Alabama Department of Environmental Management

Final
Delisting Decision
For

Joes Branch

Siltation

Waterbody ID AL03160204-0505-800

Alabama Department of Environmental Management
Water Quality Branch
Water Division
April 2020

Table of Contents

List of Tables **Page #**

List of Figures **Page #**

Useful Acronyms & Abbreviation

A

A&I - Agriculture and Industry Use Classification
AAF - Average Annual Flow
ACES - Alabama Cooperative Extension Service
ADEM - Alabama Department of Environmental Management
ADPH - Alabama Department of Public Health
AEMC - Alabama Environmental Management Commission
AFO - Animal Feeding Operation
AL - Alabama; Aluminum (Metals)
AS - Arsenic
ASWCC - Alabama Soil & Water Conservation Committee
AWIC - Alabama Water Improvement Commission

B

BAT - Best Available Technology
BCT - Best Conventional Pollutant Control Technology
BMP - Best Management Practices
BOD - Biochemical Oxygen Demand
BPJ - Best Professional Judgment

C

CAFO - Concentrated Animal Feeding Operation
$CBOD_5$ - Five-Day Carbonaceous Biochemical Oxygen Demand
$CBOD_u$ - Ultimate Carbonaceous Biochemical Oxygen Demand
CFR - Code of Federal Regulations
CFS - Cubic Feet per Second
CMP - Coastal Monitoring Program
COD - Chemical Oxygen Demand
CPP - Continuing Planning Process
CWA - Clean Water Act
CY - Calendar Year

D

DA - Drainage Area
DEM - Digital Elevation Model
DMR - Discharge Monitoring Report
DNCR - Department of Conservation & Natural Resources
DO - Dissolved Oxygen

E

EFDC – Environmental Fluid Dynamics Code

F

F&W - Fish and Wildlife Use Classification
FDA - Food and Drug Administration
Fe - Iron
FO - Field Operations
FS - Forestry Service (US)
FY - Fiscal Year

G

GIS - Geographic Information Systems
GOMA - Gulf of Mexico Alliance
GPS - Global Positioning System
GS - Growing Season
GSA - Geological Survey of Alabama

H

HCR - Hydrographic Controlled Release
Hg - Mercury
HUC - Hydrologic Unit Code

I

IBI - Index of Biotic Integrity
IF - Incremental Flow
IWC - Instream Waste Concentration

L

LA - Load Allocation
Lat/Long- Latitude / Longitude
LDC - Load Duration Curve
LIDAR - Light Detection & Ranging
LSPC - Load Simulation Program C
LWF - Limited Warmwater Fishery Use Classification

M

m^3/s - Cubic Meters per Second
MAF - Mean Annual Flow (MAF = AAF)
mg/l - Milligrams per Liter
MGD - Million Gallons per Day
mi - Miles
MOS - Margin of Safety
MS4s - Municipal Separate Storm Sewer Systems
MZ - Mixing Zone

N

N - Nitrogen
NA - Not Applicable
NASS - National Agricultural Statistics Service
$NBOD_x$ - Nitrogenous Biochemical Oxygen Demand
NED - National Elevation Database
NH_3-N - Ammonia Nitrogen
NHD - National Hydrography Database
NLCD - National Land Cover Dataset
NO_3+NO_2-N -Nitrate + Nitrite Nitrogen
NOAA - National Oceanic and Atmospheric Administration
NOV - Notice of Violation
NPDES - National Pollutant Discharge Elimination Syst
NPS - Non-Point Source
NRCS - National Resource Conservation Service
NTUs - Nephelometric Turbidity Units
NWS - National Weather Service

0

OAW – Outstanding Alabama Water Use Classification
OE - Organic Enrichment
ONRW - Outstanding National Resource Water

P

P - Phosphorus
Pb - Lead
PCBs - Polychlorinated Biphenyl
pH - Concentration of Hydrogen Ions Scale
POTW - Publicly Owned Treatment Works
ppb - Parts per Billion
ppm - Parts per Million
ppt - Parts per Trillion
PS - Point Source
PWS - Public Water Supply Use Classification
PWSS - Public Water Supply System

Q

Q - Flow (MGD, m^3/s, cfs)
QA/QC - Quality Assurance / Quality Control
QAPP - Quality Assurance Project Plan

R

RRMP - River and Reservoirs Monitoring Program
RSMP - River and Streams Monitoring Program

S

S - Swimming and Other Whole Body Waters Contact Sports Use Classification
SH - Shellfish Harvesting Use Classification

S (cont)

SID - State Indirect Discharge
SMZ - Streamside Management Zone
SOD - Sediment Oxygen Demand
SOP - Standard Operating Procedure
SRF - State Revolving Fund
SSO - Sanitary Sewer Overflow
STP - Sewage Treatment Facility
SW - Surface Water
SWMP - Stormwater Management Plan
SWQM - Spreadsheet Water Quality Model (AL)
SWQMP - Surface Water Quality Monitoring Program

T

TBC - Technology-Based Controls
TBD - To be Determined
TDS - Total Dissolved Solids
TKN - Total Kjeldahl Nitrogen
TMDL - Total Maximum Daily Load
TON - Total Organic Nitrogen
TOT - Time of Travel
Total P - Total Phosphorus
TSS - Total Suspended Solids
TVA - Tennessee Valley Authority

U

UAA - Use Attainability Analysis
UIC - Underground Injection Control
USDA - United Stated Department of Agriculture
USGS - United States Geological Survey
USEPA - United States Environmental Protection Agency
USFWS - United States Fish & Wildlife Services
UT - Unnamed Tributary
UV - Ultraviolet Radiation

W

WASP - Water Quality Analysis Simulation Program
WCS - Watershed Characterization System
WET - Whole Effluent Toxicity
WLA - Wasteload Allocation
WMA - Wildlife Management Area
WPCP - Wastewater Pollution Control Plant
WQB - Water Quality Branch
WRDB - Water Resources Database
WTP - Water Treatment Plant
WWTF - Wastewater Treatment Facility
WWTP - Wastewater Treatment Plant
WY - Water Year

Chapter 1. Introduction

1.1 Executive Summary

The purpose of this report is to present information that substantiates the removal of the impaired segment of Joes Branch from the Department's §303(d) list based upon the conclusion that Joes Branch is now fully supporting its designated uses with respect to siltation.

The Joes Branch watershed encompasses an area of 0.97 square miles and is located in Baldwin County. Joes Branch flows southwest for a total stream length of 1.57 miles before its confluence with D'Olive Creek. The entire assessed segment of Joes Branch is currently listed on the Department's 2018 §303(d) list.

Joes Branch was originally added to Alabama's §303(d) list in 2008 with siltation listed as the pollutant of concern. The addition of the impaired segment of Joes Branch was based upon the results of a comprehensive study conducted by the Geological Survey of Alabama in 2007 to assess the impacts of land-use change by determining sedimentation rates in streams that receive sediment from construction sites in the watershed. The results of the study indicated elevated suspended sediment loads in Joes Branch. Therefore, the Department concluded that Joes Branch "no longer supported" its use classification due to siltation impairment caused from land development and consequently included Joes Branch on the 2008 §303(d) List. The table below is an excerpt from the Department's 2018 §303(d) list illustrating the impaired segment of Joes Branch and additional information about the listed segment.

Table 1.1.1 Joes Branch Siltation Impaired Segments on Department's 2018 §303(d) List

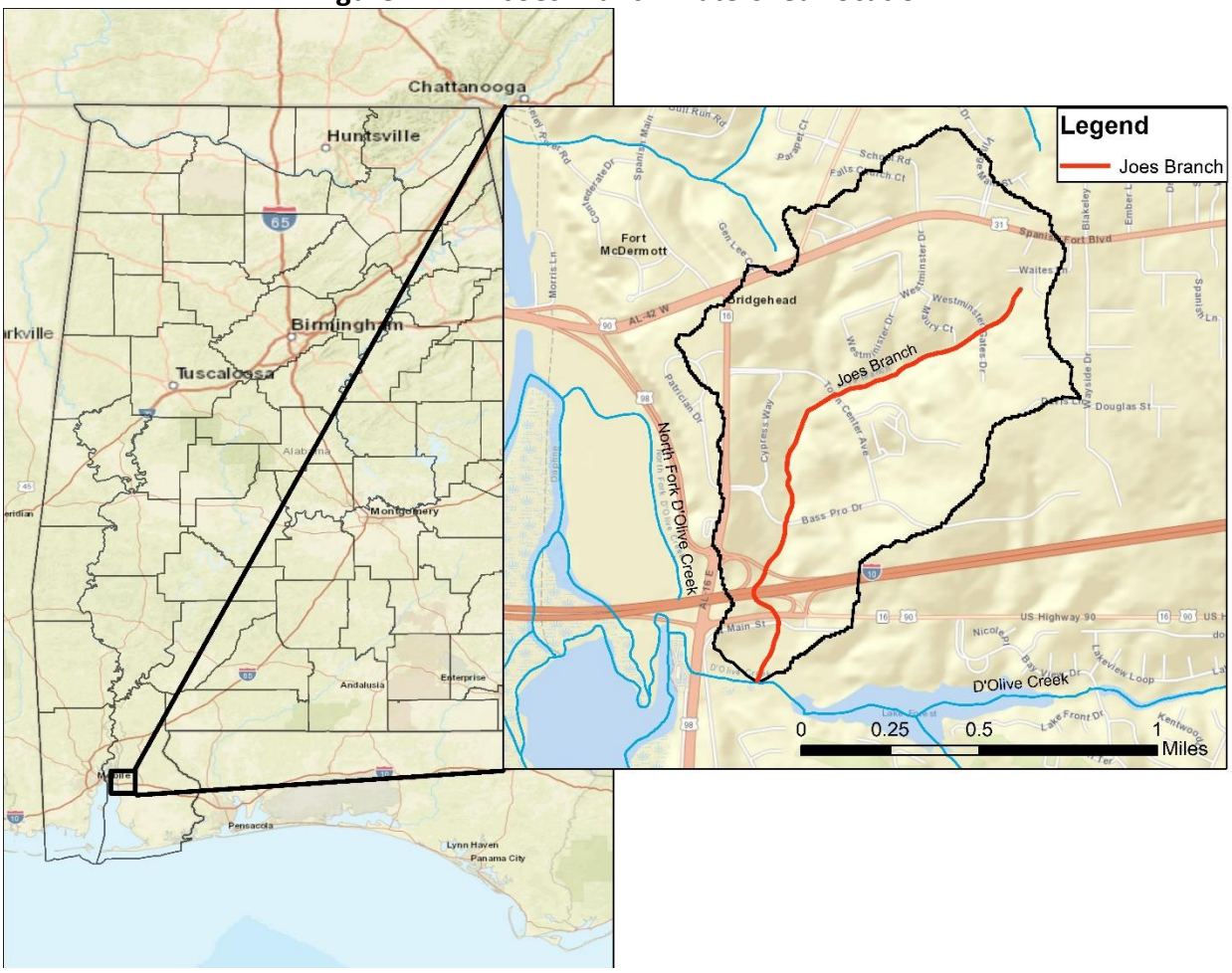
Assessment Unit ID	River Basin	County	Uses	Cause	Sources	Size (miles)	Downstream/ Upstream Locations	Year Listed
AL03160204-0505-800	Mobile	Baldwin	F&W	Siltation	Land Development	1.57	D'Olive Creek / Its Source	2008

Several significant stream restoration efforts have been completed in the Joes Branch watershed since 2011. As a result, the Department conducted monitoring in Joes Branch in 2019 to determine if the waterbody is now supporting its use classification with respect to siltation. During the 2019 sampling period, field parameters, conventional lab parameters, a habitat assessment, and continuous in-situ turbidity results were collected at station JOBB-2 on the listed segment of Joes Branch. Based upon an assessment of the available data, the Department has determined that a siltation impairment does not currently exist. Therefore, ADEM will not develop a TMDL for siltation due to "more recent or accurate data," which is just cause for delisting a waterbody according to Title 40 of the Code of Federal Regulations (CFR), Part 130.7(b)(6)(iv).

