6.70	6.20	5.05
Feet Stream in Reach Impacted LF =	300	250	250	430	250	130	175
M X LF =	1860.0	1550.0	1550.0	2881.0	1675.0	806.0	883.8

**Total Mitigation Credits Required = (M X LF) = 43,562 (West Alignment)**

**Total Mitigation Credits Required = (M X LF) = 42,948.5 (East Alignment)** May 2006 Ecology Report

Table 4: Summary of Wetland Characteristics and Estimated Area of Impact

Site Number	2005 Report Site Number	Cowardin Classification System	Water Regime	Wetland Drainage Association	Existing Condition	Lost Kind	Wetland Description and Value	Permanent Impact (within C/L)	Temporary Impact (within ROW Outside C/L)
W/L 2	W/L 2	PFO1E	Seasonally Saturated	Hard Labor Creek	3	A	Wetland 2 is a medium quality, bottomland hardwood forest wetland adjacent to Hard Labor Creek. Wetland hydrology indicators include inundation, saturation in the upper 12 inches, drainage patterns in wetland, and a FAC-Neutral test. Vegetation includes black gum, red maple, river birch ( <i>Betula nigra</i> ), water oak, box elder ( <i>Acer negundo</i> ), green ash ( <i>Fraxinus pennsylvanica</i> ), sweet gum, eastern cottonwood ( <i>Populus deltoides</i> ), giant cane grass ( <i>Arundinaria gigantea</i> ), and soft bulrush ( <i>Scirpus validus</i> ).	2.27 ac	N/A
W/L 7	W/L 7	PFO1A	Temporarily Flooded	Big Sandy Creek	3	A	Wetland 7 is a medium quality, bottomland hardwood forest wetland adjacent to Big Sandy Creek. Wetland hydrology indicators include inundation, saturation in the upper 12 inches, water marks, drift lines, drainage patterns in wetland, oxidized root channels, and a FAC-Neutral test. Vegetation includes water oak, red maple, green ash, tulip poplar, soft bulrush, river birch, box elder, sweet gum, and Chinese privet.	13.26 ac	N/A
W/L 16	W/L 16	PFO1E	Seasonally Saturated	Apalachee River	3	A	Wetland 16 is a medium quality, bottomland hardwood forest wetland adjacent to the Apalachee River. Vegetation includes water oak, red maple, green ash, box elder, sweet gum, and Chinese privet.	0.04 ac	N/A
Pond 18	Pond 18	PUB3Hh	Permanently Flooded	Wolf Creek	5	D	Pond 18 is a permanently flooded pond located in a wooded/pasture area on the east side of existing US 441.	0.25 ac	N/A
W/L 19	W/L 19	PFO1A	Temporarily Flooded	Freeman Creek	3	A	Wetland 19 is a medium quality, bottomland hardwood forest wetland above the headwaters of Freeman Creek. Vegetation includes water oak, red maple, black gum, box elder, sweet gum, American hornbeam ( <i>Carpinus caroliniana</i> ), American elm, elderberry ( <i>Sambucus canadensis</i> ), and panicum grass ( <i>Panicum sp.</i> ).	0.15 ac	N/A
Pond 20a	Pond 20a	PUB3Hh	Permanently Flooded	Freeman Creek	5	D	Pond 20a is a permanently flooded pond located in a wooded/residential area on the west side of the US 441 new location alignment. The pond is fed by the headwaters of an unnamed tributary to Freeman Creek.	0.49 ac	N/A
Pond 20c	Pond 20c	PUB3Hh	Permanently Flooded	Freeman Creek	5	D	Pond 20c is a permanently flooded pond located in a wooded area within the US 441 new location alignment. The pond is fed by the headwaters of an unnamed tributary to Freeman Creek.	0.34 ac	N/A
Pond 21	Pond 20d	PUB3Hh	Permanently Flooded	Freeman Creek	5	D	Pond 21 is an approximately 0.53 acre spring fed pond that drains to form Stream 22. The landowner uses the pond for recreation/fishing. The pond is high quality, had low turbidity and is surrounded by a MPH. The fringe vegetation is primarily soft bulrush and water lilies ( <i>Nymphaea odorata</i> ).	0.18 ac	N/A
Pond 24	NONE	Not Mapped	Not Mapped	Freeman Creek	5	D	Pond 24 is an approximately 0.66 acre farm/recreation pond that drains to form Stream 23. The pond is moderate quality, had moderate turbidity and is surrounded by a maintained lawn and hardwood community. The fringe vegetation is primarily maintained grasses.	0.17 ac	N/A

Table 4: Summary of Wetland Characteristics and Estimated Area of Impact

W/L 25	W/L 20e	PFOIE	Seasonally Saturated	Freeman Creek	4	A	<p>Wetland 25 is a small, riparian wetland adjacent to Stream 23. Wetland hydrology indicators include inundated pockets, saturation in the upper 12 inches, water stained leaves, wetland drainage patterns, and a 10 inch depth to free water in the pit. Vegetation includes giant cane grass, black willow, hazel alder, sweetgum, water oak, blackberries, tulip poplar, soft bulrush, red maple, and pignut hickory. Impacts to this wetland are major; recovery would require major enhancement. As noted above, there appears to be seepage of toxic waste into this wetland from an uphill toxic waste site.</p>	0.12 ac	N/A	
W/L 28	NONE	Not Mapped	Not Mapped	Greenbrier Creek	2	A	<p>Wetland 28 is a small, headwater wetland of Stream 27. Wetland hydrology indicators include inundation, saturation in the upper 12 inches, wetland drainage patterns, and a less than 2 inch depth to free water in the pit. Vegetation includes giant cane grass, hazel alder, sweetgum, netted chain fern, soft bulrush, wild azalea, and blueberry. Impacts to this wetland are minor; recovery would require minor enhancement.</p>	0.0 ac Western Alignment	0.12 ac Eastern Alignment	N/A
W/L 29	NONE	Not Mapped	Not Mapped	Greenbrier Creek	1	A	<p>Wetland 29 is a large, riparian wetland of Stream 26. Wetland hydrology indicators include inundated pockets, saturation in the upper 12 inches, wetland drainage patterns, water stained leaves, local soil survey data, and a 4 inch depth to free water in the pit. Vegetation includes hazel alder, black willow, elderberry, false nettle (<i>Boehmeria cylindrica</i>), Japanese stilt grass (<i>Microstegium vimineum</i>), Chinese privet, red maple, soft bulrush, and netted chain fern. Impacts to this wetland are minor; recovery without assistance.</p>	0.92 ac Western Alignment	0.0 ac Eastern Alignment	N/A
W/L 32	NONE	PSSIC	Seasonally Flooded	Greenbrier Creek	1	A	<p>Wetland 32 is a large, riparian wetland of Stream 31 that transitions from a forested wetland to a scrub/shrub wetland as it continues north of Stream 31 along Greenbrier Creek. Wetland hydrology indicators include inundated pockets, saturation in the upper 12 inches, wetland drainage patterns, water stained leaves, and a 4 inch depth to free water in the pit. Vegetation includes hazel alder, black willow, elderberry, false nettle (<i>Boehmeria cylindrica</i>), Japanese stilt grass (<i>Microstegium vimineum</i>), red maple, soft bulrush, and netted chain fern. Vegetation in the scrub/shrub area included wool grass, lizard's tail (<i>Saururus cernuus</i>), soft bulrush, black willow, and hazel alder. Impacts to this wetland are minor; recovery without assistance.</p>	1.54 ac Western Alignment	1.44 ac Eastern Alignment	N/A
Pond 35	Pond 28	PUB3Hh	Permanently Flooded	Greenbrier Creek	5	D	<p>Pond 35 is an approximately 0.97 acre recreational pond that drains to form Stream 34. The pond is moderate quality, had moderate turbidity and is surrounded by a maintained lawn.</p>	0.0 ac Western Alignment	0.13 ac Eastern Alignment	N/A
WL 39	WL 33	PFOIE	Seasonally Saturated	Greenbrier Creek	1	A	<p>Wetland 39 is a large, riparian wetland of Stream 38. Wetland hydrology indicators include inundation, wetland drainage patterns, oxidized root channels, water stained leaves, and a less than 2 inch depth to free water in the pit. Vegetation includes lizard's tail, giant cane grass, hazel alder, netted chain fern, red maple, and common greenbrier. This is a fully functional, high quality wetland.</p>	1.48 ac Western Alignment	0.34 ac Eastern Alignment	N/A

Table 4: Summary of Wetland Characteristics and Estimated Area of Impact

WL 40	WL 36	PEM1A	Seasonally Saturated	Greenbrier Creek	5	D	Wetland 40 is a small pond that is frequently dry. A personal communication with the former landowner revealed that a drainage ditch that used to feed the pond has been diverted, resulting in decreased ponding. Wetland hydrology indicators include saturation in the upper 12 inches, oxidized root channels, and water-stained leaves. Herbaceous species dominating this wetland include soft bulrush, knotweed ( <i>Polygonum</i> sp.), and various unknown grasses. This is a medium quality wetland.	0.38 ac	N/A
WL 41	WL 37	PEM1E	Seasonally Saturated	Greenbrier Creek	5	B	Wetland 41 is an upland depression in a pasture. The wetland is grazed and is drained by a small ditch. Wetland hydrology indicators include oxidized root channels. Species present include barnyard grass, Bahia grass, dog fennel ( <i>Eupatorium capillifolium</i> ), and various pasture grasses. This is a low quality wetland due to disturbance, small size, and minimal hydrology.	0.44 ac	N/A
WL 42	WL 38	PFO1E	Seasonally Saturated	Greenbrier Creek	2	A	Wetland 42 is a hardwood wetland that fringes Stream 43. The wetlands are influenced by beaver impoundments at the source of Stream 43 and further downstream. Wetland hydrology indicators include wetland drainage patterns. Species present include tulip poplar, red maple, sweetgum, Chinese privet, Japanese grass, netted chain fern, and common greenbrier. This is a high quality wetland.	0.44 ac	N/A
WL 44	WL 40	PSS1A	Temporarily Flooded	Greenbrier Creek	3	A	Wetland 44 is a medium quality, scrub/shrub wetland above the headwaters of Greenbrier Creek. Vegetation includes giant cane grass, red maple, water oak, sweetgum, and Japanese honeysuckle.	0.51 ac	N/A
WL 46	WL 42	PFO1A	Temporarily Flooded	Greenbrier Creek	3	A	Wetland 46 is a medium quality, scrub/shrub wetland above the headwaters of Greenbrier Creek. Vegetation includes water oak, sweetgum, and American hornbeam.	0.79 ac	N/A
								23.77 ac West Alignment	21.86 ac East Alignment

Terminology used in table:

- USFWS/Cowardin Classification System
- PEM - Palustrine, Emergent, Persistent
- PUB - Palustrine Unconsolidated Bottom
- PFO - Palustrine, Forested
- PSS - Palustrine Scrub/Shrub

Existing Conditions:

- 1: fully functional
- 2: impacts are minor, recovery without assistance
- 3: impacts are minor, recovery needs minor enhancement
- 4: impacts are major, recovery requires substantial enhancement
- 5: most aquatic functions have been lost

Lost Kind: (Savannah District, USACE SOP)

- “A” refers to riverine wetlands (with flowing streams), intertidal wetlands
- “B” refers to non-riverine forested wetlands (including wetlands with intermittent streams).
- “C” refers to pine flatwood wetlands
- “D” refers to lakes and impoundments
- “E” refers to naturalized borrow pits

*\* All temporary impacts have been considered permanent impacts because no mapping defining the construction limits was available at the time this report was prepared. Impacts quantified by this report were based on the Proposed Right of Way widths included in the layout provided by GDOT in February 2006.*

TABLE 5: Wetlands and Open Waters Mitigation Worksheet

WIDENING AND RECONSTRUCTION OF US 441/SR24  
 GDOT PROJECTS EDS-441 (42) (43); P.I. 222560, 122660  
 Morgan and Oconee Counties, Georgia

**ADVERSE IMPACT FACTORS**

Factor	Options						
	Fill	Dredge	Impound	Drain	Flood	Clear	Shade
Dominant Effect	2.0	1.8	1.6	1.4	1.2	1.0	0.5
Duration of Effects	7 + years 2.0	5-7 years 1.5	3-5 years 1.0	1-3 years 0.5	> 1 year 0.1		
Existing Condition	Class 1 2.0	Class 2 1.5	Class 3 1.0	Class 4 0.5	Class 5 0.1		
Lost Kind	Kind A 2.0	Kind B 1.5	Kind C 1.0	Kind D 0.5	Kind E 0.1		
Preventability	High 2.0	Moderate 1.0	Low 0.5	None 0.0			
Rarity Ranking	Rare 2.0	Uncommon 0.5	Common 0.1				

\* These factors are determined on a case-by-case basis

**REQUIRED MITIGATION CREDITS WORKSHEET**

Factor	W/L-2	W/L-7	W/L-16	Pond-18	W/L-19	Pond-20a	Pond-20c
	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent
Dominant Effect	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Duration of Effect	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Existing Condition	1.0	1.0	1.0	0.1	1.0	0.1	0.1
Lost Kind	2.0	2.0	2.0	0.5	2.0	0.5	0.5
Preventability	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rarity Ranking	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sum of r Factors	R <sub>1</sub> = 7.6	R <sub>2</sub> = 7.6	R <sub>3</sub> = 7.6	R <sub>4</sub> = 5.2	R <sub>5</sub> = 7.6	R <sub>6</sub> = 5.2	R <sub>7</sub> = 5.2
Impacted Area (Acres)	AA <sub>1</sub> = 2.27	AA <sub>2</sub> = 13.26	AA <sub>3</sub> = 0.04	AA <sub>4</sub> = 0.25	AA <sub>5</sub> = 0.15	AA <sub>6</sub> = 0.49	AA <sub>7</sub> = 0.34
R x AA =	17.25	100.78	0.30	1.30	1.14	2.55	1.77

West Alignment - Page 1 Required Credits= Sum(R x AA)=

125.09

East Alignment - Page 1 Required Credits= Sum(R x AA)=

125.09

**TABLE 5: Wetlands and Open Waters Mitigation Worksheet**  
 WIDENING AND RECONSTRUCTION OF US 441/SR24  
 GDOT PROJECTS EDS-441 (42) (43); P.I. 222560, 122660  
 Morgan and Oconee Counties, Georgia