1.2 Joes Branch Background Information

The Joes Branch watershed encompasses an area of 0.97 square miles and is located in Baldwin County. Joes Branch flows southwest for a total stream length of 1.57 miles before its confluence with D'Olive Creek. The entire assessed segment of Joes Branch is currently listed on the Department's 2018 §303(d) list. The figure below illustrates the location of the Joes Branch watershed.

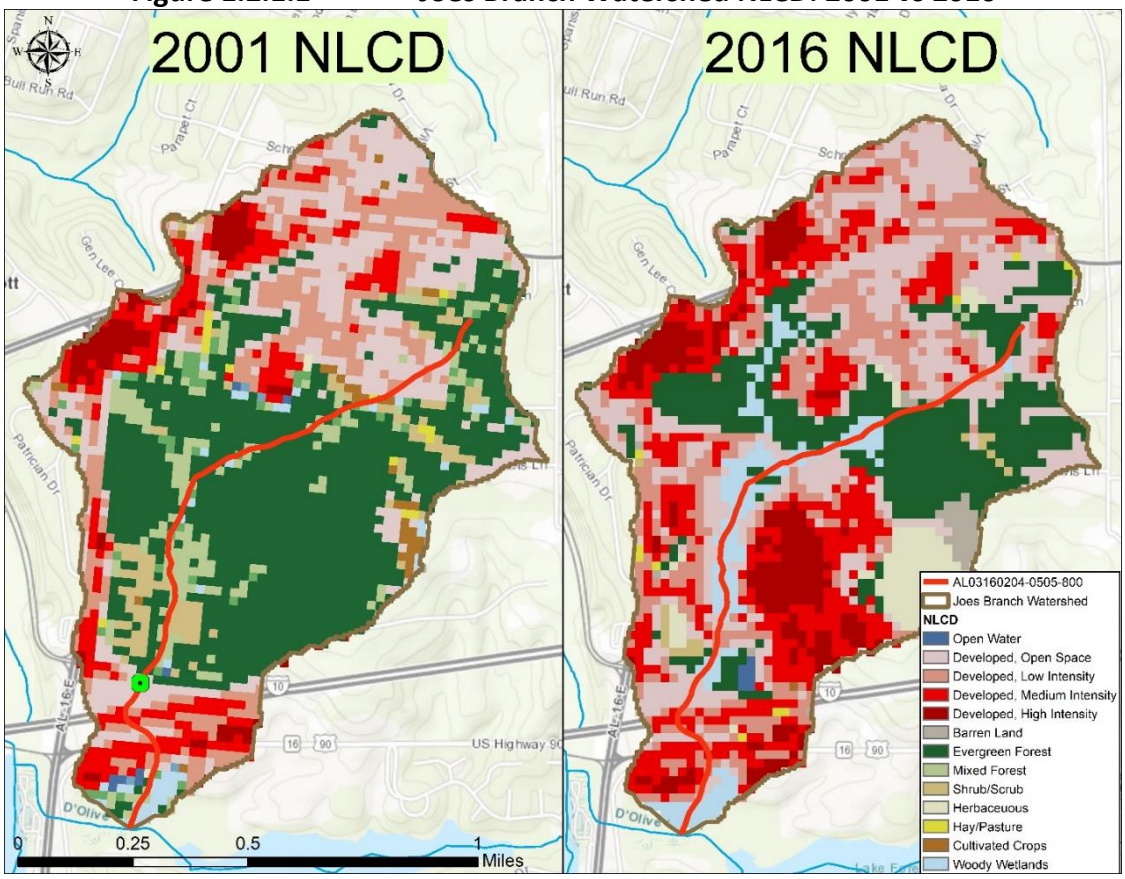
Figure 1.2.1 Joes Branch Watershed Location



1.2.1 Watershed Land Use Coverage

Currently, the Joes Branch watershed is characterized by a mostly developed, urbanized land use coverage. During the time period from 2001 to 2016, the developed land coverage increased nearly 24% in the Joes Branch watershed. On the other hand, the forested land use coverage saw a 28.5% decrease in area coverage. The figure below depicts the National Land Cover Database coverage for Joes Branch watershed for both 2001 and 2016. The medium and high intensity developed (i.e., urban) land use coverage has increased significantly in the watershed since 2001, particularly in the southern half of the watershed.

Figure 1.2.1.1 Joes Branch Watershed NLCD: 2001 vs 2016



The table below depicts the percent area NLCD land use coverage for the years of 2001 and 2016. Also included in the table is the percent land use change from the years of 2001 to 2016.

Table 1.2.1.1 Joes Branch Watershed NLCD: 2001 vs 2016

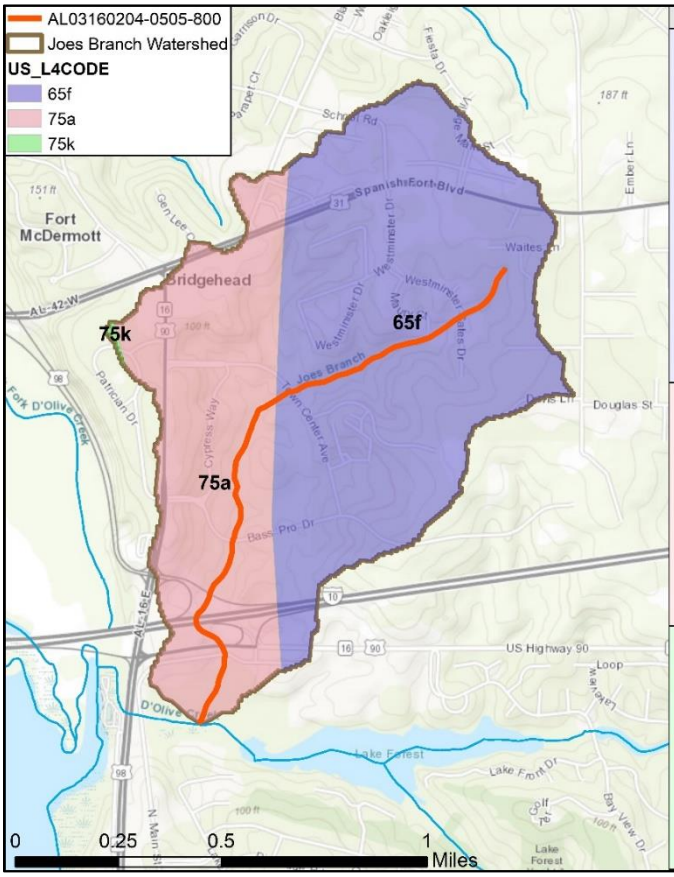
NLCD Land Cover	NLCD Legend	2001 NLCD %	2016 NLCD %	Change 2001 to 2016
Open Water	11	0.28%	0.25%	-0.04%
Developed, Open Space	21	17.74%	22.56%	4.83%
Developed, Low Intensity	22	14.46%	19.32%	4.87%
Developed, Medium Intensity	23	8.97%	18.11%	9.14%
Developed, High Intensity	24	3.17%	8.40%	5.23%
Barren Land	31	0.00%	1.42%	1.42%
Deciduous Forest	41	1.85%	0.00%	-1.85%
Evergreen Forest	42	38.85%	18.90%	-19.96%
Mixed Forest	43	6.80%	0.14%	-6.66%
Shrub/Scrub	52	4.10%	0.71%	-3.38%
Herbaceuous	71	0.14%	3.95%	3.81%
Hay/Pasture	81	0.61%	0.39%	-0.21%
Cultivated Crops	82	1.25%	0.04%	-1.21%
Woody Wetlands	90	1.64%	5.80%	4.16%
Emergent Herbaceuous Wetlands	95	0.14%	0.00%	-0.14%

Cumalative NLCD Land Cover	NLCD Legend	2001 NLCD %	2016 NLCD %	Change 2001 to 2016
Open Water	11	0.28%	0.25%	-0.04%
Developed	21,22,23,24	44.34%	68.40%	24.06%
Barren Land	31	0.00%	1.42%	1.42%
Forested	41,42,43	47.51%	19.04%	-28.47%
Grassland/Shrub	52,71	4.24%	4.66%	0.42%
Agriculture	81,82	1.85%	0.43%	-1.42%
Wetlands	90,95	1.78%	5.80%	4.02%

1.2.2 Ecoregions

The Joes Branch watershed is comprised of two Level III Ecoregions: 65-Southeastern Plains and 75-Southern Coastal Plains. The watershed can be further subdivided into the following Level IV Ecoregions: 65f Southern Pine Plains and Hills (63.7%), 75a Gulf Coast Flatwoods (36.2%), and 75k Gulf Barrier Islands and Coastal Marshes (0.2%). The figure below illustrates the aforementioned Level IV ecoregions found in the Joes Branch Watershed and provides a brief description of each ecoregion.

Figure 1.2.2.1 Joes Branch Watershed Level IV Eco-regions



Ecoregion	Ecoregion Description
65f	65f. The **Southern Pine Plains and Hills** have a different mix of vegetation and land use compared to 65d, and streams tend to be darker tea-colored and more acidic as one moves south. The oak-hickory-pine forest of the north in 65d grades into Southern mixed forest and longleaf pine forest in this region. The longleaf pine forest provided habitat for now rare or endangered species such as the red-cockaded woodpecker, gopher tortoise, eastern indigo snake, and Florida pine snake. Loblolly and slash pine plantations now cover wide areas. The hill summits and higher elevations are composed of the Citronelle formation, generally sandy, gravelly, and porous, and more resistent to erosion than the older underlying Miocene sandstones.
75a	75a. The **Gulf Coast Flatwoods** ecoregion stretches from eastern Louisiana, across southern Mississippi and Alabama, and into west central Florida. In Alabama, it is a narrow region of nearly level terraces and delta deposits composed of Quaternary sands and clays. Wet, sandy flats and broad depressions that are locally swampy are usually forested, while some of the better-drained land has been cleared for pasture or crops. Most of the Mobile urban area is also contained in this region.
75k	75k. The **Gulf Barrier Islands and Coastal Marshes** region contains salt and brackish marshes, dunes, beaches, and barrier islands that enclose the Mississippi Sound and Mobile Bay. Cordgrass and saltgrass are common in the intertidal zone, while xeric coastal strand and pine scrub vegetation occurs on parts of the dunes, spits, and barrier islands. Dauphin Island, one of Alabama's best birding sites, is known for the many trans-gulf migrant bird species that can be seen in spring and fall.

Chapter 2. Problem Definition

2.1 §303(d) List History

Section 303(d) of the Clean Water Act (CWA), as amended by the Water Quality Act of 1987 and EPA's Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations (CFR), Part 130), requires states to identify waterbodies that are not meeting water quality standards applicable to their designated use classifications. The identified waters are prioritized based on severity of pollution with respect to designated use classifications, and listed on each state's §303(d) List of Impaired Waters. If subsequent water quality sampling shows that segments listed in a previous cycle are meeting applicable water quality standards and fully supporting their use classification(s), the waterbody can be proposed as a candidate for delisting based on more recent or more accurate data.

2.1.1 Joes Branch §303(d) Listing History

Joes Branch was originally added to Alabama's §303(d) list in 2008 with siltation listed as the pollutant of concern. The addition of this impaired segment of Joes Branch was based upon the results of a comprehensive study conducted by the Geological Survey of Alabama in 2007 to assess the impacts of land-use change by determining sedimentation rates in streams that receive sediment from construction sites in the watershed. Sediment loads in Joes Branch were determined by the direct measurement of suspended and bed sediment for a range of discharge events. The results of the study indicated elevated suspended sediment loads in Joes Branch. Therefore, the Department concluded that Joes Branch "no longer supported" its use classification due to siltation impairment caused from land development and consequently included Joes Branch on the 2008 §303(d) List. The table below illustrates the impaired segment as it appeared on the Department's 2008 §303(d) List:

Table 2.1.1.1 Joes Branch Siltation Impaired Segments on Department's 2008 §303(d) List

Assessment Unit ID	River Basin	County	Uses	Cause	Sources	Size (miles)	Downstream /Upstream Locations	Year Listed
AL03160204-0505-800	Mobile	Baldwin	F&W	Siltation (habitiat Alteration)	Land Development	1.57	D'Olive Creek / Its Source	2008

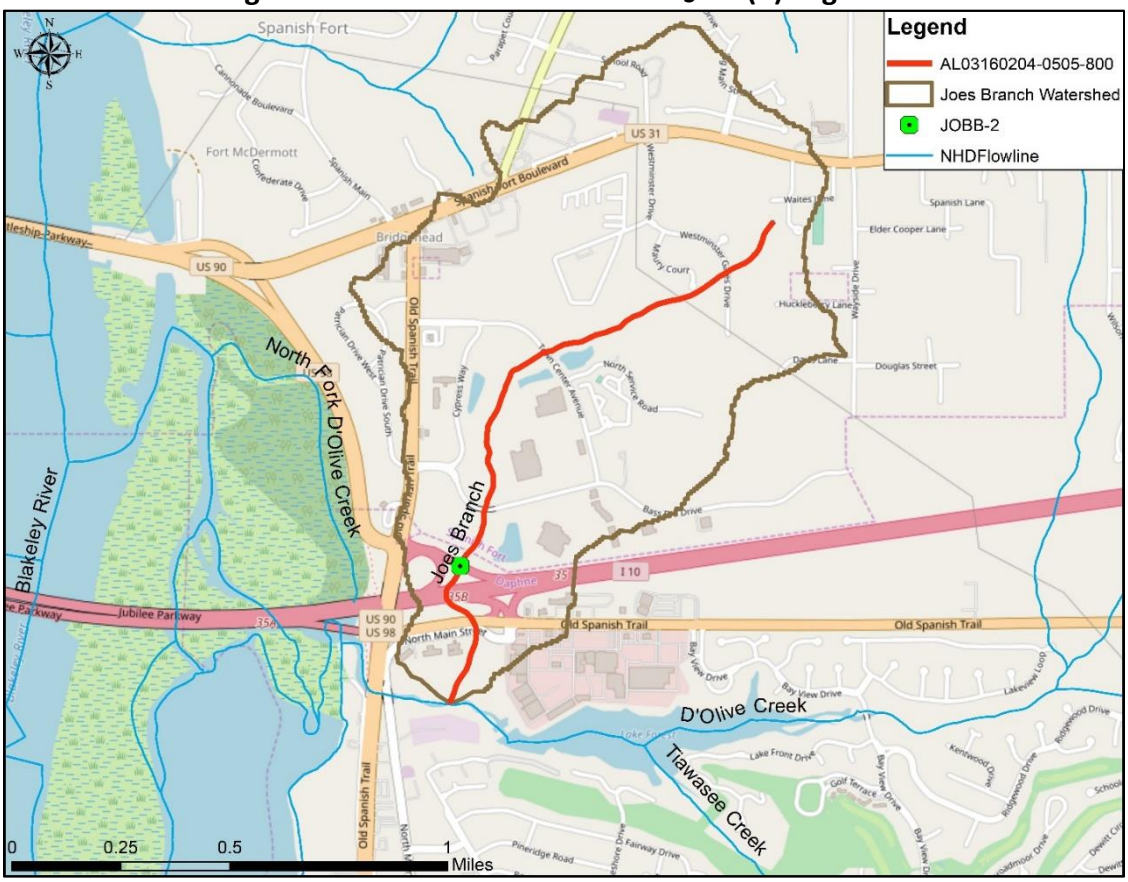
The table below is an excerpt from the Department's 2018 §303(d) list illustrating the impaired segment of Joes Branch.

Table 2.1.1.2 Joes Branch Siltation Impaired Segments on Department's 2018 §303(d) List

Assessment Unit ID	River Basin	County	Uses	Cause	Sources	Size (miles)	Downstream /Upstream Locations	Year Listed
AL03160204-0505-800	Mobile	Baldwin	F&W	Siltation	Land Development	1.57	D'Olive Creek / Its Source	2008

The figure below illustrates the listed segment of Joes Branch that is addressed in this Delisting Decision:

Figure 2.1.1.1 Joes Branch 2018 §303(d) Segment



2.2 Joes Branch Watershed Restoration Efforts

The rapid increase in population and urbanization of the city of Daphne in Baldwin County has led to substantial changes in the land use coverages found in the Joes Branch watershed. Impervious surfaces play a large role in the hydrology of this urban watershed by reducing rain infiltration rates, increasing the overall volume of stormwater, and decreasing the total amount of retention areas. The 2007 GSA study to assess the impacts of land-use change by determining sedimentation rates in streams that receive sediment from construction sites in the watershed found the following:

"Changes in land use are the primary causes of excessive erosion and sedimentation in the D'Olive Creek watershed. Highly erodable soils formed from undifferentiated Miocene sediments combined with relatively high topographic relief related to the formation of Mobile Bay result in excessive sediment transport." (Cook, 6)

Ultimately, the land use changes described above led to the Department concluding that Joes Branch "no longer supported" its use classification due to siltation impairment caused from land development. In order to address the siltation impaired segments of Joes Branch, a comprehensive watershed management plan was developed for the D'Olive Creek, Tiawasee Creek and Joes Branch watersheds in 2010. Several restoration efforts have been completed within the Joes Branch watershed. The list below is an excerpt from the Mobile Bay National Estuary Program (NEP) website that gives a brief description of the completed projects in the watershed. A complete and detailed description of the completed projects in the Joes Branch watershed that was provided by the Mobile Bay National Estuary Program can be found in Appendix E.

***Joe's Branch tributary JB Step Pool Stormwater Conveyance**.*

- *In 2011, collapsing banks along an ephemeral (only wet after rains) Spanish Fort tributary on Westminster Village property threatened residences and Highway 31 and delivered an unprecedented 100,000 tons of sediment per square mile into Mobile Bay. MBNEP secured Clean Water Act Section 319 funding to construct a rock step pool conveyance over a sand infiltration matrix down the steep 1,000-foot slope to reduce stormwater energy and volume. Southern Excavating was contracted to implement this Thompson Engineering design. This successful restoration project won a 2015 Gulf Guardian Award for Partnerships and survived April 29, 2014, 500-year rain event.*

***JB Project 2**.*

- *With funding from a National Fish and Wildlife Foundation Gulf Environmental Benefits Grant for comprehensive restoration of the most critically-degraded streams across the D'Olive Watershed, a head cut advancing towards the toe of the step pool conveyance and threatening sewer infrastructure was the next project to be addressed. Thompson designed hybrid measures, including elevating the stream bed, expanding the flood plain, using rock to stabilize stream banks, and installing rock weirs and energy dissipating log structures. This project, constructed by North State Environmental and including restoration of 1,700-linear feet of stream and eight acres of wetland and flood plains, was substantially completed in August 2015. Of note: GSA sampling indicates that the Step Pool Conveyance and JB Project 2 were successful in reducing sediment loads by over 90%.*

Stream tributaries J4-1, J4-2, and JA, Joe's Branch Stormwater Management Facilities (SWMF)

- *J4-1 & J4-2: Designed by Thompson Engineering and constructed by Southern Excavating, this NFWF GEBF project restored 1,100 linear feet of incised stream and relocated an existing sewer line.*
- *JB & J SWMF: Restored an existing 35,000 cubic feet detention basin on the property of Westminster Gates to original storage capacity (J SWMF).*
- *Constructed a new 53,000 cubic feet detention basin (JB SWMF) on the Alabama Power easement at Westminster Village immediately upstream of the Step Pool Conveyance.*
- *Both projects were funded by NFWF GEBF and reached substantial completion November 2016.*

- *JA: Restoration of three degraded gullies totaling 600 linear feet behind the Piggly Wiggly in Spanish Fort. Water was piped down the steep slope, to provide ecological services, to a plunge pool and wetlands to reduce energy and improve water quality prior to its confluence with the main stem of Joe's Branch.*
- *J4-1 & J4-2, JA, JB SWMF, and JSWMF were substantially completed in November 2016.*

In addition, a video was developed specifically highlighting the watershed management plan implemented for the Joes Branch waterbody and stream restoration efforts in that watershed. A link to the video can be found here: Protecting Alabama's Waters - Partnering with EPA's 319 Program. Funding for the video was provided by the Alabama Department of Environmental Management through the Clean Water Act Section 319(H) Non-Point Source Grant provided by the USEPA – Region 4.

Chapter 3. Technical Basis for Delisting Decision

3.1 Applicable Water Quality Criteria

ADEM's decision to delist Joes Branch for siltation is authorized under ADEM's Water Quality Standards Program, which employs both numeric and narrative criteria to ensure adequate protection of designated uses for surface waters of the State. Numeric criteria typically have quantifiable endpoints for given parameters such as pH, dissolved oxygen, or turbidity. ADEM Admin. Code r. 335-6-10-.09(5)(e)9 describes the specific numeric water quality criterion for turbidity, applicable for all designated uses:

"There shall be no turbidity other than of natural origin that will cause substantial visible contrast with the natural appearance of the waters or interfere with any beneficial uses which they serve. Furthermore, in no case shall the turbidity exceed 50 NTU above background. Background will be interpreted as the natural condition of the receiving water without the influence of man-made or man-induced causes. Turbidity caused by natural runoff will be included in establishing background levels.

Currently, the Department does not have numeric water quality criteria specifically for "siltation." Therefore, ADEM has chosen to use the "reference condition" approach for determining the appropriate numeric siltation targets in the waterbody necessary to support its designated uses. This approach is based on using ambient water quality data from reference streams that are located in characteristically similar regions of Alabama known as ecoregions. An ecoregion is defined as a relatively homogeneous area defined by similar climate, landform, soil, potential natural vegetation, hydrology and other ecologically relevant variables (USEPA, 2000b). "Reference streams" are defined as waterbodies that have been relatively undisturbed or minimally-impacted that can serve as examples of the natural biological integrity of a particular ecoregion. These "reference streams" can be monitored over time to establish a baseline to which other waters can be compared. Reference streams are not necessarily pristine or undisturbed by humans; however, they do represent waters within Alabama that are healthy and

fully support their designated uses, to include protection of aquatic life. ADEM believes that the "reference condition" approach used to determine appropriate siltation targets for Joes Branch is reasonable, scientifically defensible, protective of designated uses, and consistent with USEPA guidance.