**ADVERSE IMPACT FACTORS**

Factor	Options						
	Fill	Dredge	Impound	Drain	Flood	Clear	Shade
Dominant Effect	2.0	1.8	1.6	1.4	1.2	1.0	0.5
Duration of Effects	7 + years 2.0	5-7 years 1.5	3-5 years 1.0	1-3 years 0.5	> 1 year 0.1		
Existing Condition	Class 1 2.0	Class 2 1.5	Class 3 1.0	Class 4 0.5	Class 5 0.1		
Lost Kind	Kind A 2.0	Kind B 1.5	Kind C 1.0	Kind D 0.5	Kind E 0.1		
Preventability	High 2.0	Moderate 1.0	Low 0.5	None 0.0			
Rarity Ranking	Rare 2.0	Uncommon 0.5	Common 0.1				

\* These factors are determined on a case-by-case basis

**REQUIRED MITIGATION CREDITS WORKSHEET**

Factor	Pond-21 Permanent	Pond-24 Permanent	W/L-25 Permanent	W/L-28 East Permanent	W/L-29 West Permanent	W/L-32 West Permanent	W/L-32 East Permanent
Dominant Effect	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Duration of Effect	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Existing Condition	0.1	0.1	0.5	1.5	2.0	2.0	2.0
Lost Kind	0.5	0.5	2.0	2.0	2.0	2.0	2.0
Preventability	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rarity Ranking	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sum of r Factors	R <sub>1</sub> = 5.2	R <sub>2</sub> = 5.2	R <sub>3</sub> = 7.1	R <sub>4</sub> = 8.1	R <sub>5</sub> = 8.6	R <sub>6</sub> = 8.6	R <sub>7</sub> = 8.6
Impacted Area (Acres)	AA <sub>1</sub> = 0.18	AA <sub>2</sub> = 0.17	AA <sub>3</sub> = 0.12	AA <sub>4</sub> = 0.12	AA <sub>5</sub> = 0.92	AA <sub>6</sub> = 1.54	AA <sub>7</sub> = 1.44
R x AA =	0.94	0.88	0.85	0.97	7.91	13.24	12.38

**West Alignment - Page 2 Required Credits= Sum(R x AA)=**

23.83

**East Alignment - Page 2 Required Credits= Sum(R x AA)=**

16.03

**TABLE 5: Wetlands and Open Waters Mitigation Worksheet**  
**WIDENING AND RECONSTRUCTION OF US 441/SR24**  
**GDOT PROJECTS EDS-441 (42) (43); P.I. 222560, 122660**  
**Morgan and Oconee Counties, Georgia**

**ADVERSE IMPACT FACTORS**

Factor	Options						
	Fill	Dredge	Impound	Drain	Flood	Clear	Shade
Dominant Effect	2.0	1.8	1.6	1.4	1.2	1.0	0.5
Duration of Effects	7 + years 2.0	5-7 years 1.5	3-5 years 1.0	1-3 years 0.5	> 1 year 0.1		
Existing Condition	Class 1 2.0	Class 2 1.5	Class 3 1.0	Class 4 0.5	Class 5 0.1		
Lost Kind	Kind A 2.0	Kind B 1.5	Kind C 1.0	Kind D 0.5	Kind E 0.1		
Preventability	High 2.0	Moderate 1.0	Low 0.5	None 0.0			
Rarity Ranking	Rare 2.0	Uncommon 0.5	Common 0.1				

\* These factors are determined on a case-by-case basis

**REQUIRED MITIGATION CREDITS WORKSHEET**

Factor	Pond-35 East Permanent	W/L-39 West Permanent	W/L-39 East Permanent	W/L-40 Permanent	W/L-41 Permanent	W/L-42 Permanent	W/L-44 Permanent
Dominant Effect	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Duration of Effect	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Existing Condition	0.1	2.0	2.0	0.1	0.1	1.5	1.0
Lost Kind	0.5	2.0	2.0	0.5	1.5	2.0	2.0
Preventability	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rarity Ranking	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sum of r Factors	R <sub>1</sub> = 5.2	R <sub>2</sub> = 8.6	R <sub>3</sub> = 8.6	R <sub>4</sub> = 5.2	R <sub>5</sub> = 6.2	8.1	7.6
Impacted Area (Acres)	AA <sub>1</sub> = 0.13	AA <sub>2</sub> = 1.48	AA <sub>3</sub> = 0.34	AA <sub>4</sub> = 0.38	AA <sub>5</sub> = 0.44	0.44	0.51
R x AA =	0.68	12.73	2.92	1.98	2.73	3.56	3.88

**West Alignment - Page 3 Required Credits= Sum(R x AA)=**

24.87

**East Alignment - Page 3 Required Credits= Sum(R x AA)=**

15.74

TABLE 5: Wetlands and Open Waters Mitigation Worksheet

WIDENING AND RECONSTRUCTION OF US 441/SR24

GDOT PROJECTS EDS-441 (42) (43); P.I. 222560, 122660

Morgan and Oconee Counties, Georgia

**ADVERSE IMPACT FACTORS**

Factor	Options						
	Fill	Dredge	Impound	Drain	Flood	Clear	Shade
Dominant Effect	2.0	1.8	1.6	1.4	1.2	1.0	0.5
Duration of Effects	7 + years 2.0	5-7 years 1.5	3-5 years 1.0	1-3 years 0.5	> 1 year 0.1		
Existing Condition	Class 1 2.0	Class 2 1.5	Class 3 1.0	Class 4 0.5	Class 5 0.1		
Lost Kind	Kind A 2.0	Kind B 1.5	Kind C 1.0	Kind D 0.5	Kind E 0.1		
Preventability	High 2.0	Moderate 1.0	Low 0.5	None 0.0			
Rarity Ranking	Rare 2.0	Uncommon 0.5	Common 0.1				

\* These factors are determined on a case-by-case basis

**REQUIRED MITIGATION CREDITS WORKSHEET**

Factor	W/L-46 Permanent						
Dominant Effect	2.0						
Duration of Effect	2.0						
Existing Condition	1.0						
Lost Kind	2.0						
Preventability	0.5						
Rarity Ranking	0.1						
Sum of r Factors	R <sub>1</sub> = 7.6						
Impacted Area (Acres)	AA <sub>1</sub> = 0.79						
R x AA =	6.00						

West Alignment - Page 4 Required Credits= Sum(R x AA)=

6.00

East Alignment - Page 4 Required Credits= Sum(R x AA)=

6.00

West Alignment - Total Required Credits= Sum(R x AA)=

179.79

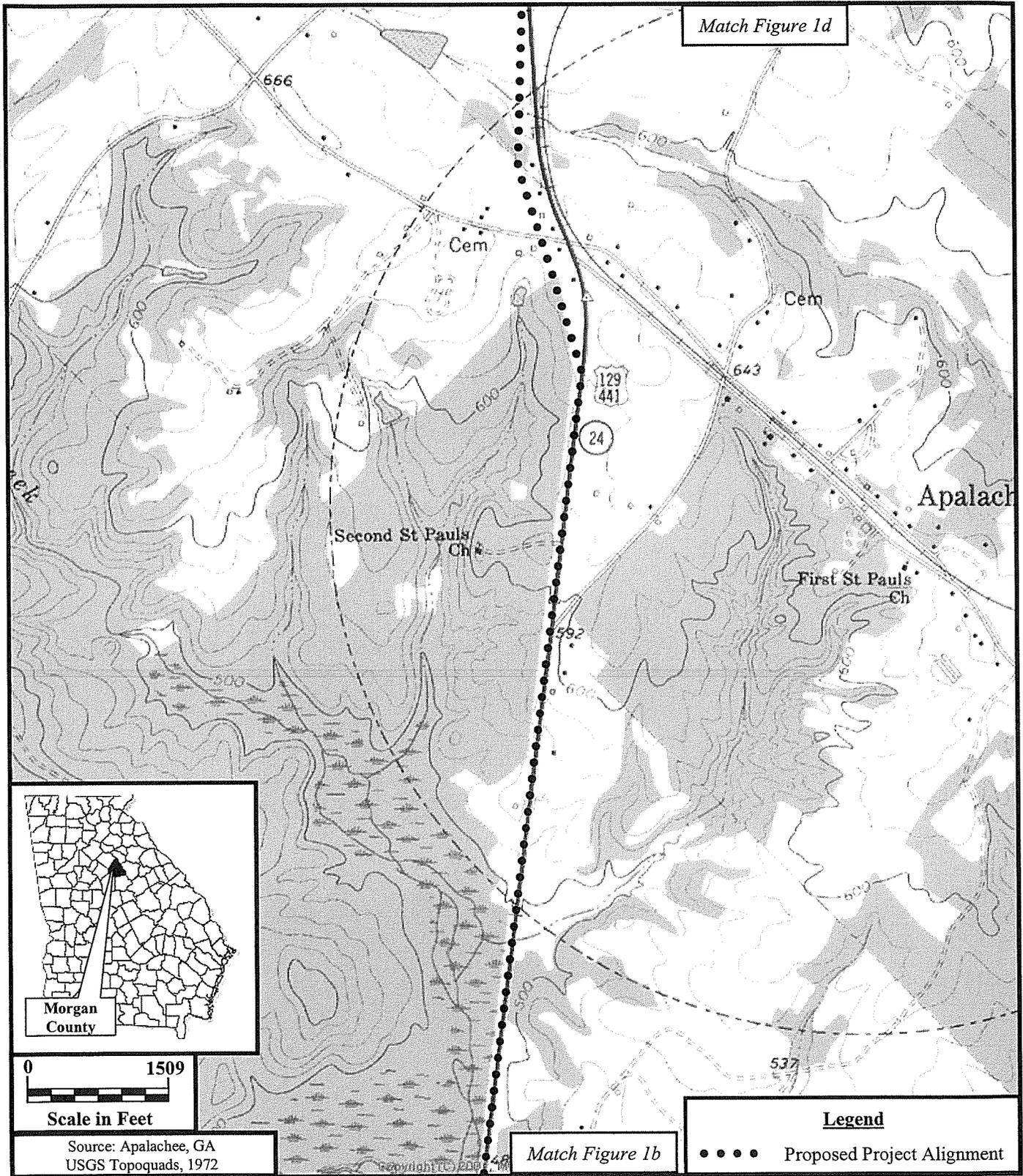
East Alignment - Total Required Credits= Sum(R x AA)=