3.2 Water Quality Data Sources and Availability

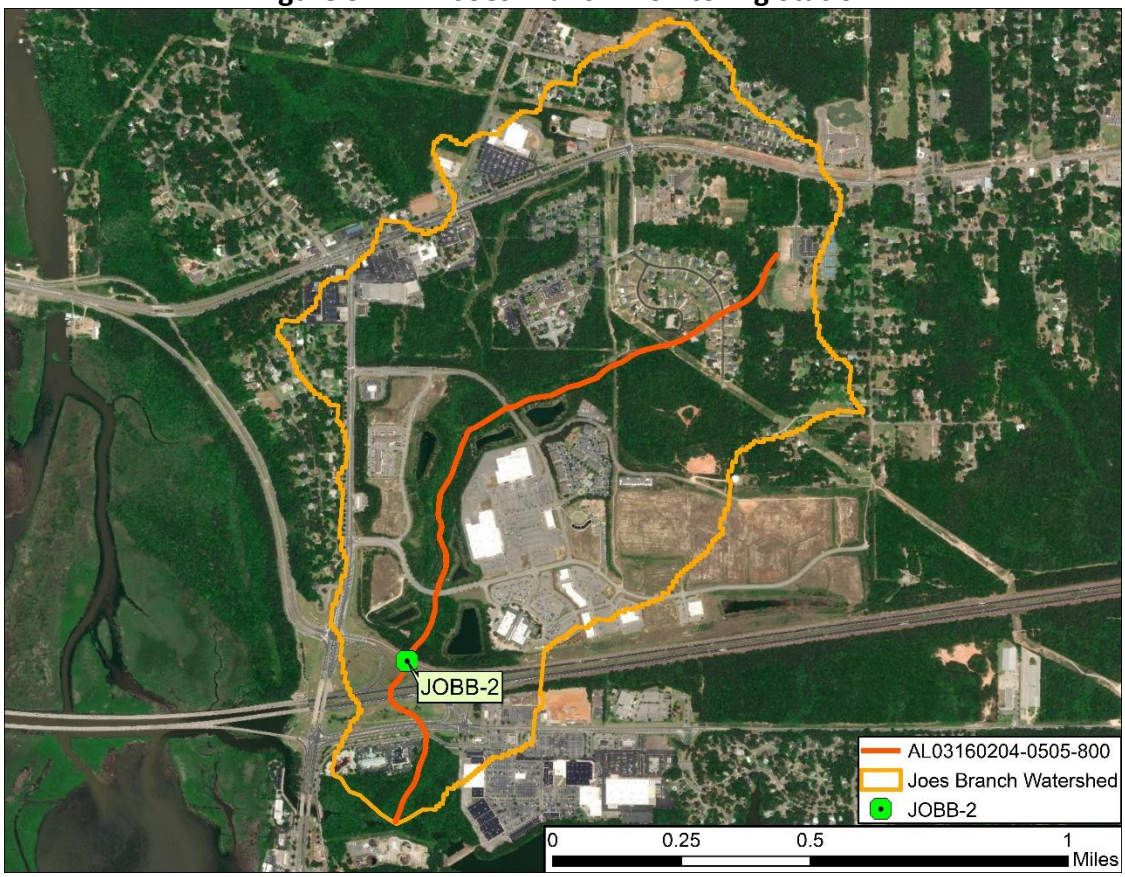
3.2.1 Conventional Water Quality Data Availability

As previously mentioned, beginning in 2011, numerous stream restoration projects have been implemented in the Joes Branch watershed to address the existing siltation impairment. In response to these efforts, the Department sampled Joes Branch in 2019 to determine if it is now meetings its designated uses with respect to siltation. The data that was utilized in this evaluation of the siltation impairment on Joes Branch is from the Department's 2019 §303(d) sampling program. During the 2019 sampling period, field parameters and conventional lab parameters were collected at station JOBB-2 on Joes Branch. A habitat assessment was also conducted at station JOBB-2. The table below gives additional information with regard to the ADEM station JOBB-2 location and description. See Figure 3.2.1.1 below for an illustration of the station location in the watershed.

Table 3.2.1.1 Joes Branch Monitoring Station

Station ID	Latitude	Longitude	Location Description	Drainage Area (mi2)
JOBB-2	30.65702	-87.90905	Joes Branch at I-10 westbound off ramp to US Hwy 90 at Spanish Fort (Exit # 35)	0.86

Figure 3.2.1.1 Joes Branch Monitoring Station



3.2.2 Continuous In-Situ Turbidity Data

Instream turbidity results in a waterbody are directly linked to flow and stage, particularly during rainfall events. During baseflow conditions for a given waterbody, instream turbidity generally stabilizes near a base turbidity level. This base flow turbidity level is dependent upon several factors including the eco-region that the watershed is located within, but generally base flow turbidity is less than 10 NTUs. Following a rainfall event in a watershed, instream turbidity results see a sharp increase due to sediment being introduced into the water column via two mechanisms: overland runoff from nonpoint sources and sediment scour/deposition within the stream channel. The benefit of having continuous in-situ turbidity results is that it allows the Department to monitor how instream turbidity reacts throughout the streamflow hydrograph, including both baseflow conditions and peak flows during a flood event.

Beginning on February 4, 2019, the Department installed an FTS DTS-12 digital turbidity sensor to continuously collect in-situ turbidity data on a 15 minute time interval on Joes Branch at station JOBB-2. Similarly, continuous in-situ turbidity data was also collected on the reference reach (Folley Creek) at station FYCE-1 during 2019 on a 15 minute time interval. The DTS-12 sensor was un-installed at the eco-reference station FYCE-1 on December 19, 2019. Therefore,

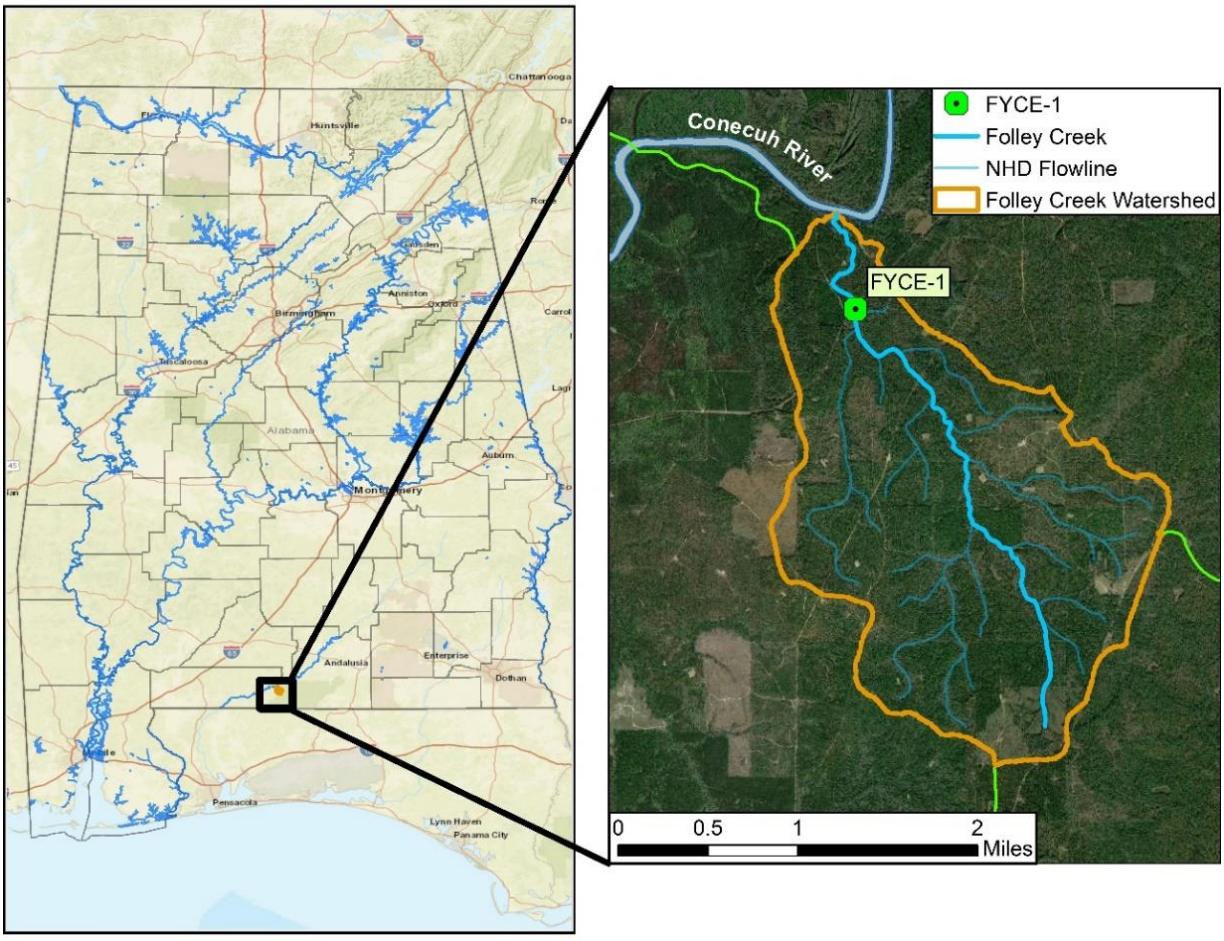
from the period of February 4, 2019 to December 19, 2019, the Department collected a comprehensive continuous turbidity dataset from both stations JOBB-2 and FYCE-1.

The table below gives information with regard to the ADEM monitoring station FYCE-1 located on Folley Creek. See Figure 3.2.2.1 below for an illustration of the station location in the watershed.

Table 3.2.2.1 Folley Creek Monitoring Station

Station ID	Latitude	Longitude	Location Description	Drainage Area (mi2)
FYCE-1	31.127793	-86.796471	Folley Creek at County Rd. 53	3.55

Figure 3.2.2.1 Folley Creek Monitoring Station



Chapter 4. Monitoring Results and Data Analysis

4.1 Conventional Water Quality Data Results

As previously mentioned, the Department has chosen to employ the "reference condition" approach for determining the appropriate numeric siltation target in the waterbody necessary to support its designated uses. For the purposes of this analysis, the available total suspended solids and turbidity water quality data collected at station JOBB-2 on Joes Branch during the Department's 2019 §303(d) sampling program was compared to the applicable eco-reference guideline concentration, which is based on the 90th percentile of the data distributions from the selected eco-region reference sites.

The reference streams selected for a particular analysis depends primarily on the number of available reference stations and associated data within a particular ecoregion. Therefore, the total number of reference sites selected and the aerial scale (i.e. Ecoregion Level III, Level IV) used to represent a reference condition will often vary on a case-by-case basis. As previously mentioned, Joes Branch watershed can be subdivided into the following Level IV Ecoregions: 65f Southern Pine Plains and Hills (63.7%), 75a Gulf Coast Flatwoods (36.2%), and 75k Gulf Barrier Islands and Coastal Marshes (0.2%). However, eco-reference guideline values for the Level III Ecoregions 75a and 75b are not available. Therefore, the applicable eco-reference guideline concentration will be based on the Level IV ecoregion 65f, which covers the majority of the Joes Branch watershed. The table below illustrates the level 65f eco-reference guideline concentrations. See Appendix C for more information regarding the 2015 eco-reference guideline concentrations.

Table 4.1.1 Joes Branch 2015 Eco-Reference Guideline Concentrations

Station	2015 65f Eco-Reference Guideline Concentrations	
	Total Suspended Solids (mg/l)	Turbidity (NTU)
JOBB-2	10.0	8

4.1.1 Total Suspended Solids

The table below presents an assessment of the available total suspended solids (TSS) data collected along the listed segment of Joes Branch in 2019. The median TSS concentration (7.0 mg/l) from Joes Branch during 2019 sampling efforts is considerably less than the eco-reference guideline concentration (10 mg/l).

Table 4.1.1.1 JOBB-2: 2019 Total Suspended Solids Results

Parameter	N	Min	Max	Med	Avg	SD	10th % ile	90th % ile	Eco-Reference (65f)
Total Suspended Solids	7	2.0	17.0	**7.0**	8.0	5.4	2.0	13.4	10.0

4.1.2 Turbidity

The current Departmental numeric turbidity criteria states that *"in no case shall turbidity exceed 50 nephelometric units above background."* For the purposes of this Delisting Decision, the eco-reference guideline turbidity value was considered to be representative of "background" conditions. Therefore, the available turbidity samples from JOBB-2 were individually compared against the applicable numeric criterion (i.e., 50 plus eco-reference guideline turbidity) in order to determine if the currently listed segment of Joes Branch is now meeting its respective designated uses.