162.86

## APPENDIX 2. FIGURES





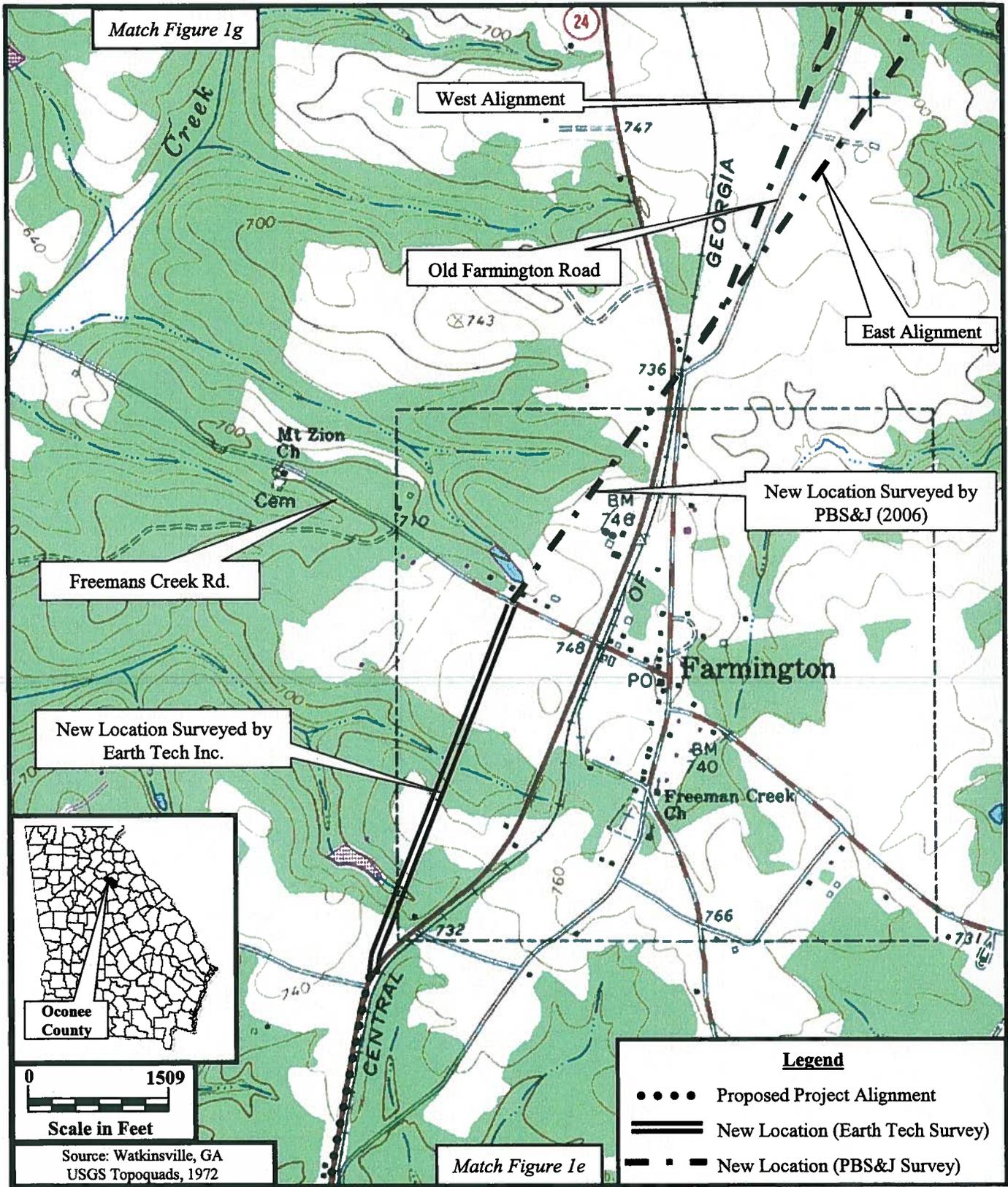


**US 441 Widening and Reconstruction**  
 EDS-441(42)(43); PI 222560,122660  
 Morgan and Oconee Counties, GA

**Figure 1c**  
**Location Map**  
 33° 43' 21" N / 83° 25' 54" W

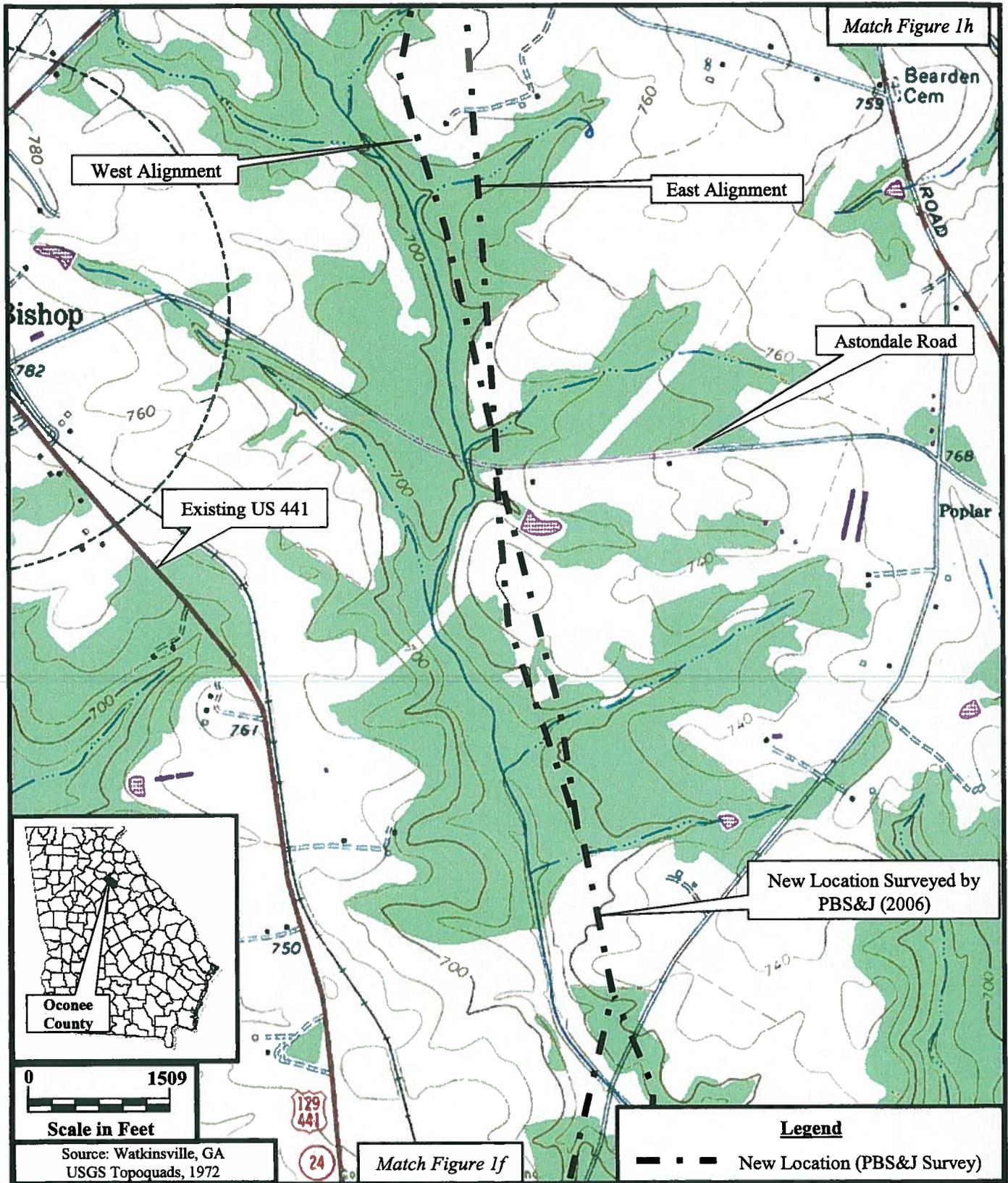






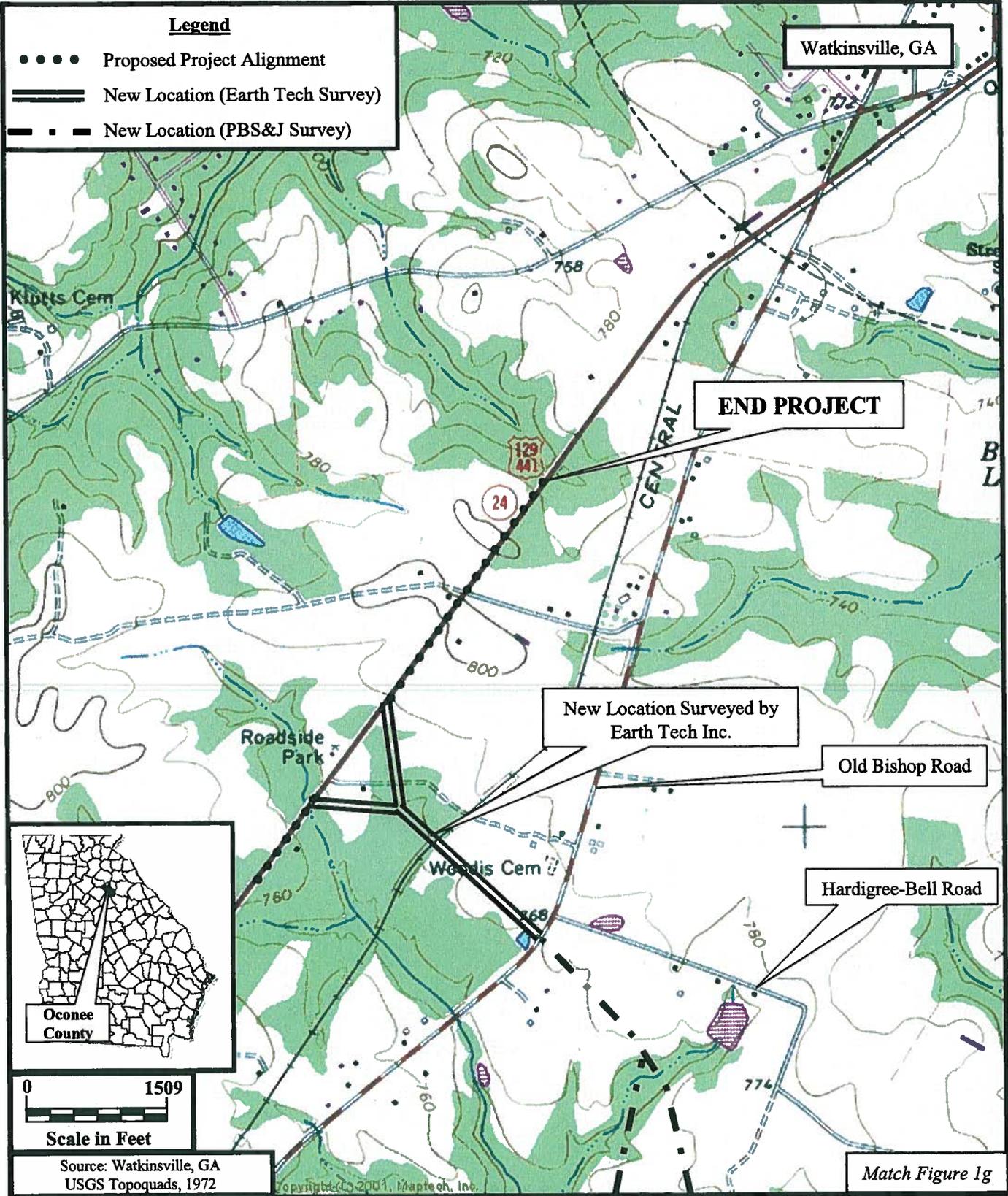
**US 441 Widening and Reconstruction**  
 EDS-441(42)(43); PI 222560,122660  
 Morgan and Oconee Counties, GA

**Figure 1f**  
**Location Map**  
 33° 43' 21" N / 83° 25' 54" W



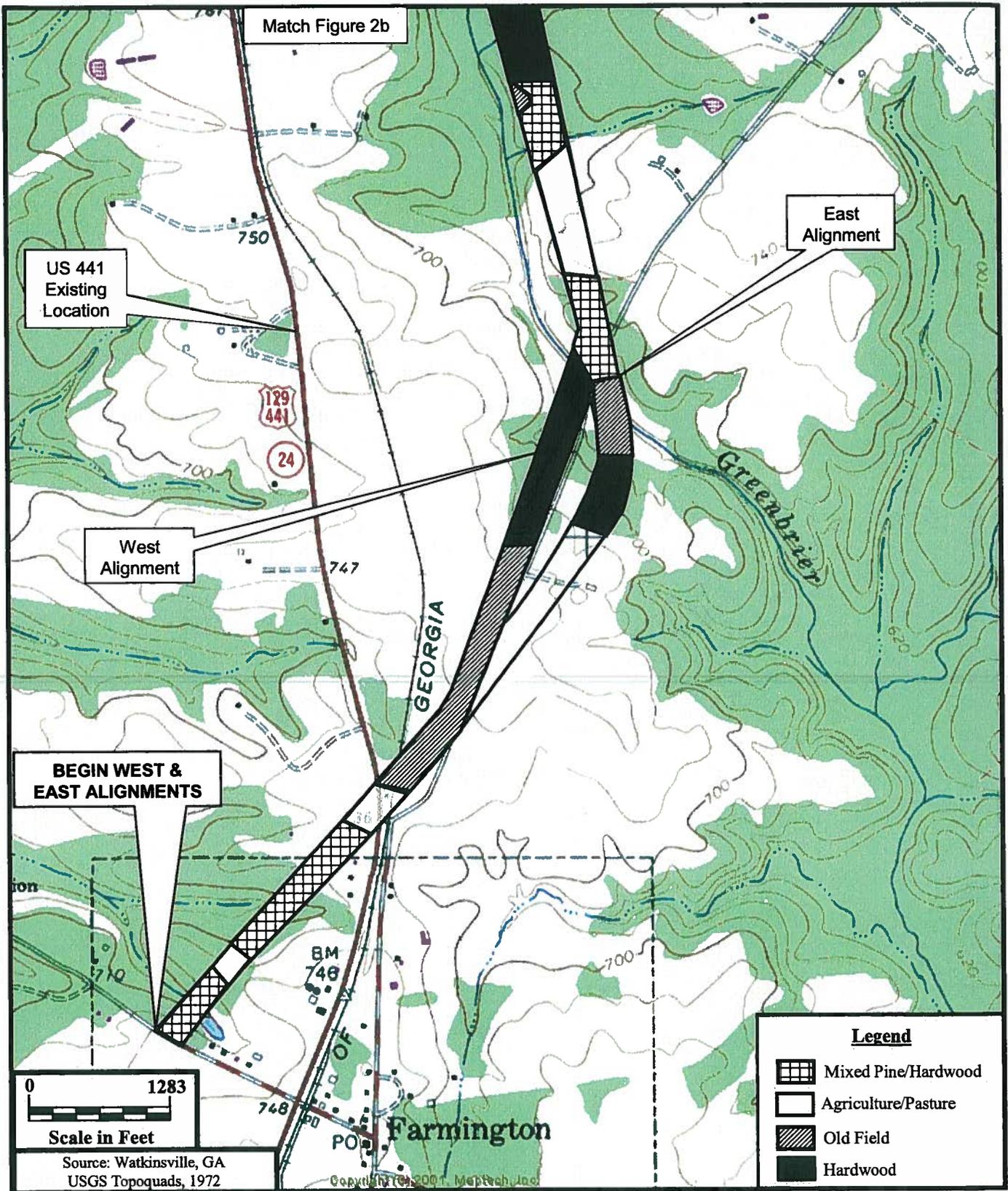
**US 441 Widening and Reconstruction**  
**EDS-441(42)(43); PI 222560,122660**  
**Morgan and Oconee Counties, GA**

**Figure 1g**  
**Location Map**  
 33° 43' 21" N / 83° 25' 54" W



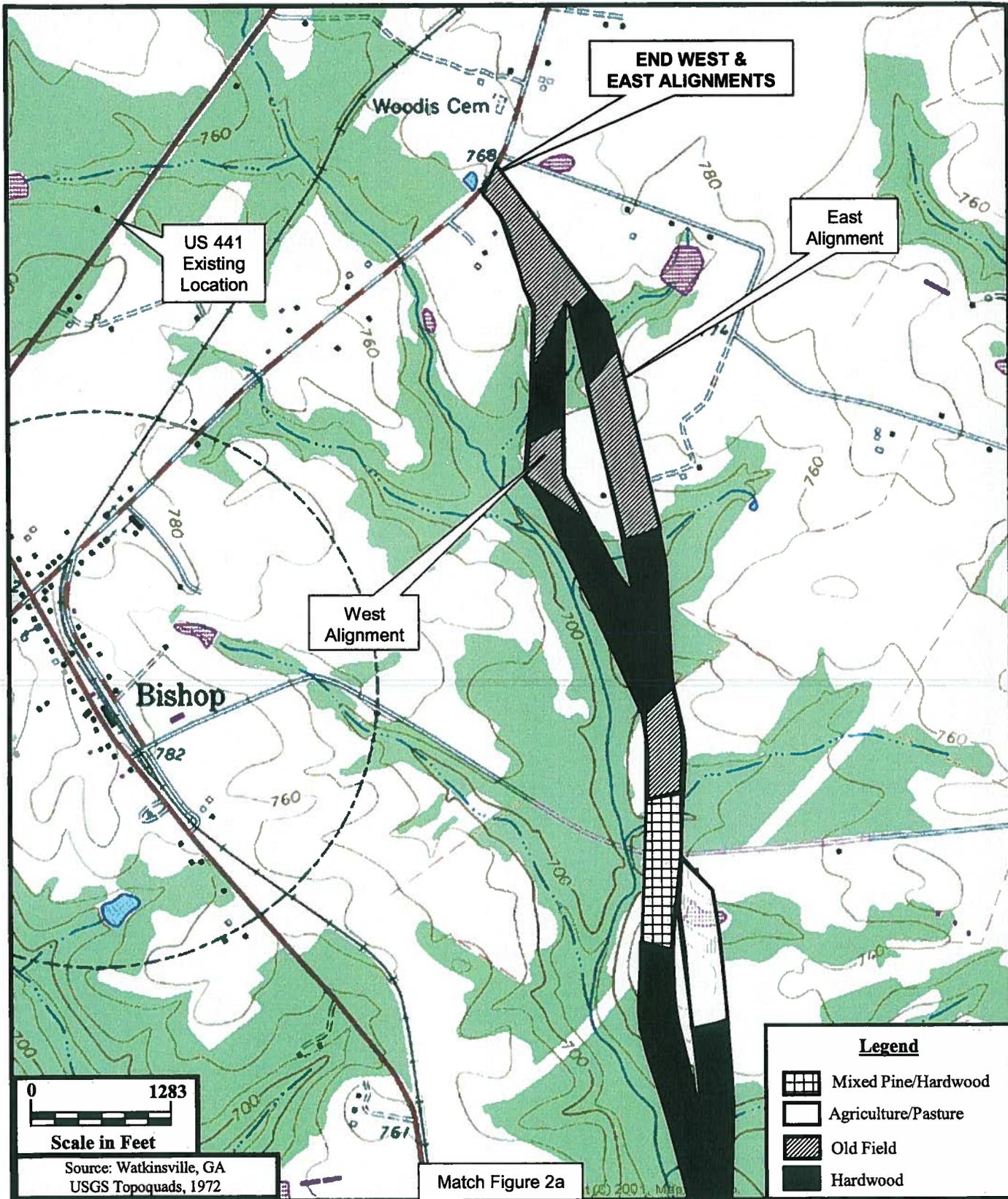
**US 441 Widening and Reconstruction**  
**EDS-441(42)(43); PI 222560,122660**  
**Morgan and Oconee Counties, GA**

**Figure 1h**  
**Location Map**  
 33° 43' 21" N / 83° 25' 54" W



US 441 Widening and Reconstruction  
 EDS-441(42),(43); PI 222560,122660  
 Morgan and Oconee Counties, GA

**Figure 2a**  
**Natural Communities Map**  
 (2 new alignments)  
 33° 43' 21" N / 83° 25' 54" W

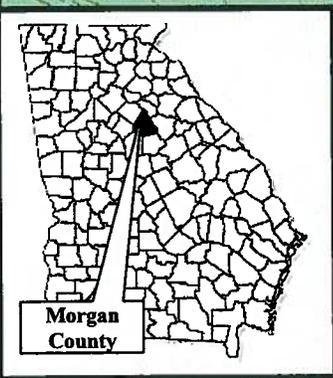
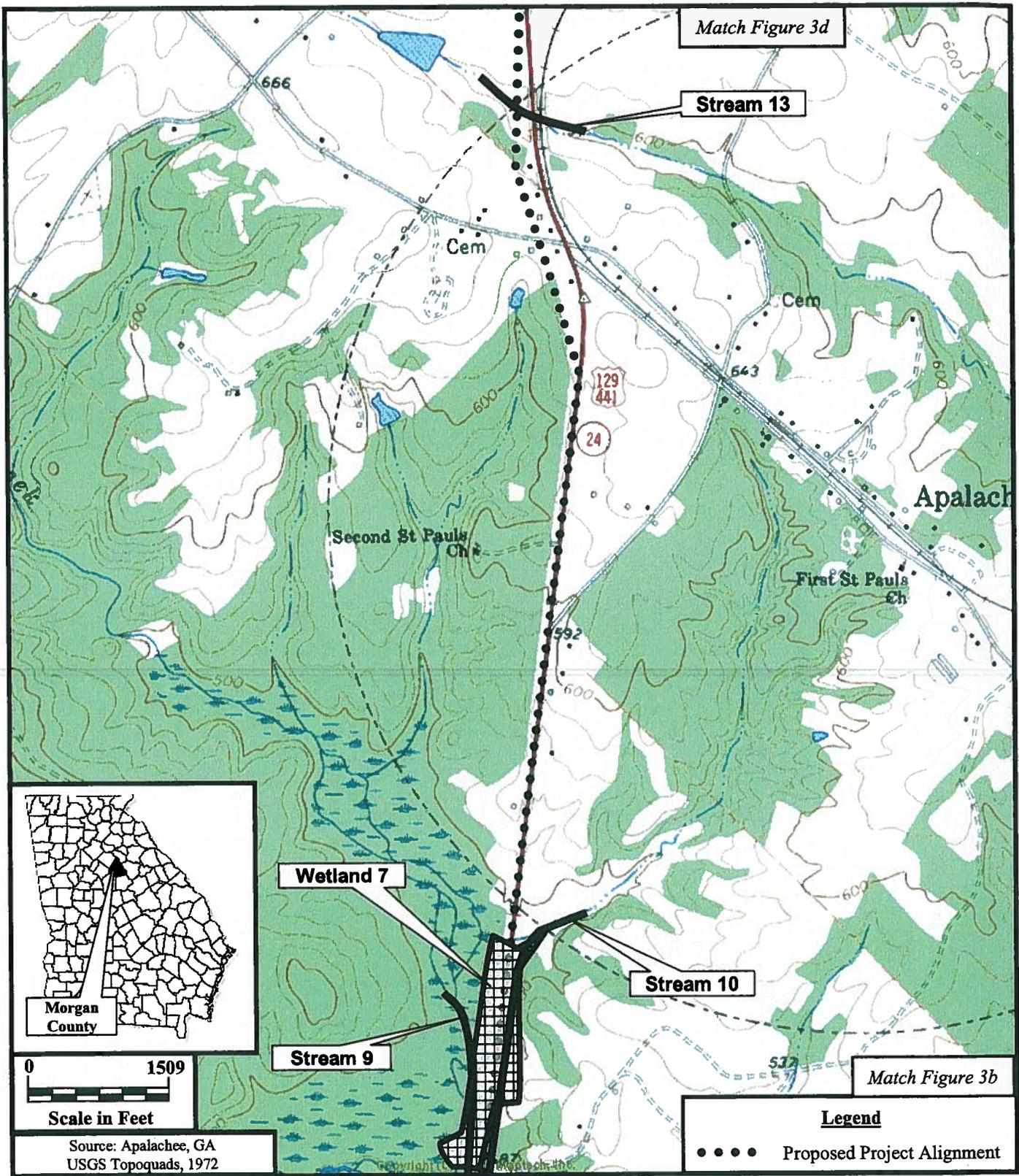


**US 441 Widening and Reconstruction**  
 EDS-441(42),(43); PI 222560,122660  
 Morgan and Oconee Counties, GA

**Figure 2b**  
**Natural Communities Map**  
 (2 new alignments)  
 33° 43' 21" N / 83° 25' 54" W







0 1509  
Scale in Feet

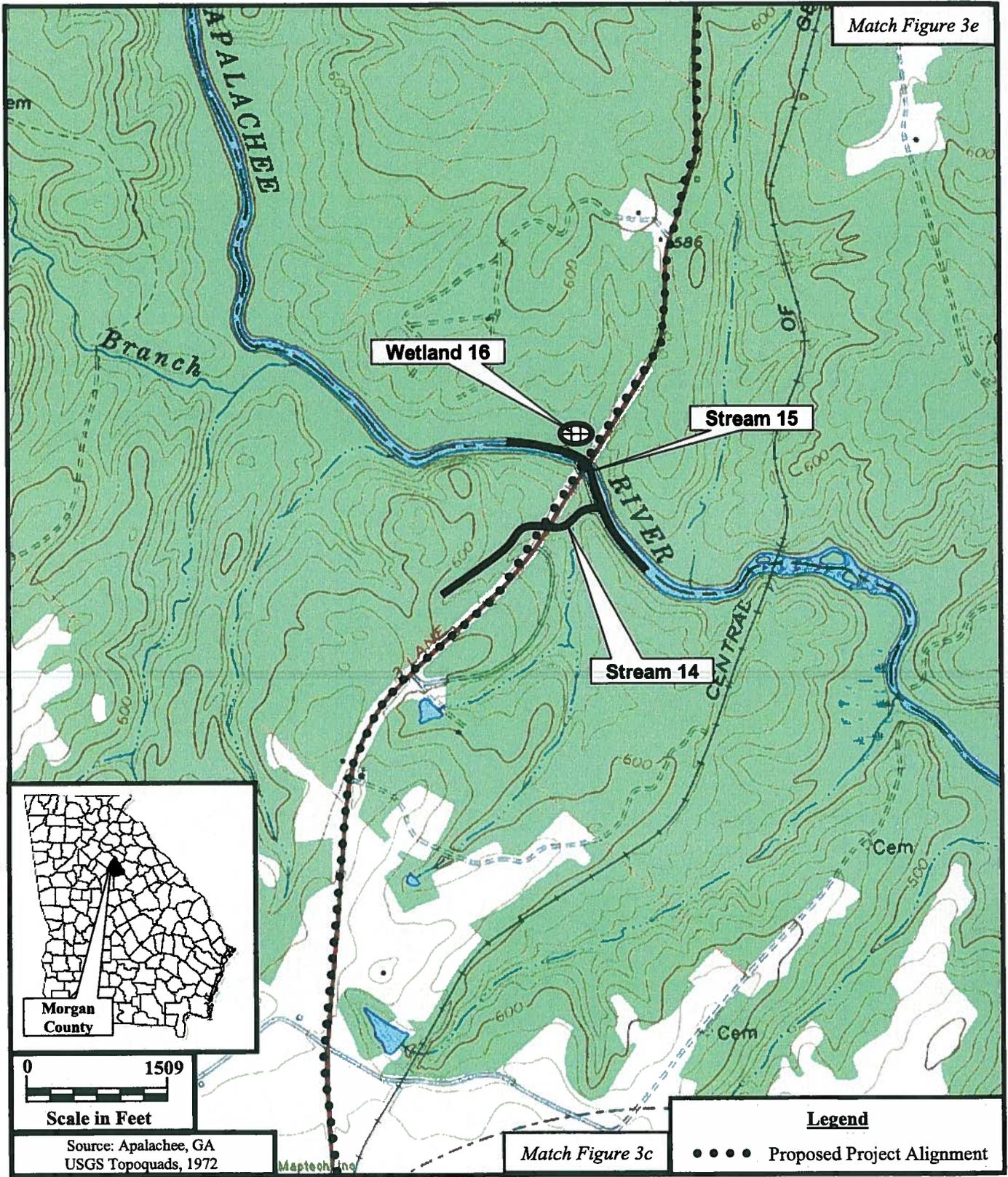
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USGS Topoquads, 1972

**Legend**  
•••• Proposed Project Alignment



**US 41 Widening and Reconstruction**  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

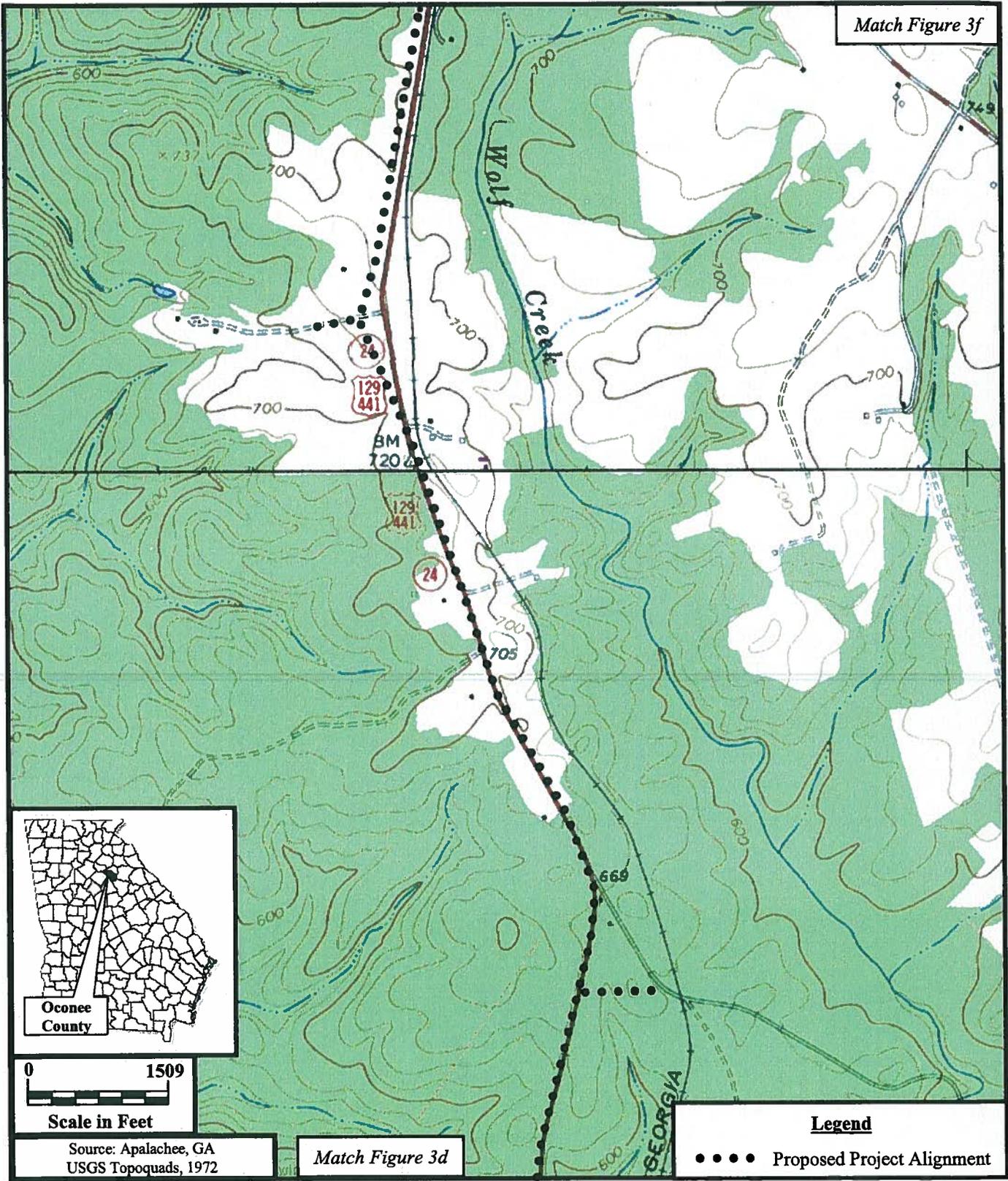
**Figure 3c**  
**Waters of US Map**  
33° 43' 21" N / 83° 25' 54" W