The table below presents an assessment of the available individual grab sample turbidity data collected along the listed segment of Joes Branch in 2019. Based upon the table below, all of the collected turbidity samples were less than the applicable numeric criterion.

Table 4.1.2.1 JOBB-2: 2019 Turbidity Results

Station	# of Turbidity Grab Samples	Maximum measured NTU	Background Concentration (i.e. Eco-reference Concentration)	Turbidity Numeric Criterion (50 + Background)	# of Turbidity Samples > Numeric Criterion
JOBB-2	8	29.2	8.0	58	0

4.1.3 Habitat Assessment

A habitat assessment survey was conducted on Joes Branch at station JOBB-2 during the 2019 sampling period. Reach characteristics and habitat conditions were evaluated based on several categories including instream habitat quality, sediment deposition, stream sinuosity, bank stability, and riparian buffer. The results were then compared to scores from reference reaches in the same or similar eco-regions in order to provide an overall indication of the quality and availability of habitat for aquatic life. Below are the results for the habitat assessments conducted at station JOBB-2.

Table 4.1.3.1 Joes Branch 2019 Habitat Assessment Survey Results

Joes Branch at JOBB-2, April 25, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	**40**	Marginal (30-49.999)
Sediment Deposition	**35**	Marginal (30-49.999)
Sinuosity	**30**	Marginal (30-49.999)
Bank Vegetative Stability	**69**	Sub-optimal (55-74.999)
Riparian Zone Measurements	**78**	Sub-optimal/Optimal (75-79.999)
Habitat Assessment Score	**96**	
% Maximum Score	**53**	**Marginal/Sub-optimal (50-54.999)**

4.2 Continuous In-situ Turbidity Results

In order to address the siltation impairment on Joes Branch, the Department also evaluated continuous in-situ turbidity results in addition to conventional grab total suspended solids results. Total suspended solids results cannot be measured continuously in-situ, and must be evaluated as individual static results from grab samples. The approach of evaluating continuous in-situ results in addition to individual static grab samples allows the Department to monitor how instream turbidity is responding throughout time along the entire streamflow hydrograph, rather than at one specific snapshot in time. This allows the Department to assess how instream turbidity is responding during varying streamflow regimes, from baseflow conditions to extreme rain event driven conditions.

The assessment of the siltation impairment on Joes Branch was based upon the evaluation of the continuous in-situ turbidity data collected at station JOBB-2 in comparison to continuous in-situ turbidity data from the eco-reference stream station FYCE-1 during the available period. This assessment consisted of a multi-faceted approach analyzing how instream turbidity in both Joes Branch and the reference stream Folley Creek respond to varying stream flow conditions, from baseflow to rainfall driven events.

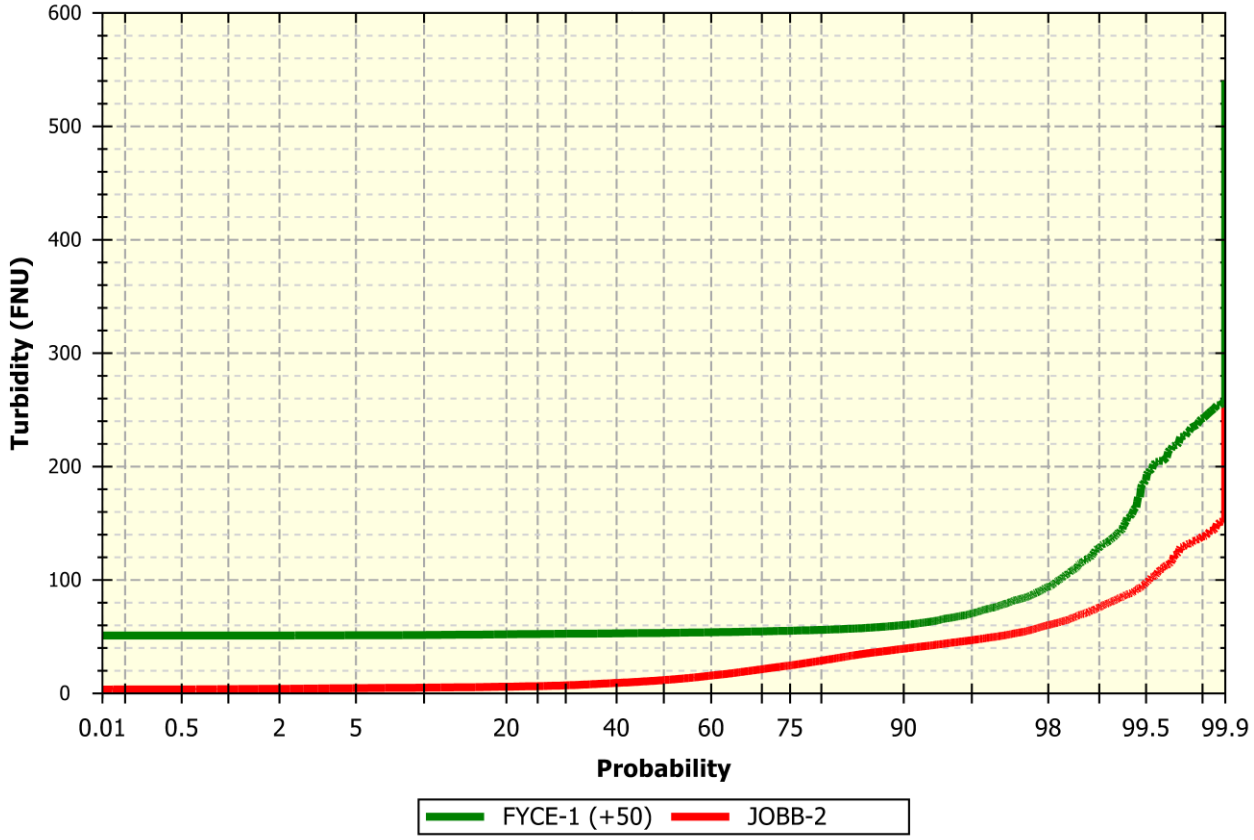
4.2.1 Continuous In-situ Turbidity Data Analysis

The first step in analyzing the continuous monitoring data was to consider the Department's specific numeric water quality criterion for turbidity which states that *"in no case shall turbidity exceed 50 nephelometric units above background."* As mentioned previously, the reference stream selected for analysis of the continuous in-situ results was station FYCE-1, located on Folley Creek in Escambia County, Alabama. Continuous turbidity results from the eco-reference station FYCE-1 were considered as "background." Therefore, the applicable numeric turbidity criterion

is represented by each individual turbidity result recorded at station FYCE-1 plus an additional 50 NTUs (i.e., 50 plus background).

The figure below illustrates a probability plot of the available continuous Joes Branch turbidity results compared to the numeric turbidity criterion described above (FYCE-1 Turbidity plus 50 NTUs). Based on the results illustrated in the graph, the instream turbidity results from station JOBB-2 are less than the applicable criterion. At station JOBB-2, a total of 24,910 individual turbidity samples were recorded during the time frame of February 4, 2019 to December 19, 2019. The graph below illustrates that 96.24% of the 24,910 individual continuous in-situ turbidity results are less than 50 NTUs.

Figure 4.2.1.1 Continuous In-situ Turbidity: FYCE-1 (+50) vs. JOBB-2

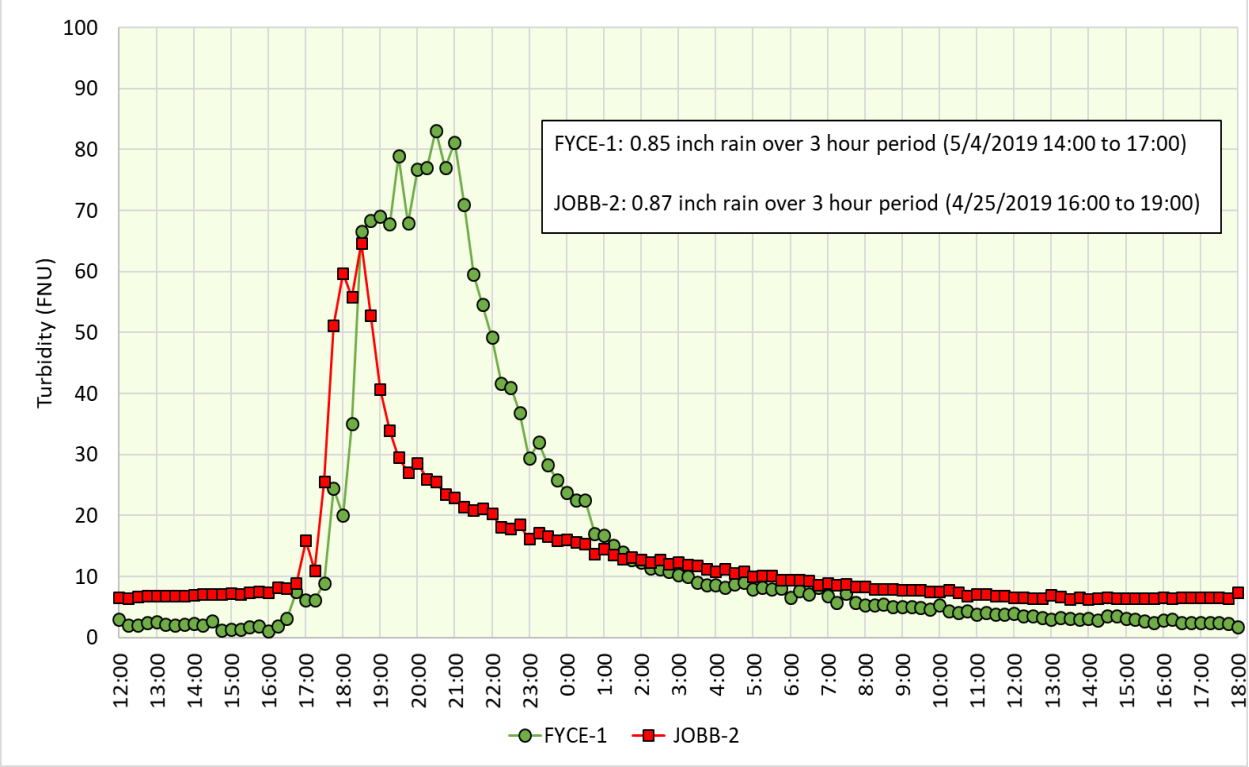


Station ID	Min	Max	Mean	Median	Pct 0.5	Pct 2	Pct 5	Pct 20	Pct 40	Pct 60	Pct 75	Pct 90	Pct 98	Pct 99.5	Pct 99.9
FYCE-1 (+50)	51	540	56.8	53.3	51	51	51.2	52	52.9	53.8	55.2	60.2	93.9	187.1	270.0
JOBB-2	10.1	342.2	26.9	22.2	3.5	4	10.7	5.8	9.16	15.6	34.8	45.5	60.2	97.0	177.4

The Department also evaluated how the instream turbidity within the listed segment of Joes Branch and the ecoreference stream Folley Creek react to rainfall events of similar magnitude and duration in the watershed. This analysis encompasses how the turbidity results respond along the entire streamflow hydrograph. Precipitation gages were set up near the Joes Branch and Folley Creek watersheds to record rainfall events. Note, the figures below do not depict the identical rainfall event within both watersheds. Rather, the intent of this analysis is to present the instream turbidity response for a given rainfall event of similar magnitude and duration.