**US 441 Widening and Reconstruction**  
**EDS-441(42)(43); PI 222560,122660**  
**Morgan and Oconee Counties, GA**

**Figure 3d**  
**Waters of US Map**  
 33° 43' 21" N / 83° 25' 54" W

Match Figure 3f



Source: Apalachee, GA  
USGS Topoquads, 1972

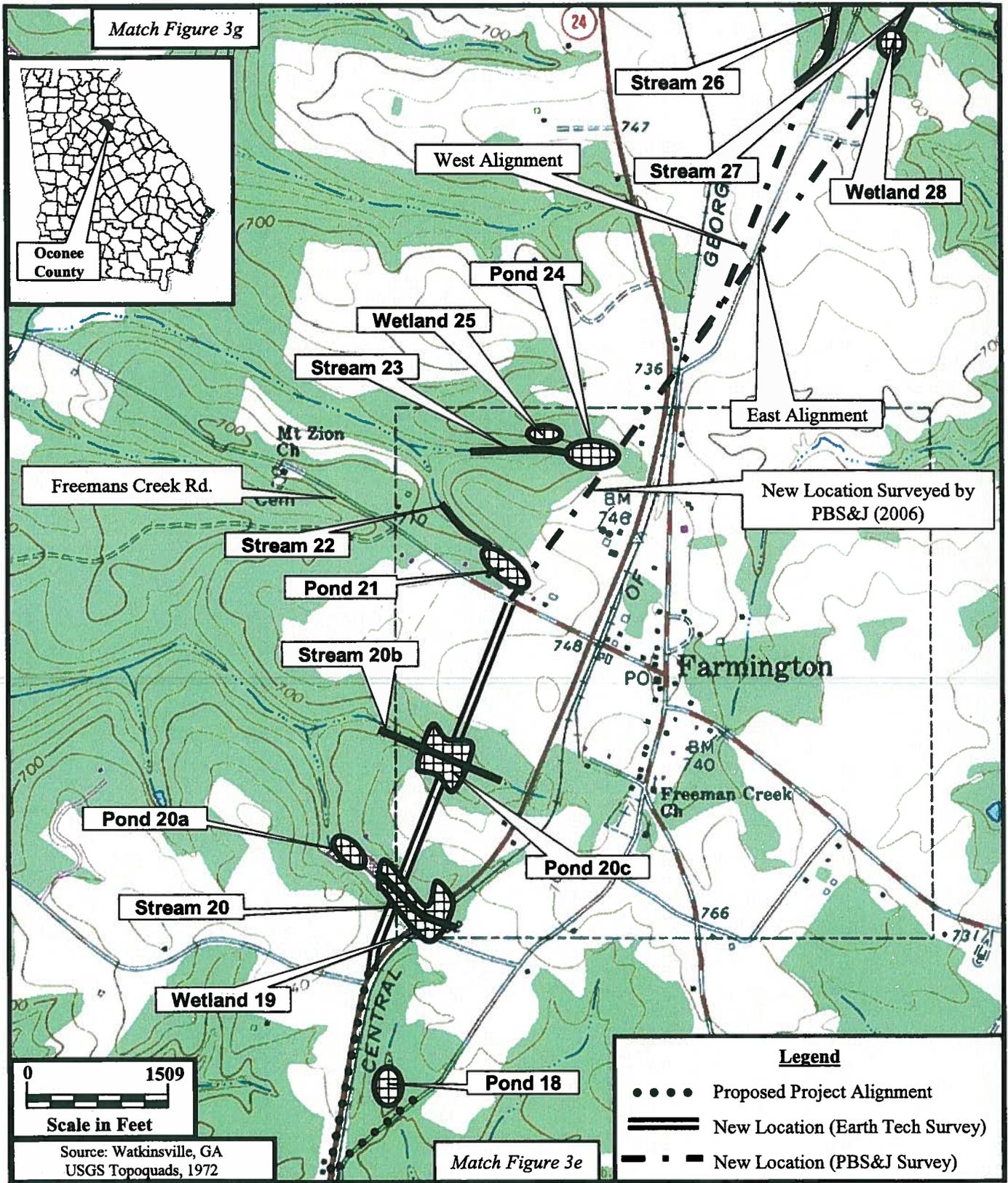
Match Figure 3d

**Legend**  
 •••• Proposed Project Alignment



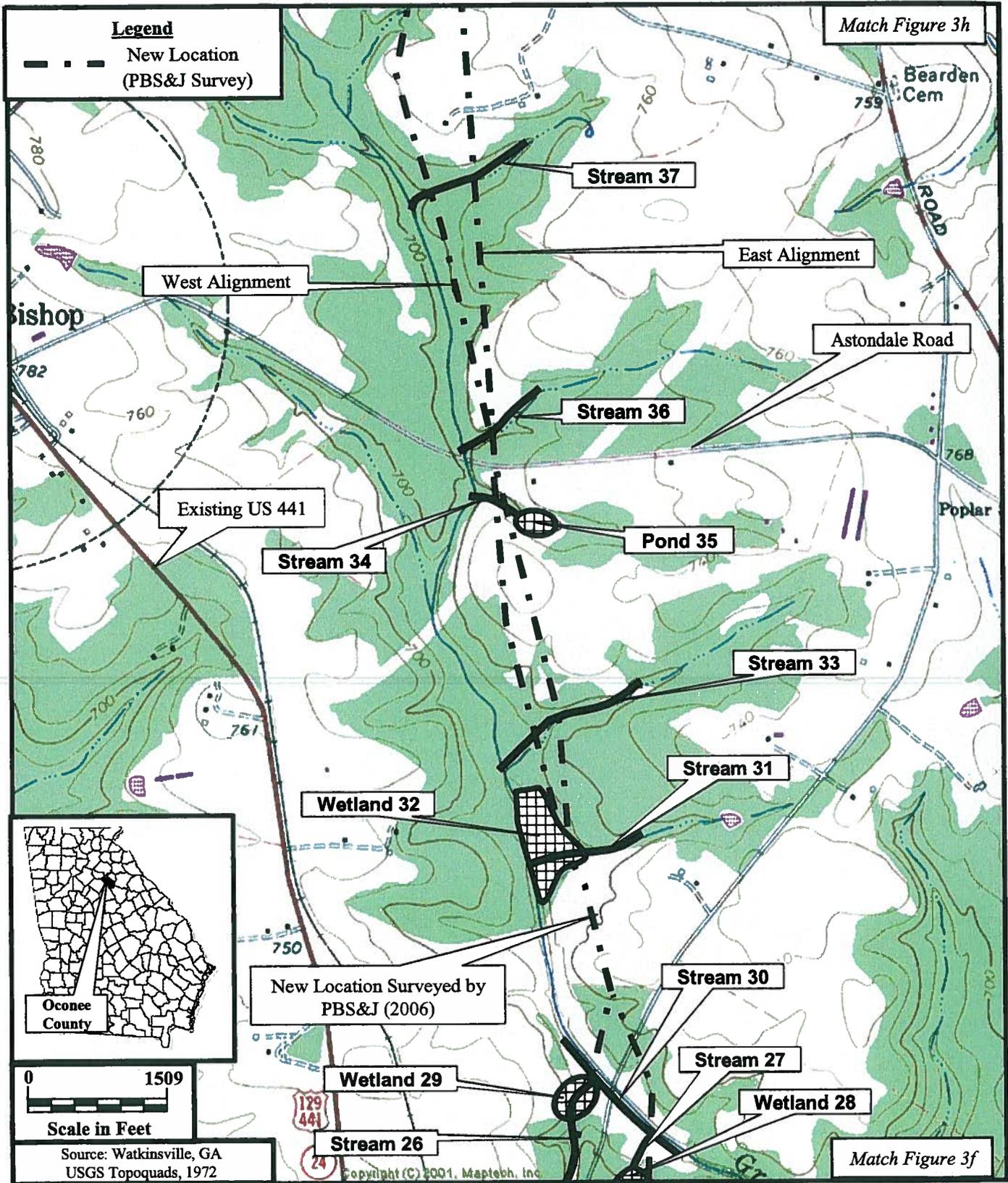
**US 441 Widening and Reconstruction**  
**EDS-441(42)(43); PI 222560,122660**  
**Morgan and Oconee Counties, GA**

**Figure 3e**  
**Waters of US Map**  
 33° 43' 21" N / 83° 25' 54" W



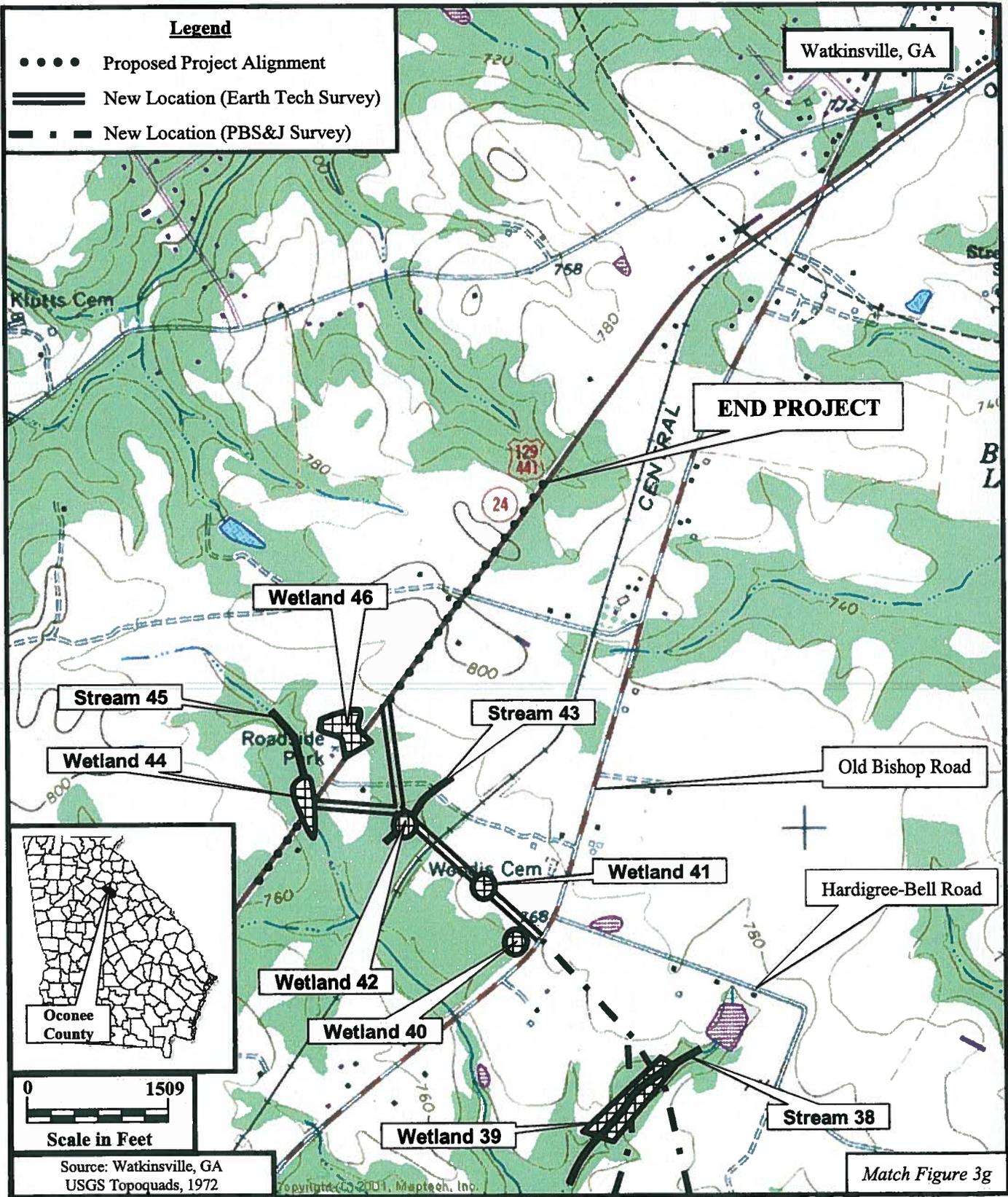
US 441 Widening and Reconstruction  
 EDS-441(42)(43); PI 222560,122660  
 Morgan and Oconee Counties, GA