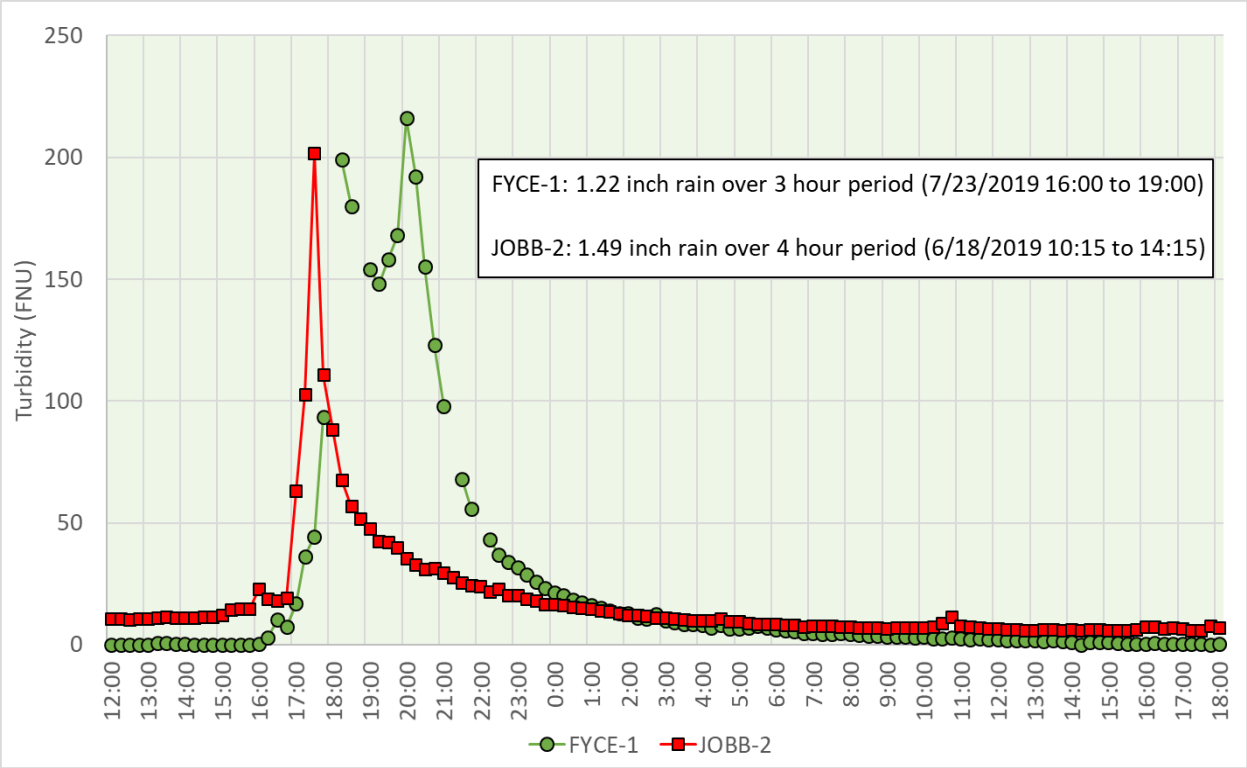
The figure below illustrates the turbidity response from a nearly 1 inch rain over a three hour time period that occurred in both watersheds. As illustrated in the figure below, the maximum instream turbidity recorded at station JOBB-2 is less than the maximum instream turbidity result recorded at the reference station FYCE-1. Furthermore, the total elapsed time for the instream turbidity to return to "baseflow" conditions within both waterbodies is very similar.

Figure 4.2.1.2 FYCE-1 vs JOBB-2: Rainfall Event Response Scenario #1



Similarly, the figure on the following page illustrates the turbidity response from a nearly 1.5 inch rain over a three to four hour time period that occurred in both watersheds. As Illustrated in the figure below, the maximum instream turbidity recorded at station JOBB-2 is comparable to the instream turbidity results recorded at the reference station FYCE-1. Furthermore, the total elapsed time for the instream turbidity to return to "baseflow" conditions within both waterbodies is very similar.

Figure 4.2.1.3 FYCE-1 vs JOBB-2: Rainfall Event Response Scenario #2



Chapter 5. Conclusion

From examination of available data, ADEM has determined that a water quality impairment due to siltation does not currently exist for Joes Branch. Therefore, ADEM will not develop a TMDL for siltation due to "more recent data," which is a just cause for delisting waterbodies according to Title 40 of the Code of Federal Regulations (CFR), Part 130.7(b)(6)(iv).

Chapter 6. Public Participation

As part of the public participation process, this Delisting Decision was placed on public notice and made available for review and comment. A public notice was prepared and published in the major daily newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject Delisting Decision were made available on ADEM's Website: www.adem.alabama.gov. The public could also request hard or electronic copies of the Delisting Decision by contacting Ms. Kimberly Minton at 334-271-7826 or kminton@adem.alabama.gov. The public was given an opportunity to review the Delisting Decision and submit comments to the Department in writing. At the end of the comment period, all written comments received during the public notice period became part of the administrative record. ADEM considered all comments received by the public prior to final completion of this Delisting Decision and subsequent submission to EPA Region 4 for final approval.

Appendix A. References

Alabama Department of Environmental Management. Administrative Code, 2017. Water Quality Program, Chapter 335-6-10, Water Quality Criteria, and Chapter 335-6-11 Use Classifications for Interstate and Intrastate Waters.

Alabama Department of Environmental Management, Field Operations Division. *Alabama's Surface Water Quality Monitoring Plan 2000-2018*

Cook, Marlon R., 2007. *Analysis of sediment loading rates and impacts of land use change on the D'Olive and Tiawasee Creek watersheds, Baldwin County, Alabama, 2007*. Open file report 0710, Geological Survey of Alabama, Tuscaloosa, AL.

"Mobile Bay National Estuary Program." The Restoration - Mobile Bay National Estuary Program, www.mobilebaynep.com/the_watersheds/dolive_watershed/the_restoration/

United States Environmental Protection Agency. 1991. Guidance for Water Quality-Based Decisions: The TMDL Process, Office of Water, EPA 440/4-91-001.

Appendix B. Water Quality Data

STATION ID	ACTIVITY DATE	Flow cfs	Dissolved Oxygen mg/l	pH su	Turbidity ntu	Temp,Water c	Solids, Total Suspended mg/l	DET_COND - Solids, Total Suspended mg/l
FYCE-1	3/21/2019 10:00		9.4	5.6	4	13.6	6	
FYCE-1	4/9/2019 11:08	5.6	8.7	4.9	4	18.2	5	
FYCE-1	4/24/2019 14:11	4.1	9	5.4	3.6	18.3		
FYCE-1	5/16/2019 12:00	5.5	8.8	5.3	4.7	19.3	5	
FYCE-1	6/12/2019 11:05	3	8.4	5	4.3	21.3	1	< MDL 1
FYCE-1	7/17/2019 10:33	2.5	8.3	4.9	2.3	21.9	6	JQ6
FYCE-1	8/8/2019 9:15	2.5	8.3	5.7	4.2	21.9	4	
FYCE-1	9/5/2019 10:39		8.4	5.2	3.4	21.8	4	
FYCE-1	10/1/2019 11:31	1.8	8.5	6.1	2.2	21.7	3	
JOBB-2	3/13/2019 11:11	0.6	6.8	6.8	16.5	18.4	17	
JOBB-2	4/17/2019 15:15	0.5	6.4	6.5	7.2	21.1	2	JI
JOBB-2	4/25/2019 6:47	0.4	5.2	6.6	25.4	20.4		
JOBB-2	5/15/2019 10:17	0.4	6.2	6.8	8.3	21.6	11	
JOBB-2	6/19/2019 10:17	0.9	5.8		6.6	25.9	2	JI
JOBB-2	7/24/2019 10:40	1.1	6.5		29.2	25.9	6	
JOBB-2	8/6/2019 15:22	0.1	5.5	6.6		28		
JOBB-2	8/7/2019 10:44	0.3	3.9	6.6	19.7	26.6	7	
JOBB-2	9/10/2019 10:39	0.1	2.8	6.5	18.3	27	11	

Appendix C. Joes Branch Pictures

Figure C.1 Joes Branch Station JOBB-2 Upstream (4/17/2019 15:07)

Figure C.2 Joes Branch Station JOBB-2 Downstream (4/17/2019 15:07)

Figure C.3 Joes Branch Station JOBB-2 Upstream (8/07/2019 10:35)

Figure C.4 Joes Branch Station JOBB-2 Downstream (8/07/2019 10:35)

Figure C.5 Joes Branch Station JOBB-2: Continuous In-Situ Turbidity Station

Figure C.6 Joes Branch Station JOBB-2: FTS DTS-12 Turbidity Sensor

Figure C.7 Joes Branch Project #2 Westminster Gates Stream Restoration (Downstream)

Figure C.8 Joes Branch Project #2 Westminster Gates Stream Restoration (Upstream)

Figure C.9 Joes Branch UT 2012 Westminster Village Stream Restoration (Downstream)

Figure C.10 Joes Branch UT 2012 Westminster Village Stream Restoration (Upstream)