**Figure 3f**  
 Waters of US Map  
 33° 43' 21" N / 83° 25' 54" W



**US 41 Widening and Reconstruction**  
 EDS-441(42)(43); PI 222560,122660  
 Morgan and Oconee Counties, GA

**Figure 3g**  
 Waters of US Map  
 33° 43' 21" N / 83° 25' 54" W

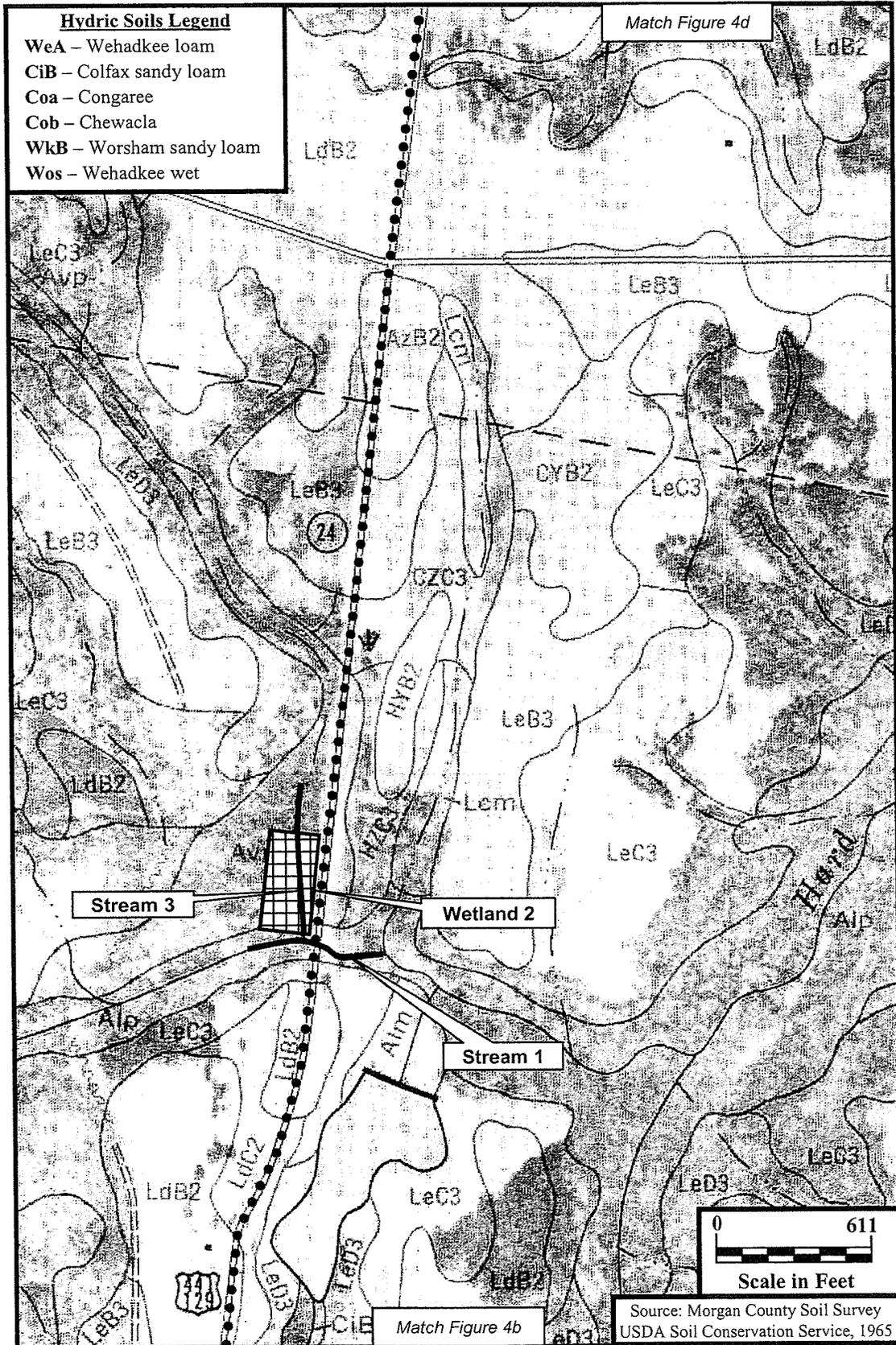


US 441 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

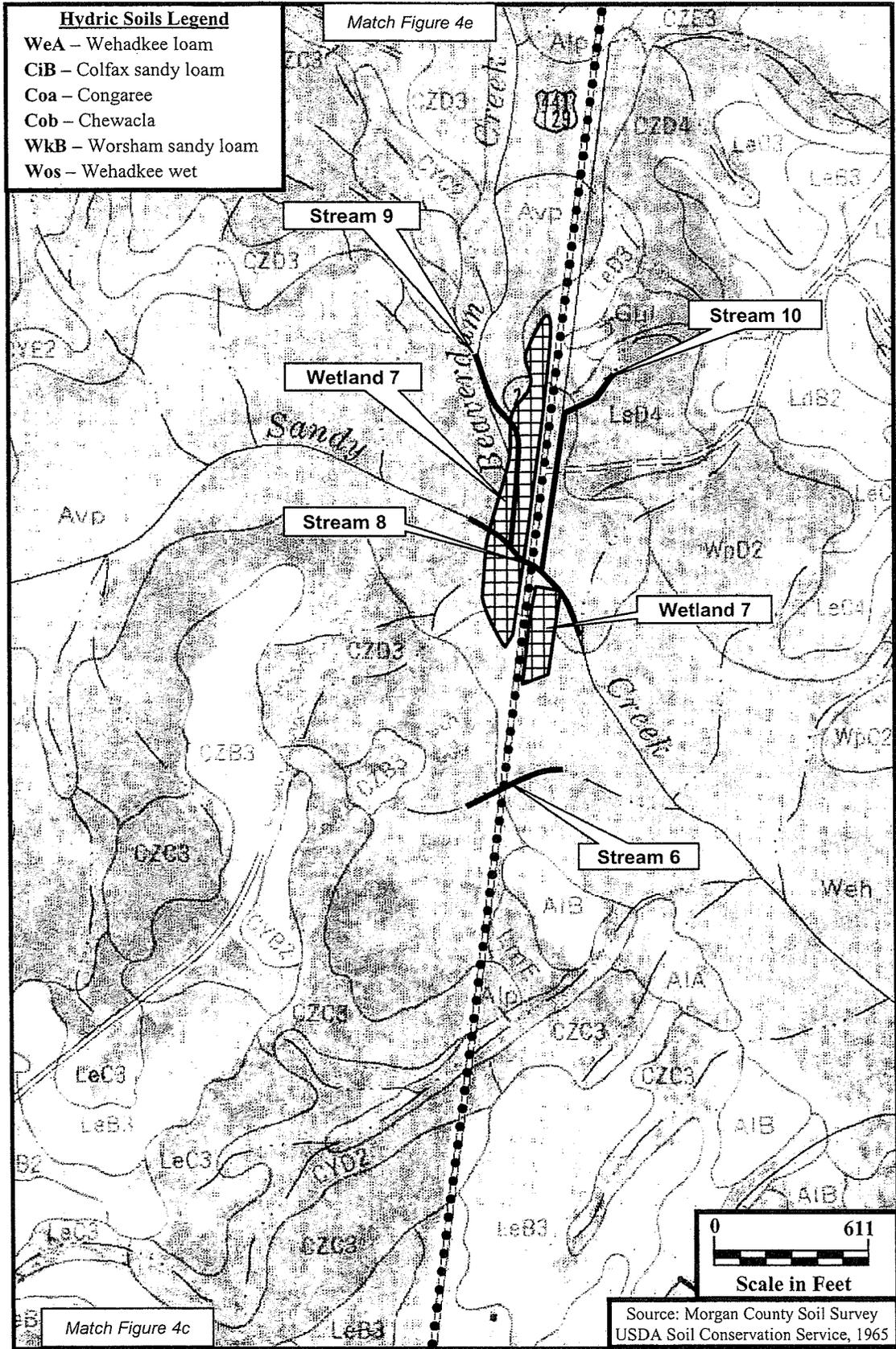
Figure 3h  
Waters of US Map  
33° 43' 21" N / 83° 25' 54" W







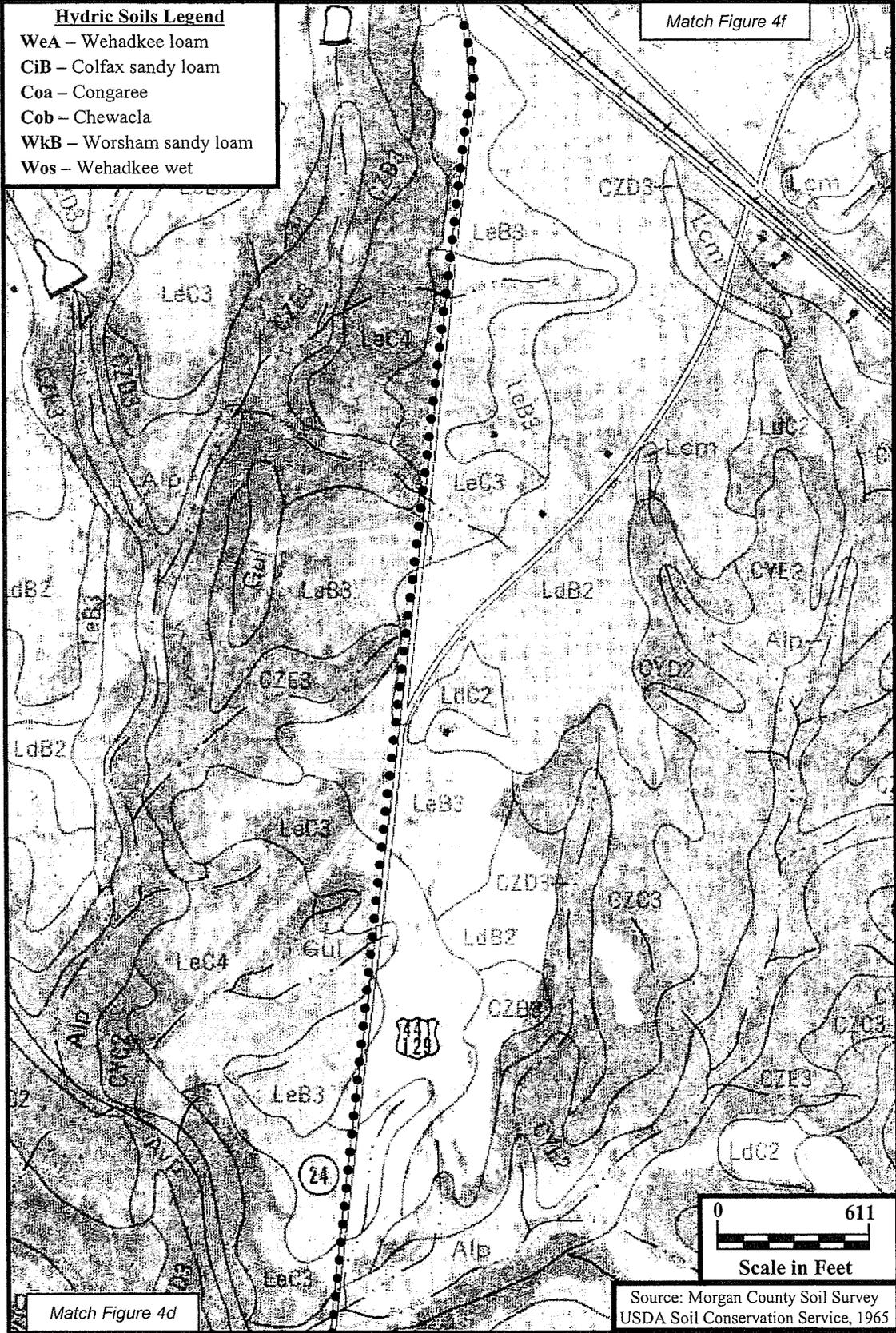
	<p><b>US 441 Widening and Reconstruction</b> EDS-441(42)(43); PI 222560,122660 Morgan and Oconee Counties, GA</p>	<p><b>Figure 4c</b> <b>Soils Map</b> 33° 43' 21" N / 83° 25' 54" W</p>
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US 41 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

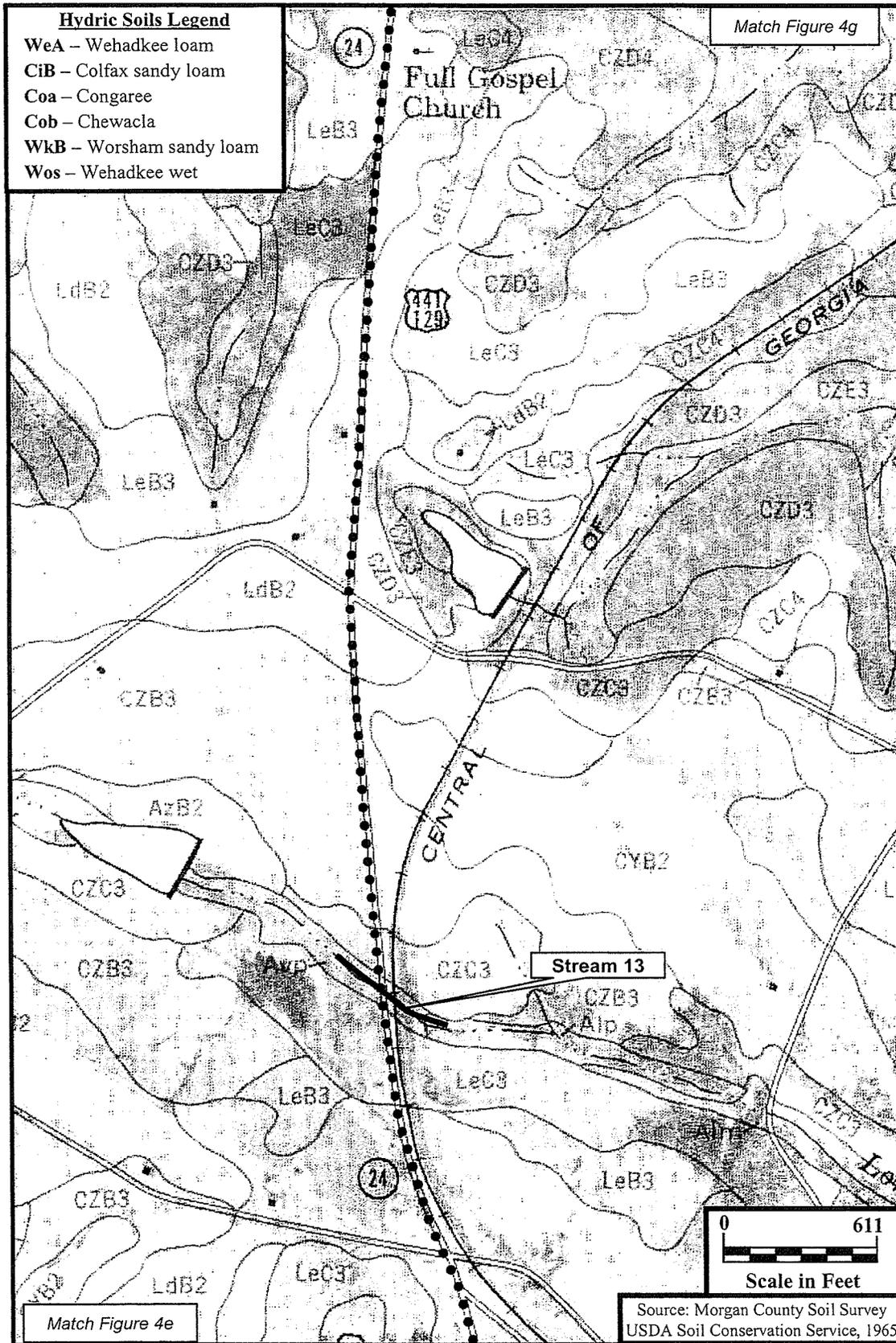
Figure 4d  
Soils Map

33° 43' 21" N / 83° 25' 54" W



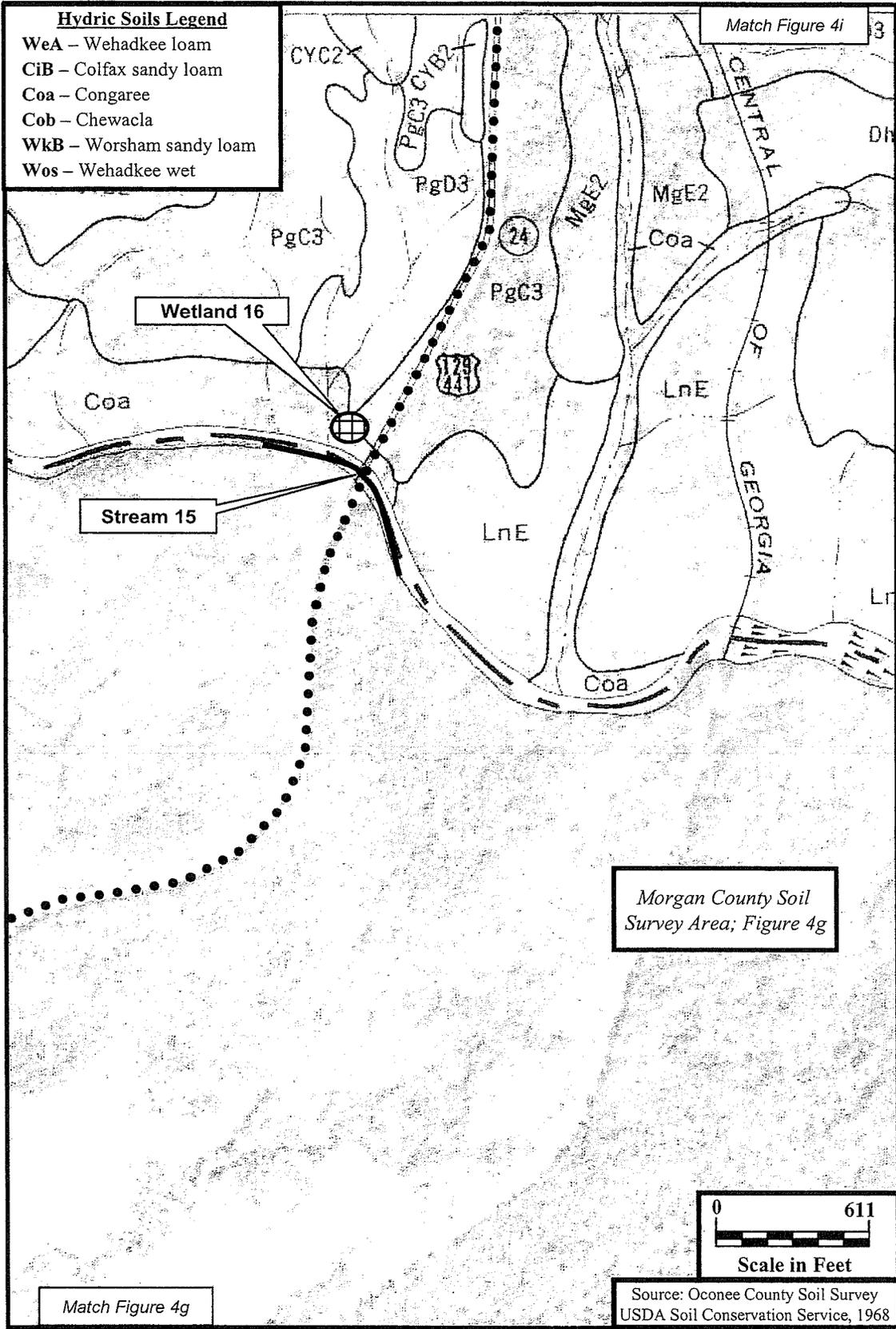
US 441 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

Figure 4e  
Soils Map  
33° 43' 21" N / 83° 25' 54" W



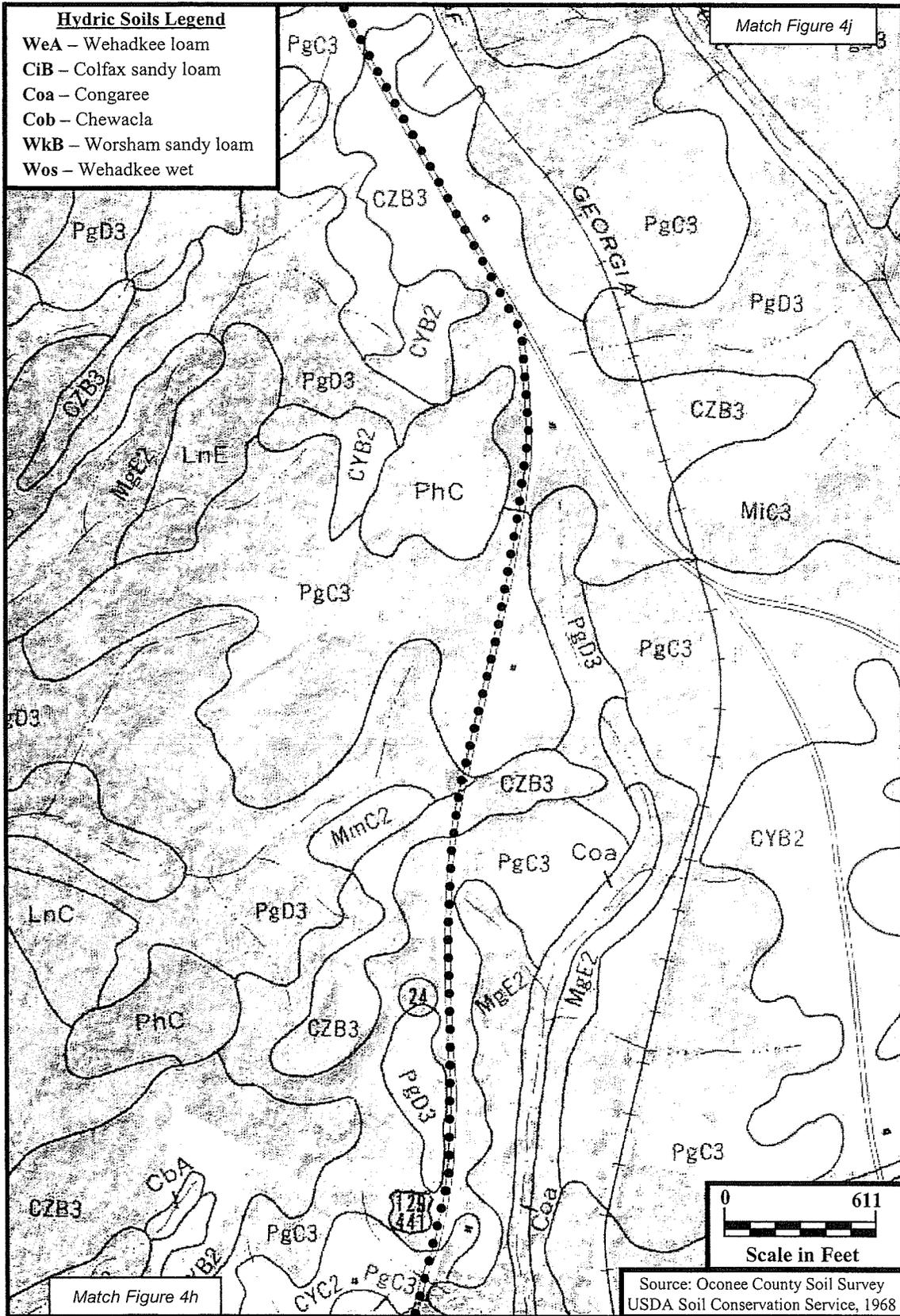
	<p>US 441 Widening and Reconstruction EDS-441(42)(43); PI 222560,122660 Morgan and Oconee Counties, GA</p>	<p>Figure 4f Soils Map 33° 43' 21" N / 83° 25' 54" W</p>
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US 441 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

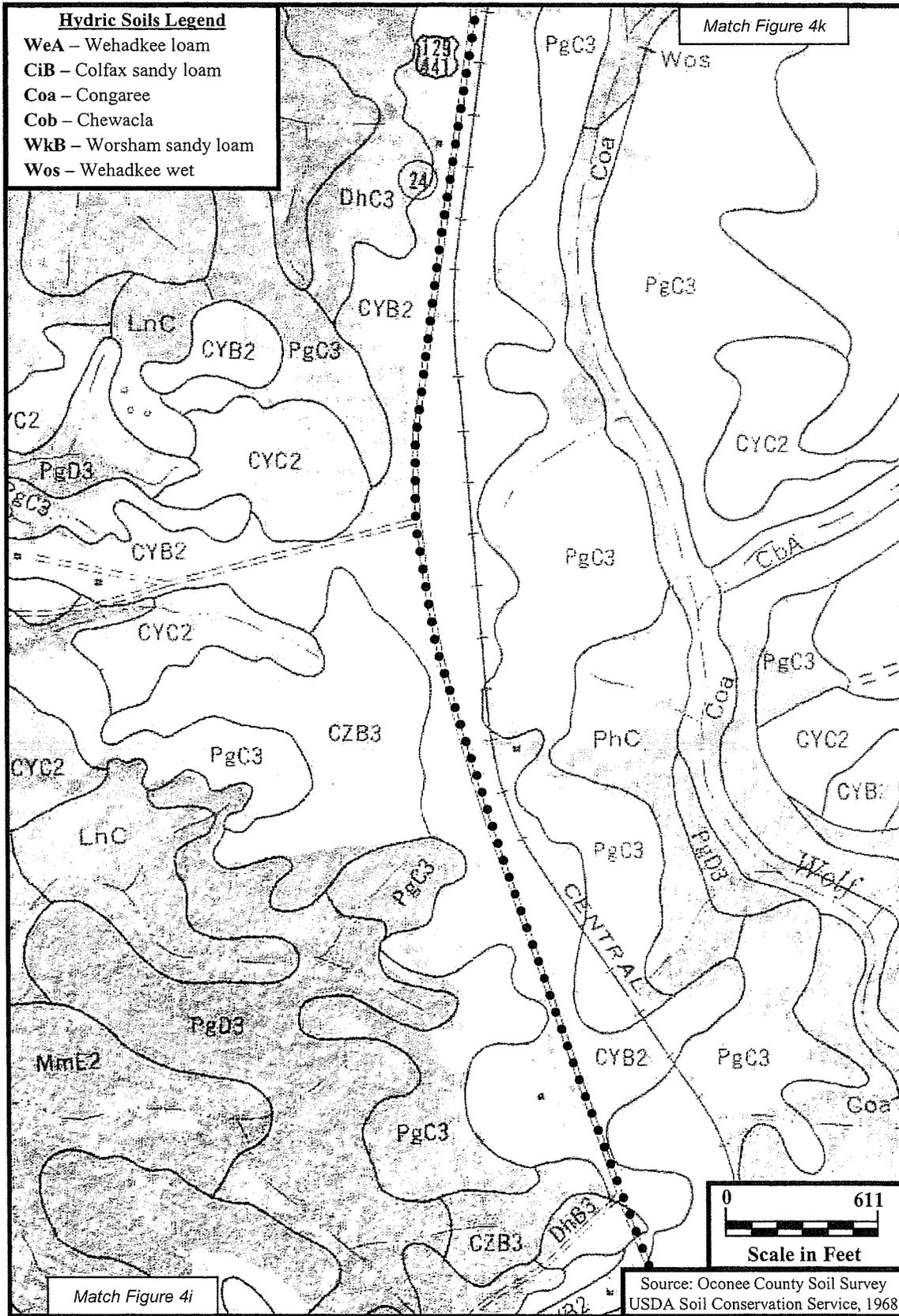
Figure 4h  
Soils Map  
33° 43' 21" N / 83° 25' 54" W



US 441 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

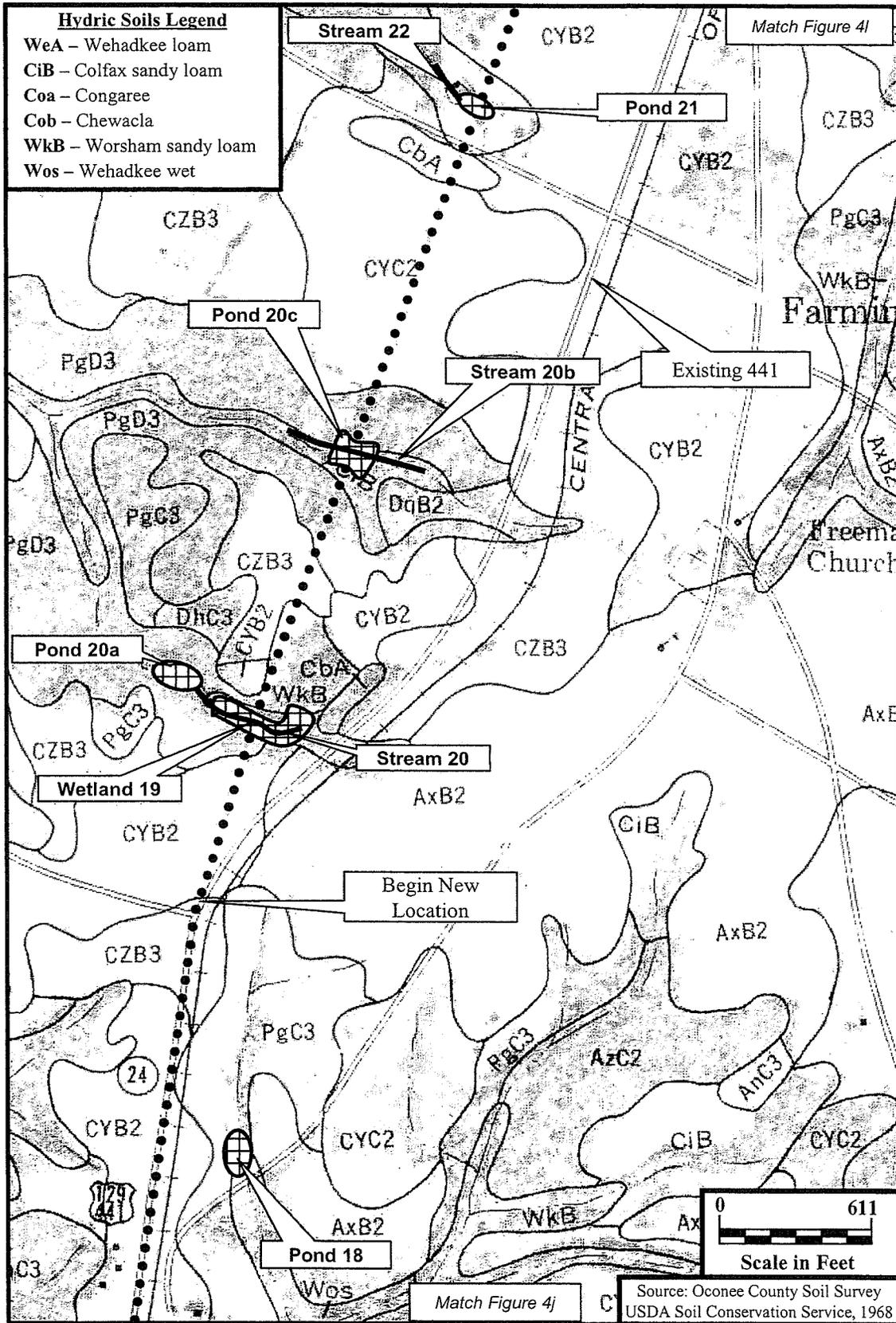
Figure 4i  
Soils Map

33° 43' 21" N / 83° 25' 54" W

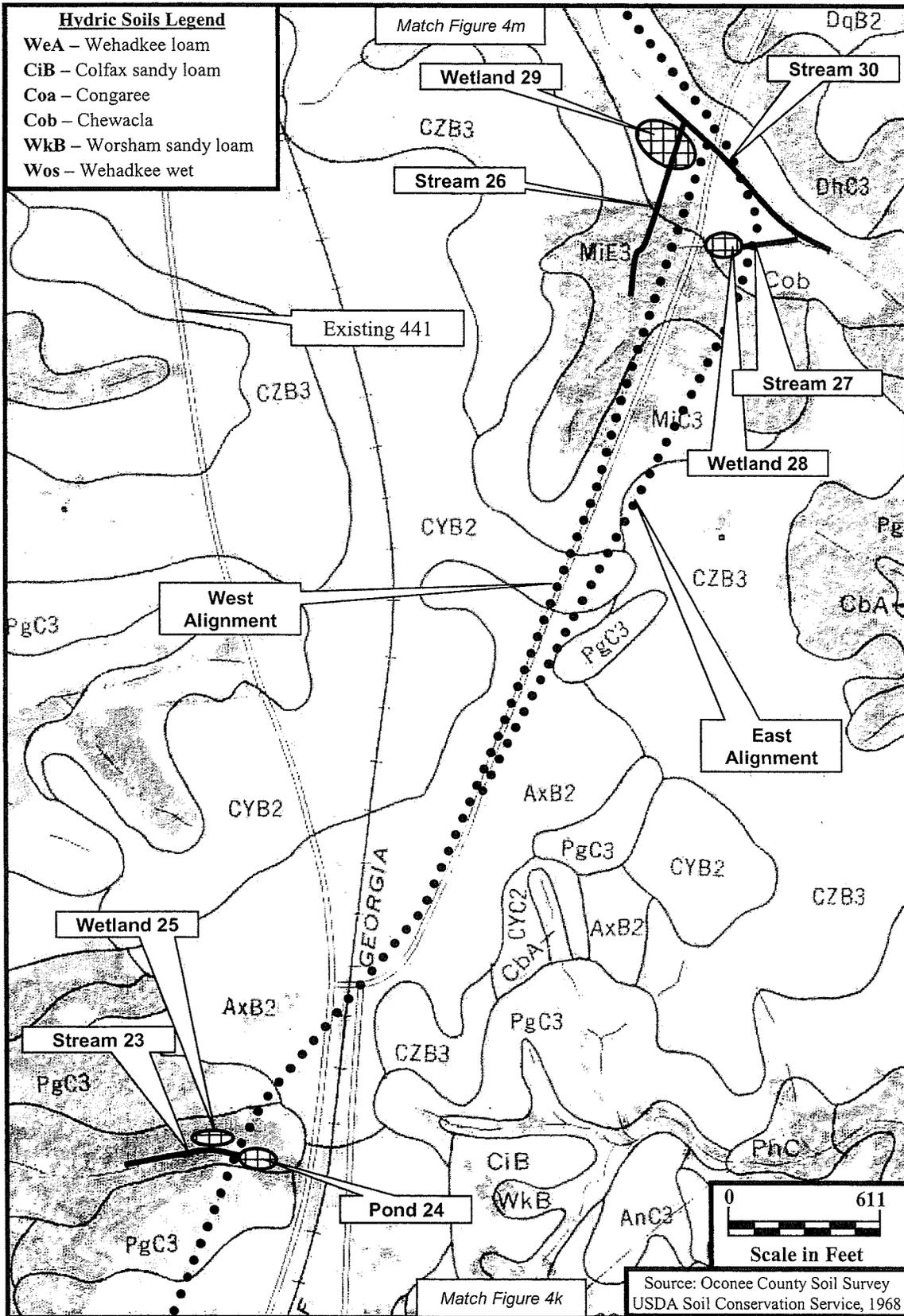


US 441 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

Figure 4j  
Soils Map  
33° 43' 21" N / 83° 25' 54" W



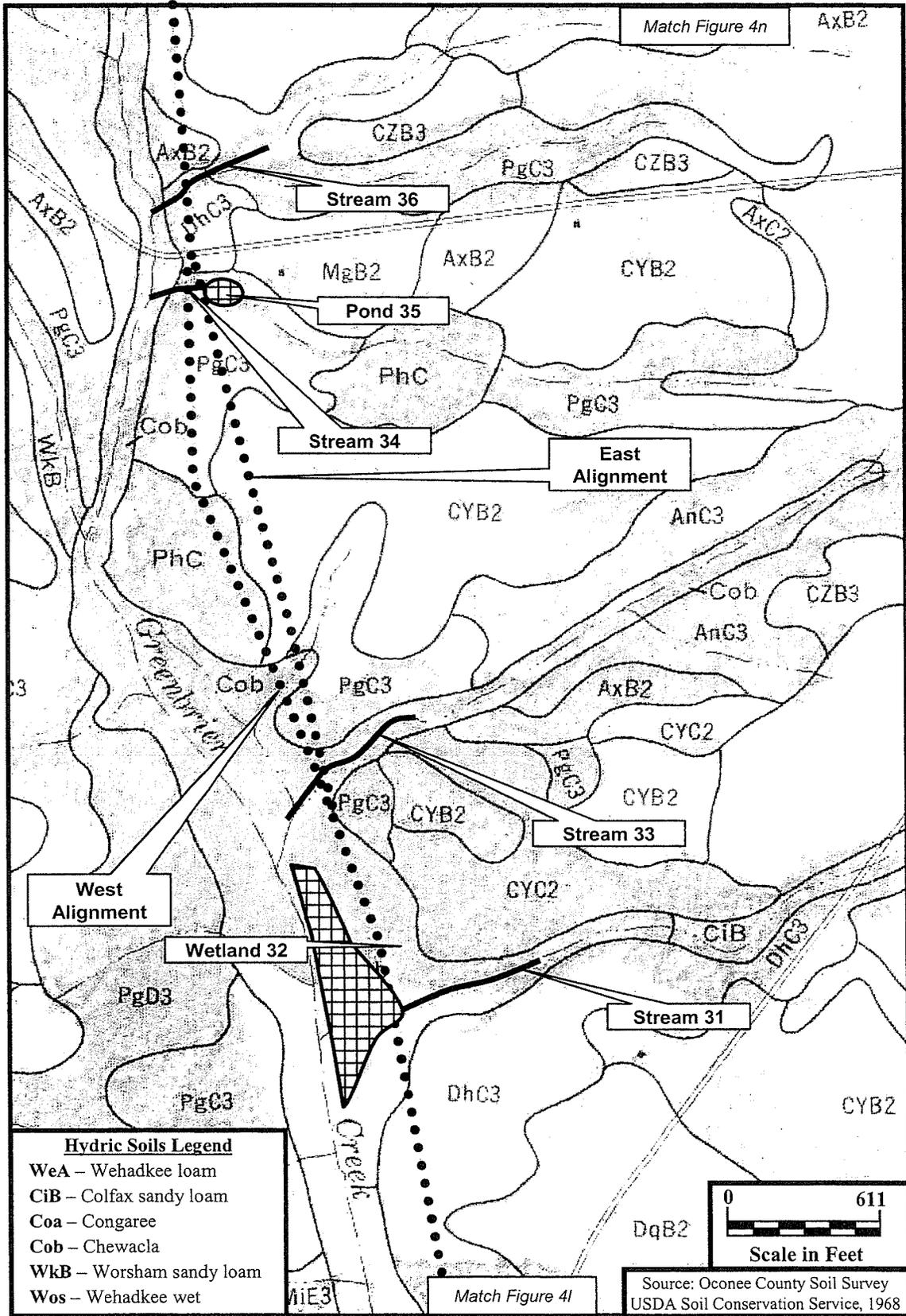
	<p>US 441 Widening and Reconstruction EDS-441(42)(43); PI 222560,122660 Morgan and Oconee Counties, GA</p>	<p>Figure 4k Soils Map 33° 43' 21" N / 83° 25' 54" W</p>
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US 441 Widening and Reconstruction  
 EDS-441(42)(43); PI 222560,122660  
 Morgan and Oconee Counties, GA

Figure 41  
 Soils Map

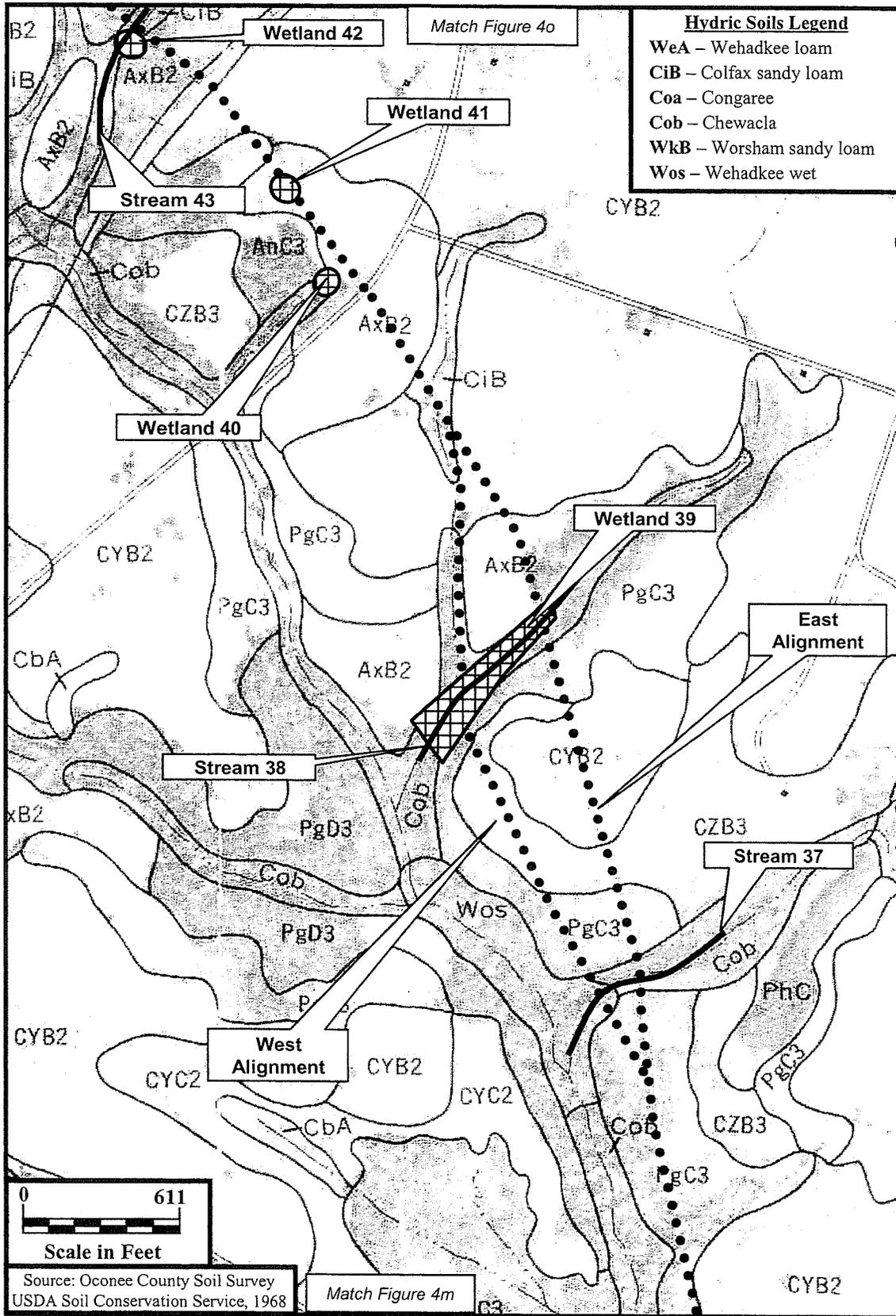
33° 43' 21" N / 83° 25' 54" W



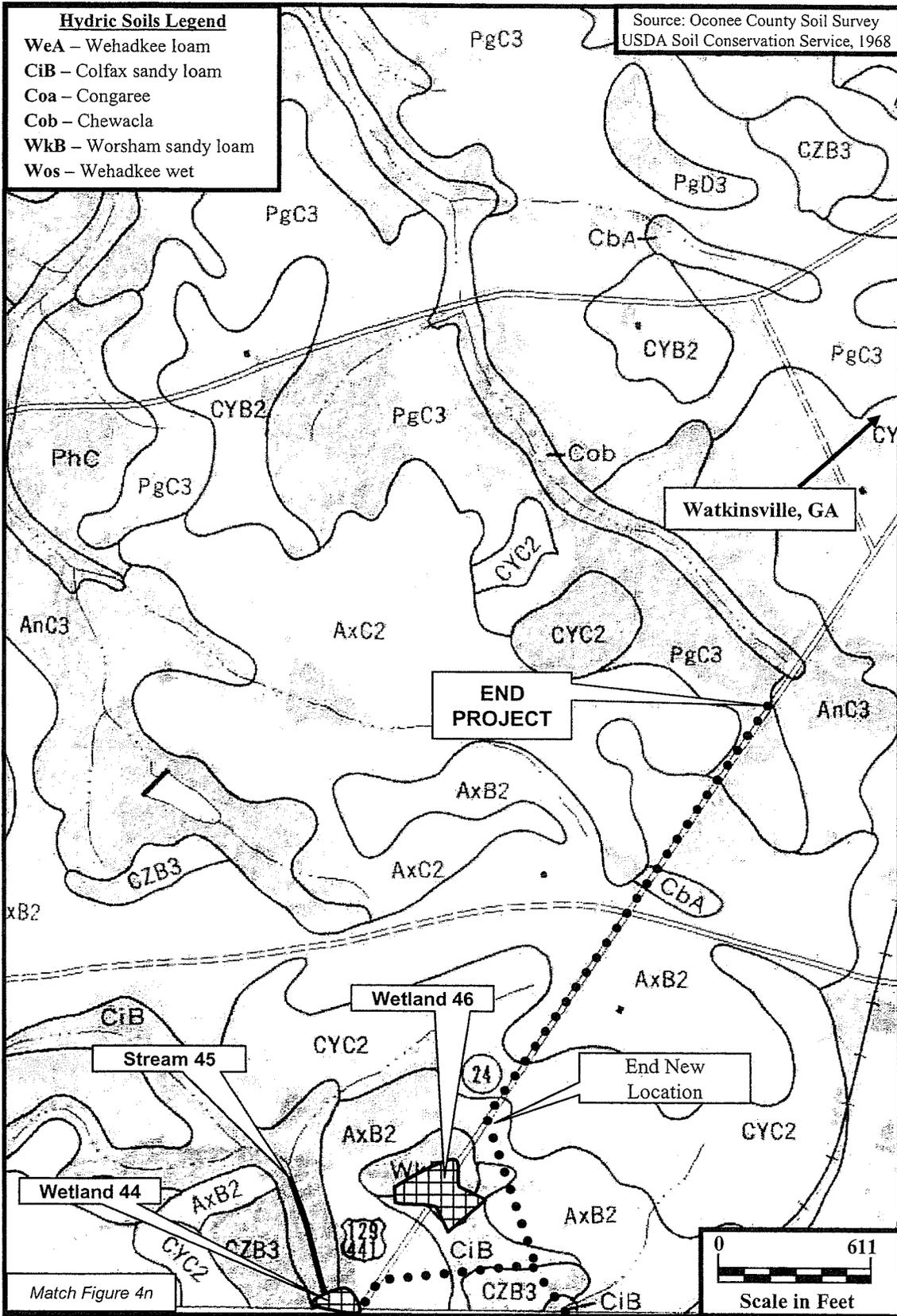
US 441 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

Figure 4m  
Soils Map

33° 43' 21" N / 83° 25' 54" W



	<p align="center"> <b>US 441 Widening and Reconstruction</b>  <b>EDS-441(42)(43); PI 222560,122660</b>  <b>Morgan and Oconee Counties, GA</b> </p>	<p align="center"> <b>Figure 4n</b>  <b>Soils Map</b>          33° 43' 21" N / 83° 25' 54" W       </p>
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US 441 Widening and Reconstruction  
EDS-441(42)(43); PI 222560,122660  
Morgan and Oconee Counties, GA

Figure 4o  
Soils Map

33° 43' 21" N / 83° 25' 54" W

## APPENDIX 3. PHOTOGRAPHS



**Photo 1: Pond 21, new location alignment, west of existing US 441**



**Photo 2: Stream 22, view downstream, west of existing US 441**