Appendix D. Alabama 2015 Ecoregional Reference Guidelines

		Level 4	Level 4	Level 3	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 3	Level 4	Level 4	Level 4	Level 3	Level 4	Level 4	Level 4	Level 3
Parameters	Basis of comparison	45a	45d	45	65a	65b	65a/b	65d	65f	65g	65i	65j	65q	67f	67h	67	68c	68d	68e	68	71f	71g	71h	71
Physical																								
Temperature (°C)	90th %ile	26.0	25.0	26.0	28.5	27.9	28.5	24.5	25.0	25.7	25.0	23.4	26.8	23.2	24.0	24.0	23.6	24.9	24.0	24.0	23.2	23.0	22.8	22.9
Turbidity (NTU)	90th %ile	16.69	8.00	13.30	46.52	5.65	35.22	31.64	8.00	12.20	31.14	9.90	20.10	11.89	-	10.20	7.85	9.68	10.15	9.12	3.55	27.72	2.89	10.74
Total Dissolved Solids (mg/L)	90th %ile	68.5	86.2	71.2	174.5	-	165.0	104.8	66.0	101.0	58.0	51.6	131.8	174.5	85.2	163.8	212.9	92.2	70.9	187.0	-	-	78.6	123.4
Total Suspended Solids (mg/L)	90th %ile	15.0	13.2	15.0	44.1	-	36.3	46.6	10.0	17.8	33.4	18.4	29.4	13.2	9.0	12.6	6.0	26.6	10.0	11.0	-	15.4	4.0	8.4
Specific Conductance (µmhos)	Median	39.7	37.2	39.3	210.3	137.0	187.2	76.8	24.2	57.5	21.0	23.9	86.1	209.1	26.3	196.0	311.0	49.0	40.0	52.0	97.3	249.0	100.0	107.0
Hardness (mg/L)	Median	11.1	11.0	11.1	82.1	56.8	75.2	30.8	5.7	24.1	6.0	7.5	42.0	103.0	-	79.3	161.5	14.1	10.0	15.2	-	137.0	-	51.5
Total Alkalinity (mg/L)	90th %ile	23.91	21.62	23.40	94.44	76.96	87.18	37.50	12.00	75.26	13.96	11.75	48.22	121.33	8.20	120.08	165.80	20.88	37.87	144.00	-	-	49.60	101.20
Chemical																								
Dissolved Oxygen (mg/L)	10th %ile	7.24	7.61	7.31	5.86	6.19	5.90	7.30	6.32	4.63	6.65	6.76	6.69	7.98	8.14	8.03	6.40	6.70	7.30	6.90	8.18	7.02	8.97	7.83
pH (SU)	10th %ile	6.5	6.8	6.6	7.0	7.1	7.0	6.6	4.7	4.8	5.8	6.0	6.5	7.0	6.8	6.9	7.5	6.5	6.7	6.7	7.1	7.3	7.6	7.2
pH (SU)	90th %ile	7.6	7.7	7.7	8.4	8.2	8.4	7.6	6.8	7.5	7.2	7.0	7.7	8.3	8.3	8.3	8.0	7.7	7.8	7.9	7.7	7.9	8.4	8.3
Ammonia Nitrogen (mg/L)	90th %ile	0.0075	0.0105	0.0075	0.0521	0.0382	0.0512	0.0270	0.0485	0.0227	0.0663	0.0220	0.0619	0.0305	0.0167	0.0302	0.0264	0.1091	0.5000	0.1676	-	0.0075	0.0156	0.0180
Nitrate + Nitrite Nitrogen (mg/L)	90th %ile	0.1444	0.0770	0.1190	0.1696	0.1854	0.1810	0.4448	0.3470	0.2166	0.2467	0.2184	0.0739	0.2435	0.0590	0.2256	0.2998	1.0751	0.4244	0.5780	-	1.0565	1.6164	1.4694
Total Kjeldahl Nitrogen (mg/L)	90th %ile	0.3783	0.2544	0.3137	0.9846	0.3526	0.7401	0.5527	0.4700	0.5849	0.5350	0.3020	0.5596	0.3504	0.3389	0.3490	0.3428	0.8216	0.4668	0.4850	-	0.2660	0.2410	0.2475
Total Nitrogen (mg/L)	90th %ile	0.4774	0.2868	0.4135	1.1498	0.4340	0.9126	0.7444	0.7822	0.7590	0.6165	0.4170	0.5925	0.4726	0.3479	0.4585	0.5220	1.5698	0.6242	0.8786	-	1.2320	1.6428	1.5820
Dissolved Reactive Phosphorous (mg/L)	90th %ile	0.0205	0.0270	0.0230	0.0680	-	0.0598	0.0167	0.0208	0.0170	0.0204	0.0876	0.0180	0.0152	0.0088	0.0150	0.0216	0.0130	0.0136	0.0170	-	-	0.0150	0.0150
Total Phosphorous (mg/L)	90th %ile	0.0671	0.0535	0.0610	0.1537	0.0462	0.1348	0.0609	0.0310	0.0536	0.0590	0.0154	0.0597	0.0474	0.0400	0.0452	0.0190	0.0512	0.0500	0.0500	-	0.0355	0.0234	0.0354
CBOD-5 mg/L	90th %ile	2.80	2.40	2.51	2.40	-	2.22	1.81	1.99	1.84	2.10	1.30	2.30	1.72	-	2.06	1.00	1.50	1.25	1.43	-	-	1.04	1.27
Chlorides (mg/L)	90th %ile	4.79	4.06	4.60	14.08	6.93	13.90	4.99	6.00	4.97	4.52	6.28	5.65	2.48	-	3.61	11.47	5.72	2.07	4.13	-	-	2.52	2.54
Total Metals																								
Total Aluminium (µg/L)	90th %ile	186.80	118.00	187.40	2290.00	-	1160.00	1039.60	501.00	463.80	991.20	-	550.00	373.90	-	379.00	313.00	-	491.40	330.50	-	-	-	69.80
Total Iron (µg/L)	90th %ile	1045.80	616.00	985.50	2564.00	-	1820.00	2290.00	1337.00	3184.00	4398.00	-	3263.00	522.00	-	445.80	229.20	1304.00	809.00	809.00	-	-	-	430.80
Total Manganese (µg/L)	90th %ile	82.00	68.60	82.00	281.00	-	143.30	143.40	50.70	455.60	530.20	-	253.40	25.70	-	26.80	46.50	129.10	109.00	82.20	-	-	-	25.00
Dissolved Metals																								
Dissolved Aluminium (µg/L)	90th %ile	106.30	54.50	54.50	114.00	-	100.00	111.40	308.00	269.40	100.00	-	180.00	100.00	-	100.00	38.00	-	100.00	100.00	-	-	-	79.25
Dissolved Antimony (µg/L)	90th %ile	1.00	1.00	1.00	-	-	1.82	1.31	3.75	1.00	1.82	-	3.75	5.00	-	1.82	3.00	-	5.00	5.00	-	-	-	5.00
Dissolved Arsenic (µg/L)	90th %ile	-	-	-	-	-	1.96	-	2.50	-	1.40	-	2.50	9.80	-	5.00	0.39	0.50	0.50	0.50	-	-	-	-
Dissolved Cadmium (µg/L)	90th %ile	2.5000	2.5000	2.5000	-	-	2.5000	0.1555	0.1555	2.5000	2.5000	-	0.1250	-	-	2.5000	-	-	0.2000	0.2000	-	-	-	-
Dissolved Chromium (µg/L)	90th %ile	39.5000	39.5000	39.5000	-	-	19.7000	16.0000	39.5000	39.5000	39.5000	-	7.5000	25.0000	-	25.0000	3.5000	-	25.0000	25.0000	-	-	-	25.0000
Dissolved Copper (µg/L)	90th %ile	2.5000	2.5000	2.5000	-	-	-	2.5000	2.5000	-	-	-	-	-	-	-	-	-	15.5000	15.5000	-	-	-	-
Dissolved Iron (µg/L)	90th %ile	373.90	247.50	367.50	387.00	-	339.80	624.20	634.00	709.40	504.60	-	1214.00	162.00	-	151.60	57.10	-	519.20	432.80	-	-	-	149.00
Dissolved Lead (µg/L)	90th %ile	1.00	1.00	1.00	1.00	-	1.00	1.60	2.50	1.00	1.00	-	2.50	1.00	-	1.00	0.75	-	1.00	1.00	-	-	-	-
Dissolved Manganese (µg/L)	90th %ile	46.00	23.50	29.80	-	-	32.60	65.60	47.00	388.80	319.80	-	131.20	25.00	-	25.00	27.40	-	83.00	50.00	-	-	-	25.00
Dissolved Mercury (µg/L)	90th %ile	0.15	0.15	0.15	0.15	-	0.15	-	0.25	-	0.34	-	0.25	0.20	-	0.20	-	-	0.07	0.20	-	-	-	0.15
Dissolved Nickel (µg/L)	90th %ile	3.0000	9.5000	9.5000	-	-	21.0000	21.6000	8.4000	13.0000	25.0000	-	21.0000	25.0000	-	25.0000	4.0000	-	25.0000	25.0000	-	-	-	25.0000
Dissolved Selenium (µg/L)	90th %ile	5.00	5.00	5.00	5.00	-	5.00	5.00	4.13	5.00	5.00	-	5.00	5.00	-	5.00	0.72	5.00	5.00	1.00	-	-	-	-
Dissolved Silver (µg/L)	90th %ile	1.5000	1.5000	1.5000	-	-	1.5000	1.5000	1.5000	1.5000	1.5000	-	1.5000	-	-	-	1.0600	-	2.5000	2.5000	-	-	-	-
Dissolved Thallium (µg/L)	90th %ile	0.5	0.50	0.50	-	-	0.54	0.55	0.50	0.50	0.68	-	0.60	0.68	-	0.68	0.20	-	0.50	0.50	-	-	-	-
Dissolved Zinc (µg/L)	90th %ile	34.5000	34.5000	34.5000	34.5000	-	34.5000	8.5000	34.5000	34.5000	34.5000	-	16.6000	34.5000	-	34.5000	30.0000	-	33.5500	34.5000	-	-	-	25.0000
Biological																								
Chlorophylla (µg/L)	90th %ile	5.34	2.14	3.20	3.28	-	3.20	3.20	3.24	5.79	3.82	1.67	3.20	2.17	2.14	2.14	1.34	1.98	1.12	1.60	-	-	5.05	4.76
E Coli (mpn/100 ml)	10th %ile	-	-	24.25	-	-	45.84	66.12	8.60	-	143.02	-	-	-	-	-	38.73	-	24.60	28.32	-	-	-	-

Appendix E. Joes Branch Completed Projects Summary

Completed Projects

Joe's Branch Subwatershed

- **Joe's Branch (JB) Step Pool Stormwater Conveyance**: In 2011, collapsing banks along an ephemeral (only wet after rains) Spanish Fort tributary on Westminster Village property threatened residences and Highway 31 and delivered an unprecedented 100,000 tons of sediment per square mile into Mobile Bay. MBNEP secured Clean Water Act Section 319 funding to construct a rock step pool conveyance over a sand infiltration matrix down the steep 1,000-foot slope to reduce stormwater energy and volume. Southern Excavating was contracted to implement this Thompson Engineering design. This successful restoration project won a 2015 Gulf Guardian Award for Partnerships and survived the April 29, 2014, 500-year rain event.

- **JB Project 2**: With funding from the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund (NFWF GEBF) for comprehensive restoration of the most critically-degraded streams across the D'Olive Watershed, a head cut advancing towards the toe of the step pool conveyance and threatening sewer infrastructure was the next project to be addressed. Thompson designed hybrid measures, including elevating the stream bed, expanding the flood plain, using rock to stabilize stream banks, and installing rock weirs and energy dissipating log structures. This project, constructed by North State Environmental, restored 1,400-linear feet of stream and eight acres of wetland and flood plains, was substantially completed in August 2015. The Alabama Department of Transportation also provided funding for JB 2. Of note: Geological Survey of Alabama sampling indicates that the Step Pool Conveyance and JB Project 2 were successful in reducing sediment loads by over 90%.

Stream tributaries J4-1, J4-2, and JA, Joe's Branch Stormwater Management Facilities (SWMF).

- **J4-1 & J4-2:** Designed by Thompson Engineering and constructed by Southern Excavating, this NFWF GEBF project restored 1,100 linear feet of incised stream and relocated an existing sewer line.
- **JB & J SWMF:** Restored an existing 35,000 cubic feet detention basin on the property of Westminster Gates to original storage capacity (J SWMF).
- Constructed a new 53,000 cubic feet detention basin (JB SWMF) on the Alabama Power easement at Westminster Village immediately upstream of the Step Pool Conveyance.
- Both projects were funded by NFWF GEBF and reached substantial completion November 2016.
- **JA:** Restoration of three degraded gullies totaling 600 linear feet behind the Piggly Wiggly in Spanish Fort. Water was piped down the steep slope, to provide ecological services, to a plunge pool and wetlands to reduce energy and improve water quality prior to its confluence with the main stem of Joe's Branch.
- J4-1 & J4-2, JA, JB SWMF, and JSWMF were substantially completed in November 2016.

Project I.D.: **Joe's Branch Phase 1 (JB Project 1)**

Project Name: Joe's Branch Unnamed Tributary JB, Step Pool Stormwater Conveyance (SPSC) Project, D'Olive Watershed, Spanish Fort, Alabama

Location:
Latitude/Longitude (approx. center): 30°40'12.8" N; 87°54'16.0" W
Descriptive location: Spanish Fort, Alabama - south of US Hwy 31 and west of Westminster Drive

General Project Information:
Landowner(s):

- Special Care Facilities Financing (aka Westminster Village)

Engineer: Thompson Engineering, Inc.
Contractor: Southern Excavating LLC
Date of Start Construction: October 2012
Date of Substantial Completion of construction: April 2013
Date of completion of maintenance period: March 2015 (supplemental funding for plants)

Project Metrics:
For stream restoration / stabilization project:

Length of stream restored / stabilized (linear feet): 1000
Riparian area modified, floodplain/wetlands (acres): 2.2
Wetlands restored (acres): 0.5
Wetlands protected (acres): 13.7 (downstream)

Downstream wetlands have been protected by the Joe's Branch projects (Phases 1 and 2). The wetlands in the Spanish Fort Town Center complex (approximately 13.7 acres) were noted as severely impacted by sedimentation in the 2010 D'Olive Watershed Management Plan. The reduced sediment loadings from the Joe's Branch restoration projects are believed to have substantially lessened the continued impacts from sedimentation on the downstream wetlands.

Project Description:

In 2010, officials with the City of Daphne discovered highly turbid waters entering D'Olive Creek. The origin of the muddy water was traced to a 20-foot-deep headcut and a severely eroded channel in an unnamed tributary (designated as "JB") of Joe's Branch, within the D'Olive Watershed in Baldwin County, Alabama. Joe's Branch is included on ADEM's Section 303(d) list of impaired waters because of siltation and habitat alteration caused by land

development. This headcut, the result of excessive stormwater runoff, required immediate attention because it threatened the stability of residences at the adjacent Westminster Village Retirement Community and the heavily traveled U.S. Highway 31.

On behalf of a multi-jurisdictional project team, the Mobile Bay National Estuary Program (MBNEP) secured USEPA Section 319 funding for the project from the Alabama Department of Environmental Management (ADEM), and also matching funds from the Alabama Department of Transportation (ALDOT), to address the problem. The project represented the first step in the plan to rehabilitate Joe's Branch and remove it from the impaired waters list and was an initial effort to implement management recommendations of the D'Olive Creek Watershed Management Plan prepared by Thompson Engineering for MBNEP in 2010.

The restoration technique used is called a Step Pool Storm Conveyance (SPSC) system. The SPSC system is an aesthetically-pleasing approach that uses a porous sand/woodchip mixture beneath the primary flow channel to retain and filter stormwater during lower flow events. The system's flow path itself is constructed by a network of rock riffles and pools to stabilize the eroded channel and dissipate energy during higher flow events. The project also included restoration of the degraded wetlands severely impacted by sedimentation from the prior erosion immediately downstream of SPSC rock structures.

The construction of this first-of-its-kind project in Alabama was completed in 2013. Since installation, the SPSC project has:

- Restored the severely eroded 1,000-ft. slope to more natural conditions, remediating the effects of erosion and sedimentation and improving water quality in water bodies located downstream of the SPSC project

- Removed the threat of damaging erosion to nearby highway and housing infrastructure
- Stabilized steep slopes, provided wildlife habitat and minimized the potential for erosion with natural vegetation

- Restored wetland areas, preserved habitats and reduced threats to aquatic and wildlife species

- Demonstrated through water quality monitoring performed by the Geological Survey of Alabama (GSA) that, following construction, an order-of-magnitude reduction for turbidity and total suspended solids had occurred. In GSA's Open File Report 1408, post-restoration total sediment loadings downstream of the restoration site, as compared to pre-restoration rates, were found to be 90% lower.

In April 2014, the project area withstood a "100-year rainfall event" of more than 13-inches with minimal problems.

The SPSC project represents the first restoration measure initiated from implementation of a comprehensive Watershed Management Plan prepared for the D'Olive Bay watershed in 2010. Its success helped justify funding from the National Fish and Wildlife Foundation (NFWF) Gulf Environmental Benefit Fund for a broader program to address similar problems throughout the watershed.

An educational outreach video, The Restoration of Joe's Branch, was produced by the MBNEP to introduce the project to municipal leaders and others. It was created not only as an educational tool for this type of project, but also to emphasize the importance of a collaborative approach among various entities to address such problems. In addition to MBNEP, ADEM, ALDOT, and Thompson Engineering, other project partners included the Alabama Department of Conservation and Natural Resources (ADCNR), Geological Survey of Alabama (GSA), City of Daphne, City of Spanish Fort, and Westminster Village (the landowner). In 2015, the USEPA Gulf of Mexico Program awarded the project a 1st Place Gulf Guardian Award in the Partnerships category.

Project Maps:

Project I.D.: Joe's Branch Phase 2 (JB Project 2, JA, J4-1, J4-2, J-SWMF, JB-SWMF)

Project Names and Locations:

JB2 - Joe's Branch Unnamed Tributary JB, Project 2, Stream Restoration Downstream of Step Pool Storm Conveyance (SPSC) System, D'Olive Watershed, Spanish Fort, Alabama

Location: *JB Project 2* Latitude/Longitude (approx. center): 30°40'3.5" N; 87°54'22.8" W

Descriptive location: Spanish Fort, Alabama - south of US Hwy 31 near Spanish Fort United Methodist Church

JA - Joe's Branch Unnamed Tributary JA, D'Olive Watershed, Spanish Fort, Alabama

Location: *JA* Latitude/Longitude (approx. center): 30°39'58.5" N; 87°54'34.1" W

Descriptive location: Spanish Fort, Alabama - south of US Hwy 31 near Piggly Wiggly Shopping Center

J4-1 – Joe's Branch Upstream of Town Center Avenue, D'Olive Watershed, Spanish Fort, Alabama

Location: *J4-1* Latitude/Longitude (approx. center): 30°39'54.5" N; 87°54'12.3" W

Descriptive location: Spanish Fort, Alabama - upstream of Town Center Avenue

J4-2 – Joe's Branch Upstream of J4-1, D'Olive Watershed, Spanish Fort, Alabama

Location: *J4-2* Latitude/Longitude (approx. center): 30°39'56.7" N; 87°54'6.9" W

Descriptive location: Spanish Fort, Alabama - upstream of J4-1 and downstream of J- SWMF at Westminster Gates Subdivision

J-S WMF – Joe's Branch Stormwater Management Facility (SWMF), D'Olive Watershed, Spanish Fort, Alabama

Location: *J-SWMF* Latitude/Longitude (approx. center): 30°39'58.3" N; 87°54'2.0" W

Descriptive location: Spanish Fort, Alabama - stormwater detention facility for Westminster Gates Subdivision at Maury Court

JB-SWMF – Joe's Branch Unnamed Tributary Stormwater Management Facility (SWMF) upstream of Step Pool Storm Conveyance (SPSC) System, D'Olive Watershed, Spanish Fort, Alabama

Location: *JB-SWMF* Latitude/Longitude (approx. center): 30°40'14.5" N; 87°54'8.8" W

Descriptive location: Spanish Fort, Alabama - stormwater management facility south of US Hwy 31 and west of Westminster Drive

General Project Information:

Landowner(s):
JB-2

- Special Care Facilities Financing (aka Westminster Village)
- Spanish Fort United Methodist Church
- Cypress Spanish Fort Venture LLC

JA, J4-1, J4-2, J-SWMF, JB-SWMF

- Special Care Facilities Financing (aka Westminster Village)
- Spanish Fort United Methodist Church
- Cypress Spanish Fort Venture LLC
- Church of His Presence
- Westminster Gates Homeowners Association

Engineer: Thompson Engineering, Inc.
Contractors:

JB-2 **North State Environmental LLC**
Date of start of construction: April 2015
Date of Substantial Completion of construction: August 2015
Date of completion of maintenance period: August 2017

Project Metrics:
For stream restoration / stabilization project:
Length of stream restored / stabilized (linear feet):1600
Riparian area modified, floodplain/wetlands (acres): 3
Wetlands restored (acres): 0 (not including wetlands incidental to stream restoration)

JA, J4-1, J4-2, J-SWMF, JB-SWMF **Southern Excavating LLC**

Date of start of construction: February 2016
Date of Substantial Completion of construction: November 2016

Date of completion of maintenance period: November 2018

Project Metrics:
For stream restoration / stabilization projects:

JA
Length of stream restored / stabilized (linear feet): 600
Riparian area modified, floodplain/wetlands (acres): 1
Wetlands restored (acres): 0 (not including wetlands incidental to stream restoration)

J4-1, J4-2
Length of stream restored / stabilized (linear feet): 1,100
Riparian area modified, floodplain/wetlands (acres): 3
Wetlands restored (acres): 0 (not including wetlands incidental to stream restoration)

For stormwater management facilities (SWMF):
J-SWMF
Area (acres): 0.4
Detention/retention storage volume (cubic feet): 35,000

JB-SWMF
Area (acres): 0.5
Detention/retention storage volume (cubic feet): 53,400
Wetlands protected (acres): 13.7 (downstream)

Note: The above project metrics display that Joe's Branch Phase 2 projects did not include wetland restoration other than wetlands incidental to stream restoration. However, downstream wetlands have been protected by the Joe's Branch projects (Phases 1 and 2). The wetlands in the Spanish Fort Town Center complex (approximately 13.7 acres) were noted as severely impacted by sedimentation in the 2010 D'Olive Watershed Management Plan. The reduced sediment loadings from the Joe's Branch restoration projects are believed to have substantially lessened the continued impacts from sedimentation on the downstream wetlands.

Project Description:
Subsequent to successful completion of the Joe's Branch Step Pool Storm Conveyance (SPSC) project (Joe's Branch Phase 1), additional funds were received for Joe's Branch Phase 2 from the National Fish and Wildlife Foundation – Gulf Environmental Benefit Fund (NFWF-GEBF), which was among the first use of these "BP Deepwater Horizon" funds in the state of Alabama. With this funding, MBNEP began restoration activities throughout the D'Olive Bay Watershed. This restoration program began with the Joe's Branch sub-watershed.

Initial project activities included a field assessment of stream/watershed conditions in the Joe's Branch sub-watershed, which is comprised of three stream segments: 1) unnamed tributary to Joe's Branch (JA) north of Town Center Avenue and east of US Hwy. 98; 2) unnamed tributary to Joe's Branch (JB) north of Town Center Avenue and located south of the completed SPSC Project; and 3) Joe's Branch proper, east (and upstream) of Town Center Avenue through a wooded wetland area upstream to headwater residential and commercial developed areas. The field team adopted the Unified Stream Assessment (USA) approach for the evaluation. The USA is a rapid technique to locate and evaluate problems and restoration opportunities within stream corridors.

The following were designed and constructed for Joe's Branch Phase 2 restoration:

1) JA Subwatershed:

- Gully erosion repair for three gullies in JA Lower Reach (western area near Hwy. 98) which included installation of vegetated wall systems / Flex MSE ditch checks.
- Installation of a 50-ft x 100-ft. plunge pool with an outfall.
- Installation of 300 LF of 48" diameter Class III RCP pipe to channel stormwater through a non- historic streambed area into the plunge pool. The piping system contained four junction boxes to change direction of flow.

2) JB Subwatershed:
JB Project 2 Stream Restoration

- 1,400 linear feet of armored riprap was installed to restore the unnamed tributary flowing to Joe's Branch proper and ultimately draining to the D'Olive creek watershed. The system included log and rock sills at various locations to stem waterflow velocity and provide grade control.

- Three separate stormdrain systems were installed totaling 450 linear feet of 24-inch diameter corrugated stormwater pipe with ten junction boxes for direction change, three outfalls and three plunge pools at various locations.

JB Stormwater Management Facility (JB-SWMF)

- 300-ft. x 75-ft. bio-retention pond that included wetland plants, baffle dike, outfall, and an overflow spillway/dam. The system decreased the velocity of the flow and filtered and treated the water prior to release to the step pool conveyance system.

3) Joe's Branch Subwatershed:

J4-1 and J4-2 Stream Restoration

- J4-1 stream restoration involved redirecting streamflow from an eroded area back into the historic channel and rehydrating the floodplain for roughly 700-ft.
- J4-2 stream restoration involved the installation of 400-ft. of riprap armored naturalized stream stabilization with rock sills for slowing velocity of water.

J Stormwater Management Facility (J-SWMF)

- J-SWMF involved restoring (to its original dimensions) an existing detention pond previously constructed for the Westminster Gates Subdivision

Project Maps: