CONSTRUCTION BEST MANAGEMENT PRACTICES PLAN

FOR ALDOT PROJECT NUMBER

NH-0001(611)

SR-1 (MEMORIAL PARKWAY) FROM 0.31 MILES SOUTH OF CR-75 (MASTIN LAKE RD) TO CR-65 (WINCHESTER RD). SELECT CLEARING, GRUBBING AND STRUCTURE REMOVAL.
MADISON 1966

RESPONSIBLE OFFICIAL:
Mr. Curtis W. Vincent, P.E.
ALDOT Region Engineer for Don T. Arkle, P.E., ALDOT Chief Engineer

CBMPP COMPILER:
D. Heath Cowen, T.T.
Roadway Design

DESIGN QUALIFIED CREDENTIALED PROFESSIONAL:
LaTasha R. Merchant, P.E.
Roadway Design Engineer

OPERATIONAL QUALIFIED CREDENTIALED PROFESSIONAL:
Mr. Jordan M. Fleming, P.E.
ALDOT Stormwater Coordinator
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CBMPP Explanation

This ALDOT Construction Best Management Practices Plan (CBMPP) is intended to satisfy the requirements of the Alabama Department of Environmental Management (ADEM) Administrative Code and the National Pollutant Discharge Elimination System (NPDES) Construction General Permit.

This CBMPP is also a means to gather and communicate environmental concerns, commitments, and contract requirements to ALDOT design and construction personnel as well as Contractors.

This document, all referenced or attached documents, and those posted on the Electronic CBMPP webpage together constitute the CBMPP for this project.

This CBMPP is provided to ALDOT Contractors prior to project letting.

The CBMPP is comprised of two main components; a Design Component and an Operational Component.

The Design Component is created and updated during the planning and design phase by ALDOT and/or consultant design personnel. The Design Qualified Credentialed Professional (QCP) certifies the Design Component of the CBMPP as having addressed all known environmental concerns, and that these concerns have been addressed in the project design.

The Operational Component is created and updated during the construction phase by ALDOT project personnel and contractor personnel. The Operational Qualified Credentialed Professional (QCP) certifies that the Design Component will be adhered to as closely as possible, and that the Operational Component will be created, updated, and adhered to during construction of the project.

This CBMPP is to be maintained at the Project Office during active construction on the project and retained with the project records after project completion. The CBMPP is to be made available to all project staff including all Contractors, ALDOT staff, and Regulators.
Design QCP Certification of Completion

I certify under penalty of law that the Design Component of this CBMPP and all attachments were compiled under my direction or supervision and are consistent with applicable ADEM Administrative Code and the National Pollutant Discharge Elimination System (NPDES) Construction General Permit. I further certify that all known environmental concerns and commitments, as noted in Section II., were considered and addressed during the creation of the Design Component of this CBMPP and the design reflected in the project plans. This CBMPP and any BMPs meets or exceeds the technical standards and guidelines of The Alabama Handbook and current industry standards. The Design Component of this CBMPP as submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

[Signature]
LaTasha R. Merchant, P.E.
Roadway Design Engineer

Date: 3/5/2020

NH-0001(611)
MADISON

ALDOT CBMPP Version January 2020
Operational QCP Certification of Receipt and Responsibility

I certify under penalty of law that the Design Component of this CBMPP and all attachments will be adhered to in a manner consistent with applicable ADEM Administrative Code and the National Pollutant Discharge Elimination System (NPDES) Construction General Permit. I further certify that modifications and additions to the Operational Component of this CBMPP will be made under my direction or supervision and that the Operational Component of this CBMPP will be, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

[Signature]

Date: 3/5/2020

Jordan M. Fleming
Mr. Jordan M. Fleming, P.E.
ALDOT Stormwater Coordinator
NH-0001(611)
MADISON
ALDOT Contact Information

RESPONSIBLE OFFICIAL:
Mr. Curtis W. Vincent, P.E.
ALDOT Region Engineer for Don T. Arkle, P.E., ALDOT Chief Engineer
1525 Perimeter Parkway, Suite 400
Huntsville, Alabama 35806
Phone (256) 505-4956
Fax (256)213-7038
vincentc@dot.state.al.us

DESIGN QUALIFIED CREDENTIALED PROFESSIONAL:
LaTasha R. Merchant, P.E.
Roadway Design Engineer
1409 Coliseum Boulevard
Montgomery, Alabama 36130
Phone (334) 353-6053
Fax (334)269-0826
merchantl@dot.state.al.us

OPERATIONAL QUALIFIED CREDENTIALED PROFESSIONAL:
Mr. Jordan M. Fleming, P.E.
ALDOT Stormwater Coordinator
23445 US Highway 431 North
Guntersville, Alabama 35976
Phone (256) 638-2644
Fax (256) 582-8922
flemingjo@dot.state.al.us
I.a. ADEM NPDES Notice of Intent
NOTICE OF INTENT - GENERAL PERMIT NUMBER ALR100000

NPDES PERMIT NUMBER ALR100000 IS A GENERAL PERMIT AUTHORIZING DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES THAT RESULT IN A TOTAL LAND DISTURBANCE OF ONE ACRE OR GREATER ANY SITES LESS THAN ONE ACRE BUT ARE PART OF A LARGER COMMON PLAN OR DEVELOPMENT OR SALE.

Mail to:  Alabama Department of Environmental Management
         Water Division
         Stormwater Management Branch
         Post Office Box 301463
         Montgomery, Alabama 36130-1463

PLEASE COMPLETE ALL QUESTIONS. INCOMPLETE OR INCORRECT ANSWERS, OR MISSING SIGNATURES WILL DELAY PROCESSING. IF SPACE IS INSUFFICIENT, CONTINUE ON AN ATTACHED SHEET(S) AS NECESSARY. ATTACH CBMPP AND OTHER INFORMATION AS NEEDED. PLEASE TYPE OR PRINT LEGIBLY IN INK.

I. PERMITTEE INFORMATION

Permittee Name (Legal Name)  ALABAMA DEPARTMENT OF TRANSPORTATION

Responsible Official (RO) Street/Physical Address  1525 Perimeter Parkway, Suite 400

Responsible Official (RO) Mailing Address  1525 Perimeter Parkway, Suite 400

Responsible Official Phone Number  (256) 505-4956

Responsible Official E-Mail Address  vincentc@dot.state.al.us

Responsible Owner/Operator or Official, and Title  Curtis W. Vincent, PE, ALDOT Region Engineer

Responsible Official (RO) Street/Physical Address  Huntsville, AL 35806

Responsible Official (RO) Mailing Address  Huntsville, AL 35806

Corporation

Individual

Sole Proprietorship

Partnership

LLC

LPL

Government Agency

II. FACILITY INFORMATION

Facility/Site Name  NH-0001(611) PS1966

Facility Contact Company Name  ALABAMA DEPARTMENT OF TRANSPORTATION

Facility Street Address or Location Description  SR-1 (MEMORIAL PARKWAY) FROM 0.31 MILES SOUTH OF CR-75 (MASTIN LAKE RD) TO CR-65 (WINCHESTER RD), STRUCTURE REMOVAL, AND SELECTIVE CLEARING AND GRUBBING.

Facility Contact Phone Number  (256) 571-7242

Facility Contact and Title  Jordan M. Fleming, PE, ALDOT Guntersville Area SWC

City  HUNTSVILLE

County(s)  MADISON

Zip  35810

Beginning / Ending Project Latitude and Longitude  34° 46' 01"  86° 35' 15"  34° 47' 34"  86° 34' 39"

Facility Contact E-Mail Address:  flemingjo@dot.state.al.us

Detailed Directions to the Site

SR-1 (MEMORIAL PARKWAY) FROM 0.31 MILES SOUTH OF CR-75 (MASTIN LAKE RD) TO CR-65 (WINCHESTER RD), STRUCTURE REMOVAL, AND SELECTIVE CLEARING AND GRUBBING.

III. ACTIVITY DESCRIPTION

Brief Description of Construction / Land disturbance activity(s):  CLEARING AND GRUBBING

IV. PROPOSED SCHEDULE

Anticipated Activity Schedule:  Commencement date:  04/24/2020  Completion date:  03/30/2021

Area of the Registered site:  Total site area in acres:  100  Total disturbed area in acres:  8

V. PRIORITY CONSTRUCTION SITE

Is this a Priority Construction Site as defined by Part V of the construction stormwater general Permit?  Yes  No  X  If yes, attach/submit a copy of the CBMPP that meets or exceeds the requirements of Parts III A. and E. of the construction stormwater general permit.
VI. TOPOGRAPHIC MAP SUBMITTAL

Please attach a recent 7.5 minute series USGS topographic map(s) no larger than 11 by 17 inches (several pages may be necessary), showing the location of the Facility including site boundaries, areas of disturbance, a 1 mile radius, perennial, intermittent, and ephemeral streams, lakes/springs/wells/wetlands and contour lines. The map should also show the point(s) at which stormwater runoff will exit (overfall) the facility and the point(s) where stormwater runoff from the site will enter the receiving water.

VII. RECEIVING WATERS

Are there any surface waters within 25 feet of your project's earth disturbances?  

Yes ☐ No ☒

List name of receiving water(s), latitude & longitude (decimal or deg, min, sec) of location(s) that run-off enters the receiving water, and the waterbody classification. Please refer to ADEM Admin. Code 335-6-11 for a detailed list of water use classifications. (Attach a separate list if necessary)

<table>
<thead>
<tr>
<th>Receiving Water</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Waterbody Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>See Attached</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

VIII. GENERAL INFORMATION

Will flocculants or other chemical stabilization products be used on this site?  

Yes ☐ No ☒

IX. QUALIFIED CREDENTIALED PROFESSIONAL (QCP) CERTIFICATION

"I certify under penalty of law that a comprehensive Construction Best Management Practices Plan (CBMPP) for the prevention and minimization of all sources of pollution in stormwater and authorized related process wastewater runoff has been prepared under my supervision for this site/ activity, and associated regulated area/activities. The CBMPP meets the requirements of this permit and if properly implemented and maintained by the operator, discharges of pollutants in stormwater runoff can reasonably be expected to be effectively minimized to the maximum extent practicable according to the requirements of ADEM Administrative Code Chapter 335-6-6-33 and this Permit. The CBMPP describes the erosion and sediment control measures that must be fully implemented and regularly maintained as needed at the permitted site in accordance with sound sediment and erosion control practices to ensure the protection of water quality."

QCP Designation/Description  
LaTasha R. Merchant, PE

Address  
1409 Coliseum Boulevard Montgomery, AL 36110

Registration / Certification  
32279

Name and Title (type or print)  
LaTasha R. Merchant, PE, ALDOT Roadway Design Engineer

Phone Number  
(334) 353-6033

Signature  
LaTasha R. Merchant, PE

Date Signed  
3/5/2020

X. OPERATOR - RESPONSIBLE OFFICIAL SIGNATURE

Pursuant to ADEM Administrative Code Rule 335-6-6-.09, this NOI must be signed by a Responsible Official of the permits who is the owner, operator, or the sole proprietor of a sole proprietorship, a general controlling member or partner, a ranking elected official or other duly authorized representative for a unit of government; or an executive officer of at least the level of vice-president for a corporation, having overall responsibility and decision making for the site/activity. "I certify under penalty of law that this form, the CBMPP, and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the qualified credentialed professional (QCP) and other person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, correct, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine or imprisonment for knowing violations. I certify that this form has not been altered, if copied or reproduced, is consistent in format and identical in content to the ADEM approved form. I further certify that the proposed discharges described in this registration have been evaluated for the presence of any non-construction and/or coal/mineral mining stormwater, or process wastewaters have been fully identified."

Name and Title (type or print)  
Curtis W. Vincent, PE, ALDOT Region Engineer

Official Title  
ALDOT Region Engineer

Signature  
Curtis W. Vincent, PE

Date Signed  
3/5/2020
### VII. RECEIVING WATERS

<table>
<thead>
<tr>
<th>Receiving Water</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Waterbody Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 UT Normal Branch</td>
<td>34° 45' 59&quot;</td>
<td>86° 35' 14&quot;</td>
<td>FW</td>
</tr>
<tr>
<td>2.0 UT Pinhook Creek</td>
<td>34° 46' 00&quot;</td>
<td>86° 35' 16&quot;</td>
<td>FW</td>
</tr>
<tr>
<td>3.0 UT Pinhook Creek</td>
<td>34° 46' 09&quot;</td>
<td>86° 35' 13&quot;</td>
<td>FW</td>
</tr>
<tr>
<td>4.0 Normal Branch</td>
<td>34° 46' 11&quot;</td>
<td>86° 34' 59&quot;</td>
<td>FW</td>
</tr>
<tr>
<td>5.0 UT Normal Branch</td>
<td>34° 46' 38&quot;</td>
<td>86° 34' 59&quot;</td>
<td>FW</td>
</tr>
<tr>
<td>6.0 UT Pinhook Creek</td>
<td>34° 47' 23&quot;</td>
<td>86° 34' 44&quot;</td>
<td>FW</td>
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</tbody>
</table>
ALABAMA
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED PROJECT NUMBER
NH-0001(611)

SR-1 (MEMORIAL PARKWAY) FROM 0.31 MILES SOUTH OF CR-75 (MASTIN LAKE RD) TO CR-65 (WINCHESTER RD).
SELECT CLEARING, GRUBBING AND STRUCTURE REMOVAL.
MADISON COUNTY

These plans have been prepared to conform with the Alabama Department of Transportation Standard Specifications for Highway Construction, 2018 edition.
## I.b. Project Plan Checklist

Detailed project information relevant to environmental design, protection, and compliance is located in the plan set. Information contained in the plan sheets satisfies the requirements of the ADEM Administrative Code and the NPDES Construction General Permit. Please reference the following applicable plan sheets. Their location within the plan set can be found on sheet 1A, the Index to Sheets.

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<td>☒</td>
<td>Sequence of Construction</td>
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<td>☒</td>
<td>☐</td>
<td>Erosion &amp; Sediment Control Plans</td>
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<tr>
<td>☒</td>
<td>☐</td>
<td>Erosion &amp; Sediment Control Schematics</td>
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<td>Hydraulic Data Sheet</td>
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<td>Drainage Sections</td>
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<td>☐</td>
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<td>Soil Boring Logs</td>
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<td>Cross Sections</td>
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I.c. Soil Properties
Custom Soil Resource Report for Madison County, Alabama

NH-0001(611)
Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual’s income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require
alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.
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<td>15</td>
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<td>References</td>
<td>22</td>
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<td>Glossary</td>
<td>24</td>
</tr>
</tbody>
</table>
How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil
scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.
## MAP LEGEND

### Area of Interest (AOI)
- Area of Interest (AOI)

### Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

### Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot

### Water Features
- Streams and Canals

### Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

### Special Line Features
- Water Features

### Background
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Madison County, Alabama

Survey Area Data: Version 11, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2019—May 24, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.
### Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad</td>
<td>Abernathy-Emory silt loams, 0 to 2 percent slopes</td>
<td>15.2</td>
<td>11.4%</td>
</tr>
<tr>
<td>Bb</td>
<td>Baxter (Fullerton) gravelly silt loam, 2 to 6 percent slopes, eroded</td>
<td>3.0</td>
<td>2.2%</td>
</tr>
<tr>
<td>Bh</td>
<td>Baxter cherty silty clay loam, severely eroded, rolling</td>
<td>21.1</td>
<td>15.8%</td>
</tr>
<tr>
<td>Bk</td>
<td>Baxter cherty silty clay loam, severely eroded, hilly</td>
<td>23.9</td>
<td>17.9%</td>
</tr>
<tr>
<td>DbB2</td>
<td>Decatur silty clay loam, 2 to 6 percent slopes, eroded</td>
<td>59.1</td>
<td>44.3%</td>
</tr>
<tr>
<td>Dd</td>
<td>Decatur silty clay, 6 to 10 percent slopes, severely eroded</td>
<td>11.2</td>
<td>8.4%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td><strong>Total Acres: 133.4</strong></td>
<td><strong>Percent: 100.0%</strong></td>
<td><strong>Total Percent: 100.0%</strong></td>
</tr>
</tbody>
</table>

### Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor...
components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.
Madison County, Alabama

Ad—Abernathy-Emory silt loams, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2sr8q
Elevation: 480 to 1,070 feet
Mean annual precipitation: 50 to 65 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 195 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Abernathy and similar soils: 60 percent
Emory and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Abernathy
Setting
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Alluvium over residuum weathered from limestone

Typical profile
Ap - 0 to 7 inches: silt loam
Bw - 7 to 16 inches: silt loam
2Ab - 16 to 35 inches: silt loam
2Btb - 35 to 65 inches: silty clay loam
2Btxb - 65 to 80 inches: silty clay loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: 63 to 72 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.02 to 0.60 in/hr)
Depth to water table: About 30 to 39 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No
Description of Emory

Setting

Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Alluvium derived from limestone over residuum weathered from limestone

Typical profile

Ap - 0 to 8 inches: silt loam
Bw - 8 to 31 inches: silt loam
2Ab - 31 to 42 inches: silty clay loam
2Btb - 42 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 60 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Tupelo

Percent of map unit: 10 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Decatur

Percent of map unit: 10 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No
**Bb—Baxter (Fullerton) gravelly silt loam, 2 to 6 percent slopes, eroded**

**Map Unit Setting**
- **National map unit symbol:** 2xn74
- **Elevation:** 590 to 980 feet
- **Mean annual precipitation:** 46 to 56 inches
- **Mean annual air temperature:** 57 to 64 degrees F
- **Frost-free period:** 180 to 220 days
- **Farmland classification:** All areas are prime farmland

**Map Unit Composition**
- **Baxter (fullerton) and similar soils:** 85 percent
- **Minor components:** 15 percent
- **Estimates are based on observations, descriptions, and transects of the mapunit.**

**Description of Baxter (fullerton)**

**Setting**
- **Landform:** Ridges
- **Landform position (two-dimensional):** Summit
- **Landform position (three-dimensional):** Side slope
- **Down-slope shape:** Convex
- **Across-slope shape:** Convex
- **Parent material:** Residuum weathered from cherty limestone

**Typical profile**
- **Ap - 0 to 11 inches:** gravelly silt loam
- **Bt1 - 11 to 19 inches:** gravelly silty clay loam
- **Bt2 - 19 to 80 inches:** gravelly clay

**Properties and qualities**
- **Slope:** 2 to 6 percent
- **Depth to restrictive feature:** More than 80 inches
- **Natural drainage class:** Well drained
- **Runoff class:** Low
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high to high (0.57 to 1.98 in/hr)
- **Depth to water table:** More than 80 inches
- **Frequency of flooding:** None
- **Frequency of ponding:** None
- **Salinity, maximum in profile:** Nonsaline to very slightly saline (0.0 to 2.0 mhmhos/cm)
- **Available water storage in profile:** Moderate (about 7.7 inches)

**Interpretive groups**
- **Land capability classification (irrigated):** None specified
- **Land capability classification (nonirrigated):** 2e
- **Hydrologic Soil Group:** B
- **Hydric soil rating:** No
Minor Components

Dewey
Percent of map unit: 8 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Dickson
Percent of map unit: 7 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Bh—Baxter cherty silty clay loam, severely eroded, rolling

Map Unit Setting
National map unit symbol: kk9h
Elevation: 500 to 1,200 feet
Mean annual precipitation: 46 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Baxter, (fullerton), and similar soils: 85 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the map unit.

Description of Baxter, (fullerton)

Setting
Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Residuum weathered from cherty limestone

Typical profile
H1 - 0 to 12 inches: gravelly silty clay loam
H2 - 12 to 48 inches: gravelly silty clay loam
H3 - 48 to 60 inches: gravelly clay
Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Lee
Percent of map unit: 1 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: Yes

Bk—Baxter cherty silty clay loam, severely eroded, hilly

Map Unit Setting

National map unit symbol: kk9j
Elevation: 500 to 1,200 feet
Mean annual precipitation: 46 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Baxter, (fullerton), and similar soils: 80 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Baxter, (fullerton)

Setting
Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
**Down-slope shape:** Linear  
**Across-slope shape:** Convex  
**Parent material:** Residuum weathered from cherty limestone  

**Typical profile**  
- **H1 - 0 to 12 inches:** gravelly silty clay loam  
- **H2 - 12 to 48 inches:** gravelly silty clay loam  
- **H3 - 48 to 60 inches:** gravelly clay  

**Properties and qualities**  
- **Slope:** 12 to 20 percent  
- **Depth to restrictive feature:** More than 80 inches  
- **Natural drainage class:** Well drained  
- **Runoff class:** Medium  
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high to high (0.57 to 1.98 in/hr)  
- **Depth to water table:** More than 80 inches  
- **Frequency of flooding:** None  
- **Frequency of ponding:** None  
- **Available water storage in profile:** Moderate (about 7.7 inches)  

**Interpretive groups**  
- **Land capability classification (irrigated):** None specified  
- **Land capability classification (nonirrigated):** 4e  
- **Hydrologic Soil Group:** B  
- **Hydric soil rating:** No  

**Minor Components**  
- **Lee**  
  - **Percent of map unit:** 1 percent  
  - **Landform:** Flood plains  
  - **Landform position (two-dimensional):** Toeslope  
  - **Landform position (three-dimensional):** Talf  
  - **Down-slope shape:** Convex  
  - **Across-slope shape:** Linear  
  - **Hydric soil rating:** Yes  

**DbB2—Decatur silty clay loam, 2 to 6 percent slopes, eroded**  

**Map Unit Setting**  
- **National map unit symbol:** 2wc2q  
- **Elevation:** 560 to 950 feet  
- **Mean annual precipitation:** 46 to 65 inches  
- **Mean annual air temperature:** 57 to 64 degrees F  
- **Frost-free period:** 180 to 240 days  
- **Farmland classification:** All areas are prime farmland  

**Map Unit Composition**  
- **Decatur and similar soils:** 85 percent  
- **Minor components:** 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Decatur

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Clayey residuum weathered from limestone

Typical profile

Ap - 0 to 7 inches: silty clay loam
Bt1 - 7 to 24 inches: silty clay loam
Bt2 - 24 to 80 inches: clay

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mhmhos/cm)
Available water storage in profile: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Emory

Percent of map unit: 8 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No

Abernathy

Percent of map unit: 4 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No

Chenneby, occasionally flooding

Percent of map unit: 3 percent
**Landform:** Flood-plain steps  
**Landform position (two-dimensional):** Toeslope  
**Landform position (three-dimensional):** Talf  
**Down-slope shape:** Concave  
**Across-slope shape:** Linear  
**Hydric soil rating:** No

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**Dd—Decatur silty clay, 6 to 10 percent slopes, severely eroded**

**Map Unit Setting**
- **National map unit symbol:** 2wc2x  
- **Elevation:** 440 to 1,120 feet  
- **Mean annual precipitation:** 46 to 60 inches  
- **Mean annual air temperature:** 57 to 70 degrees F  
- **Frost-free period:** 180 to 220 days  
- **Farmland classification:** Farmland of statewide importance

**Map Unit Composition**
- **Decatur and similar soils:** 95 percent  
- **Minor components:** 5 percent  

Estimates are based on observations, descriptions, and transects of the map unit.

**Description of Decatur**

**Setting**
- **Landform:** Hillslopes  
- **Landform position (two-dimensional):** Backslope  
- **Landform position (three-dimensional):** Side slope  
- **Down-slope shape:** Linear  
- **Across-slope shape:** Convex  
- **Parent material:** Clayey residuum weathered from limestone

**Typical profile**
- **Ap - 0 to 4 inches:** silty clay  
- **Bt1 - 4 to 20 inches:** silty clay  
- **Bt2 - 20 to 80 inches:** clay

**Properties and qualities**
- **Slope:** 6 to 10 percent  
- **Depth to restrictive feature:** More than 80 inches  
- **Natural drainage class:** Well drained  
- **Runoff class:** High  
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high to high (0.57 to 1.98 in/hr)  
- **Depth to water table:** More than 80 inches  
- **Frequency of flooding:** None  
- **Frequency of ponding:** None  
- **Salinity, maximum in profile:** Nonsaline to very slightly saline (0.0 to 2.9 mmhos/cm)  
- **Available water storage in profile:** Moderate (about 7.5 inches)
Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Emory

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No
References


Custom Soil Resource Report


Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: “National Soil Survey Handbook.”

**ABC soil**
A soil having an A, a B, and a C horizon.

**Ablation till**
Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

**AC soil**
A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

**Aeration, soil**
The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil**
Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alkali (sodic) soil**
A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

**Alluvial cone**
A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.
Alluvial fan
A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium
Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl
A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)
The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions
Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon
A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo
The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect
The direction toward which a slope faces. Also called slope aspect.

Association, soil
A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)
The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:
Very low: 0 to 3  
Low: 3 to 6  
Moderate: 6 to 9  
High: 9 to 12  
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology)
from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

**Bedding system**

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

**Bedrock**

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-controlled topography**

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

**Bench terrace**

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

**Bisequum**

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

**Blowout (map symbol)**

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

**Borrow pit (map symbol)**

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

**Bottom land**

An informal term loosely applied to various portions of a flood plain.

**Boulders**

Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Breaks**

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.
Breast height
An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management
Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte
An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding
A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil
A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche
A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)
The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy
The leafy crown of trees or shrubs. (See Crown.)
Canyon
A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water
Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena
A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation
An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity
The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps
See Terracettes.

Cement rock
Shaly limestone used in the manufacture of cement.

Channery soil material
Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment
Control of unwanted vegetation through the use of chemicals.

Chiseling
Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque
A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).
Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.
Complex slope
Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil
A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions
See Redoximorphic features.

Conglomerate
A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system
Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage
A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil
Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping
Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section
The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
Coprogenous earth (sedimentary peat)
A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)
A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)
Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop
A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management
Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system
Growing crops according to a planned system of rotation and management practices.

Cross-slope farming
Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown
The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate
A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta
An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.
Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.
Dip slope
A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)
A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming
A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)
Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the “Soil Survey Manual.”

Drainage, surface
Runoff, or surface flow of water, from an area.

Drainageway
A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw
A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift
A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.
Drumlin
A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff
A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune
A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill
See Mine spoil.

Ecological site
An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation
The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation
A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit
Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream
A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.
Episaturation
A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion
The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)
Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)
Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement
A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface
A land surface shaped by the action of erosion, especially by running water.

Escarport
A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarport, bedrock (map symbol)
A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarport, nonbedrock (map symbol)
A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker
A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left
behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

**Extrusive rock**
Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth’s surface.

**Fallow**
Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

**Fan remnant**
A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

**Fertility, soil**
The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat)**
The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity**
The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fill slope**
A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

**Fine textured soil**
Sandy clay, silty clay, or clay.

**Firebreak**
An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.
First bottom
An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material
Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone
A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain
The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms
A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay
A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step
An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial
Of or pertaining to rivers or streams; produced by stream or river action.

Foothills
A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope
The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb
Any herbaceous plant not a grass or a sedge.
Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.
Gravel
Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)
An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material
Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)
A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)
A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water
Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)
A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock
Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim
Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan
A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.
Head slope (geomorphology)
A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)
Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops
Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill
A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope
A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil
A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:
**O horizon:** An organic layer of fresh and decaying plant residue.

**L horizon:** A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

**A horizon:** The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

**E horizon:** The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

**B horizon:** The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

**C horizon:** The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

**Cr horizon:** Soft, consolidated bedrock beneath the soil.

**R layer:** Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

**M layer:** A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

**W layer:** A layer of water within or beneath the soil.

**Humus**

The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups**

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

**Igneous rock**

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

**Illuviation**

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.
Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

- Very low: Less than 0.2
- Low: 0.2 to 0.4
- Moderately low: 0.4 to 0.75
- Moderate: 0.75 to 1.25
- Moderately high: 1.25 to 1.75
- High: 1.75 to 2.5
- Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.
Intermittent stream
A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders
On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions
See Redoximorphic features.

Irrigation
Application of water to soils to assist in production of crops. Methods of irrigation are:

- **Basin**: Water is applied rapidly to nearly level plains surrounded by levees or dikes.
- **Border**: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
- **Controlled flooding**: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
- **Corrugation**: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
- **Drip (or trickle)**: Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
- **Furrow**: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
- **Sprinkler**: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
- **Subirrigation**: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
- **Wild flooding**: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame
A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.
Karst (topography)
A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll
A small, low, rounded hill rising above adjacent landforms.

Ksat
See Saturated hydraulic conductivity.

Lacustrine deposit
Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain
A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace
A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)
An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide
A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones
Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)
A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching
The removal of soluble material from soil or other material by percolating water.
Levee (map symbol)
An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility
Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$- or $1/10$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit
The moisture content at which the soil passes from a plastic to a liquid state.

Loam
Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess
Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength
The soil is not strong enough to support loads.

Low-residue crops
Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl
An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)
A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement
A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.
Masses
See Redoximorphic features.

Meander belt
The zone within which migration of a meandering channel occurs; the floodplain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar
A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll
One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment
Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil
Very fine sandy loam, loam, silt loam, or silt.

Mesa
A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock
Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth's crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)
An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil
An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil
Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.
Minimum tillage
Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area
A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)
Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil
Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil
Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon
A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine
In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil
The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil
Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Mountain
A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can
occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

**Muck**

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

**Mucky peat**

See Hemic soil material.

**Mudstone**

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

**Munsell notation**

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Natric horizon**

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

**Neutral soil**

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

**Nodules**

See Redoximorphic features.

**Nose slope (geomorphology)**

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

**Nutrient, plant**

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Organic matter**

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:
Very low: Less than 0.5 percent  
Low: 0.5 to 1.0 percent  
Moderately low: 1.0 to 2.0 percent  
Moderate: 2.0 to 4.0 percent  
High: 4.0 to 8.0 percent  
Very high: More than 8.0 percent

Outwash
Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain
An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace
An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan
A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, hardpan, fragipan, claypan, plowpan, and traffic pan.

Parent material
The unconsolidated organic and mineral material in which soil forms.

Peat
Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped
An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment
A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon
The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.
Percolation
The movement of water through the soil.

Perennial water (map symbol)
Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost
Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value
A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil
A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping
Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting
Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit
The moisture content at which a soil changes from semisolid to plastic.

Plasticity index
The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)
A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa
The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.
Plinthite
The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan
A compacted layer formed in the soil directly below the plowed layer.

Ponding
Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded
Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings
See Redoximorphic features.

Potential native plant community
See Climax plant community.

Potential rooting depth (effective rooting depth)
Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning
Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil
The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil
A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use
Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and
promotes the accumulation of litter and mulch necessary to conserve soil and water.

**Rangeland**

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

**Reaction, soil**

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

- **Ultra acid:** Less than 3.5
- **Extremely acid:** 3.5 to 4.4
- **Very strongly acid:** 4.5 to 5.0
- **Strongly acid:** 5.1 to 5.5
- **Moderately acid:** 5.6 to 6.0
- **Slightly acid:** 6.1 to 6.5
- **Neutral:** 6.6 to 7.3
- **Slightly alkaline:** 7.4 to 7.8
- **Moderately alkaline:** 7.9 to 8.4
- **Strongly alkaline:** 8.5 to 9.0
- **Very strongly alkaline:** 9.1 and higher

**Red beds**

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

**Redoximorphic concentrations**

See Redoximorphic features.

**Redoximorphic depletions**

See Redoximorphic features.

**Redoximorphic features**

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:
1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; and
   B. Masses, which are noncemented concentrations of substances within the soil matrix; and
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; and
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).

3. Reduced matrix.—This is a soil matrix that has low chroma in situ but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix
   See Redoximorphic features.

Regolith
   All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief
   The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)
   Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill
   A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.
Riser
The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut
A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments
Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)
An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone
The part of the soil that can be penetrated by plant roots.

Runoff
The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil
A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)
An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand
As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone
Sedimentary rock containing dominantly sand-sized particles.
Sandy spot (map symbol)
A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)
The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)
The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy’s Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as “Ksat.” Terms describing saturated hydraulic conductivity are:

*Very high:* 100 or more micrometers per second (14.17 or more inches per hour)
*High:* 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)
*Moderately high:* 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)
*Moderately low:* 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)
*Low:* 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)
*Very low:* Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation
Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification
The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock
A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.
Sequum
A sequence consisting of an illuvial horizon and the overlying eluvial horizon.
(See Eluviation.)

Series, soil
A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)
An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale
Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion
The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)
A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder
The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell
The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune
A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)
A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica
A combination of silicon and oxygen. The mineral form is called quartz.
Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.
Slope alluvium
Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill
The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement
Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil
A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)
An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity
The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of $\text{Na}^+$ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

- **Slight**: Less than 13:1
- **Moderate**: 13-30:1
- **Strong**: More than 30:1

Sodium adsorption ratio (SAR)
A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock
Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.
Soil
A natural, three-dimensional body at the earth’s surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates
Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:
- **Very coarse sand**: 2.0 to 1.0
- **Coarse sand**: 1.0 to 0.5
- **Medium sand**: 0.5 to 0.25
- **Fine sand**: 0.25 to 0.10
- **Very fine sand**: 0.10 to 0.05
- **Silt**: 0.05 to 0.002
- **Clay**: Less than 0.002

Solum
The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)
A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line
In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones
Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony
Refers to a soil containing stones in numbers that interfere with or prevent tillage.
**Stony spot (map symbol)**

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

**Strath terrace**

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

**Stream terrace**

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

**Stripcropping**

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

**Structure, soil**

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

*Platy:* Flat and laminated  
*Prismatic:* Vertically elongated and having flat tops  
*Columnar:* Vertically elongated and having rounded tops  
*Angular blocky:* Having faces that intersect at sharp angles (planes)  
*Subangular blocky:* Having subrounded and planar faces (no sharp angles)  
*Granular:* Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

*Single grained:* Entirely noncoherent (each grain by itself), as in loose sand  
*Massive:* Occurring as a coherent mass

**Stubble mulch**

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil**

Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling**

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.
Substratum
The part of the soil below the solum.

Subsurface layer
Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow
The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit
The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer
The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil
The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus
Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts
Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine
An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)
An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field
generally is built so that the field can be farmed. A terrace intended mainly for
drainage has a deep channel that is maintained in permanent sod.

**Terrace (geomorphology)**

A steplike surface, bordering a valley floor or shoreline, that represents the
former position of a flood plain, lake, or seashore. The term is usually applied
both to the relatively flat summit surface (tread) that was cut or built by stream
or wave action and to the steeper descending slope (scarp or riser) that has
graded to a lower base level of erosion.

**Terracettes**

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed
by creep or erosion of surficial materials that may be induced or enhanced by
trampling of livestock, such as sheep or cattle.

**Texture, soil**

The relative proportions of sand, silt, and clay particles in a mass of soil. The
basic textural classes, in order of increasing proportion of fine particles, are
sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam,
silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and
sandy loam classes may be further divided by specifying "coarse," "fine," or
"very fine."

**Thin layer**

Otherwise suitable soil material that is too thin for the specified use.

**Till**

Dominantly unsorted and nonstratified drift, generally unconsolidated and
deposited directly by a glacier without subsequent reworking by meltwater, and
consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and
boulders; rock fragments of various lithologies are embedded within a finer
matrix that can range from clay to sandy loam.

**Till plain**

An extensive area of level to gently undulating soils underlain predominantly by
till and bounded at the distal end by subordinate recessional or end moraines.

**Tilth, soil**

The physical condition of the soil as related to tillage, seedbed preparation,
seedling emergence, and root penetration.

**Toeslope**

The gently inclined surface at the base of a hillslope. Toeslopes in profile are
commonly gentle and linear and are constructional surfaces forming the lower
part of a hillslope continuum that grades to valley or closed-depression floors.
Topsoil
The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements
Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread
The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff
A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland
An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill
The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation
Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve
A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)
A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars
Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.
Weathering
All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth’s surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded
Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)
A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)
The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow
The uprooting and tipping over of trees by the wind.
I.d. Hydraulics/Hydrology

Pre/Post Development Flow Statement (select all applicable statements):

☑ There will be no significant difference in pre- and post- development peak flows.
☑ There will be no significant difference in pre- and post- development hydraulic velocities.
☑ There will be no significant difference in pre- and post- development runoff volume.

Hydraulic Analysis (select one):

☑ A hydraulic analysis was conducted for this project using rational method.
Calculations are available upon request.
☐ Hydraulic calculations were not performed due to ____________________________________________

Anticipated Rainfall Conditions

The following information was obtained from (select all that apply):

☑ NOAA’s National Weather Service Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (NOAA Atlas 14)
☑ USDA’s National Resources Conservation Service eFOTG
Alabama Supplements to the National Engineering Field Handbook – Chapter 2
☑ Other: US Department of Commerce, Weather Bureau

Minimum Design Storm for Temporary BMPs = 2-year frequency, 24-hour duration = 3.8 inches

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<thead>
<tr>
<th>Other 2-year Frequency Events (inches)</th>
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<tbody>
<tr>
<td>30 min</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1.4</td>
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</table>

<table>
<thead>
<tr>
<th>Average Monthly Precipitation (inches)</th>
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</thead>
<tbody>
<tr>
<td>Jan</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>5.17</td>
</tr>
</tbody>
</table>

Other Hydraulics/Hydrology Notes

Annual rainfall totals approximately 57.18 inches.
II.a. Environmental Concerns

Environmental Review

☒ The location of this project has been reviewed in accordance with FHWA’s required NEPA procedures.

☐ The location of this project has not been reviewed in accordance with FHWA’s required NEPA procedures.

Explanation

☐ Categorical Exclusion
☒ Programmatic Exclusion
☐ Finding of No Significant Impact
☐ Environmental Impact Statement

☒ The area reviewed for environmental concerns includes the limits of all work areas anticipated to be impacted by the project.

Environmental Concerns Found (select all that apply):

☐ Priority Construction Site (select one of the following Discharge conditions):
  ☒ 303(d) Listed – Impaired by Turbidity, Siltation, or Sedimentation
  ☒ TMDL Finalized/Approved – Impaired by Turbidity, Siltation, or Sedimentation
  ☒ Outstanding Alabama Water Use Classification
  ☒ Outstanding Natural Resource Water Use Classification
  ☒ Treasured Alabama Lake Use Classification
  ☒ Other

☐ Jurisdictional/Navigable Waters of the State including Wetlands

☐ Groundwater Well

☐ Threatened/Endangered Species and/or Habitat

☐ Historical/Archaeological Site

☒ Hazardous Materials Location (Paint, Asbestos, Underground Storage Tank, other)

☐ Proximity to Existing Municipal or Public Water Intake (½ Mile Upstream or ¼ Mile Downstream)

Potential Pollutants (select all that apply):

☒ This project will expose erodible material and thus create a potential source of sediment.

☒ Fuels, oils, and other chemicals associated with motorized equipment and vehicles may be present.

☒ Construction and worker debris may be present.

See Section III. of this document for additional information regarding pollution prevention requirements.

Other Environmental Concerns or Design Considerations

None
II.b. Environmental Commitments

Documentation follows addressing all Environmental Commitments noted below. ADEM NPDES Construction General Permit NOI and Receipt Letter are located in Section I. of this document.

Permits, Agreements, Clearances, Easements (note applicability for each)

<table>
<thead>
<tr>
<th>Yes/No</th>
<th>Commitment Type</th>
<th>Identification No.</th>
<th>Applied (Date)</th>
<th>Received (Date)</th>
<th>Expires (Date)</th>
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<tbody>
<tr>
<td>☒ Yes</td>
<td>NPDES MS4 Permit</td>
<td>ALS000006</td>
<td>9-30-19</td>
<td>10-1-19</td>
<td>9-30-24</td>
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<td>☒ Yes</td>
<td>USACOE 404 Individual Permit1</td>
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<td>USACOE 404 Nationwide Permit1</td>
<td>SAM-2016-00407-MBM</td>
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<td>3-19-17</td>
<td>3/18-22</td>
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<tr>
<td>☒ Yes</td>
<td>Corps Notification -</td>
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<tr>
<td>☒ Yes</td>
<td>FEMA</td>
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<td></td>
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</tr>
<tr>
<td>☒ Yes</td>
<td>TVA</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>☒ Yes</td>
<td>U. S. Coast Guard</td>
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<tr>
<td>☒ Yes</td>
<td>U. S. Fish &amp; Wildlife / Endangered Species</td>
<td>2009-TA-0163</td>
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<td>3-22-17</td>
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<tr>
<td>☒ Yes</td>
<td>Historical/Archaeological Clearance</td>
<td>AHC# 160532</td>
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<td>7-23-19</td>
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<tr>
<td>☒ Yes</td>
<td>Hazardous Materials Clearance</td>
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<tr>
<td>☒ Yes</td>
<td>FERC Approval</td>
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</tr>
</tbody>
</table>

Note1: This project is covered under a USACOE 404 permit, and thus, it is exempt from the Construction General Permit’s requirement to provide and maintain a 25-foot undisturbed natural buffer. However, the project will utilize BMPs to treat stormwater discharges from earth disturbances within 25 feet of the surface water to the maximum extent practicable.

Soil Exposure

This project has 8 acres of ADEM NPDES permitted disturbance.

The project maximum area of exposed erodible material at one time is limited to 17 acres, or the permitted disturbance acreage, whichever is less.

Turbidity Monitoring and Construction Stormwater Sampling

☒ Not Required

☐ Required for ALL drainage areas at the associated Primary Stormwater Discharge and Background Points

☐ Required for SELECT drainage areas at the associated Primary Stormwater Discharge and Background Points

Selected sites: list sites

Other Environmental Commitments, Obligations, or Expectations

No Environmental Commitments
March 16, 2017

Mr. William Pearson
US Fish and Wildlife Service
Daphne ES Field Office
1208-B Main Street
Daphne, AL 36526

RE: Threatened/Endangered Species Request-Update
NHF-8510 (009)
Memorial Parkway From North of Sparkman Drive
To Hollow Road NW
Madison County

Dear Mr. Pearson:

The proposed project will involve construction of frontage roads and grade separations on Memorial Parkway from south of Mastin Lake Road to Hollow Road, located in Madison County. Additional right-of-way will be required.

Your office previously cleared this project for any endangered/threatened species by letter dated August 20, 2014 (2009-TA-0163); however, the three year grace period for the endangered/threatened species clearance is close to lapsing (see attachment). In addition, the proposed project is not located near any known endangered bat hibernacula; therefore, it is the opinion of ALDOT Biologists that this proposed project fits the 2016 Programmatic Biological Opinion on the ESA Section 4(d) Rule for the Bat.

In accordance with Section 7 of the Endangered Species Act, we respectfully request that you concur again with the findings for this project. Your assistance in this matter will be greatly appreciated. If further information is needed, please contact Tony Shaddix at (334) 242-6145 or James Blanding at (334) 242-6150.

Sincerely,

Steve Walker, P.E.
Design Engineer

U.S. Fish and Wildlife Service
1208-B Main Street - Daphne, Alabama 36526
Phone: 251-441-0181 Fax: 251-441-6222

No federally listed species/critical habitat are known to occur in the project area. As described, the project will have no significant impact on fish and wildlife resources. IF PROJECT DESIGN CHANGES ARE MADE, PLEASE SUBMIT NEW PLANS FOR REVIEW. We recommend use of Best Management Practices specific to your project.

Kermit B. Clay
Environmental Administrator
Environmental Technical Section

William L. Petrakis, Field Supervisor

3/22/2017
DATE: July 23, 2019

TO: Mr. Dolha Kayisavera
   Assistant Environmental Coordinator
   ETS, Design Bureau

From: Mr. Bill Turner
   Archaeologist/Assistant Environmental Coordinator
   ETS, Design Bureau

RE: ALDOT #NH-0001(611)
   SR-1 (Memorial Pkwy) from 0.31 miles south of CR-75 (Mastin Lake Rd) to CR-65 (Winchester Rd) including an overpass at CR-75 and Access Improvements to CR-65. (Clearing, Grubbing, Structure Removal, and Utility Relocation)
   Huntsville, Madison County, Alabama

This memorandum was written regarding cultural resource issues for the above referenced project. The project area was surveyed in 2014 by MRS Consultants and submitted to SHPO review in 2016 for ALDOT #NH-8510(009), Improvements to Memorial Parkway in Huntsville. The survey covered Memorial Parkway from just north of Sparkman Drive to Hollow Road, which includes this segment of NH-0001(611). Concurrence was given in March 2016 with a no adverse effect on properties on or eligible for the National Register of Historic Places. A copy of the concurrence is attached.

After reviewing the latest set of preliminary plan sheets for NH-0001(611), SR-1 (Memorial Pkwy) from 0.31 miles south of CR-75 (Mastin Lake Rd) to CR-65 (Winchester Rd) including an overpass at CR-75 and Access Improvements to CR-65. (Clearing, Grubbing, Structure Removal, and Utility Relocation) in Huntsville, Madison County, Alabama all areas have been covered by the survey. Also, no changes have been made. Therefore, no further cultural resource work is needed. A copy of the current preliminary plan sheets is attached.

Due to there being no changes, this project meets Criteria 1 as a condition for using the Memorandum of Understanding for transportation reevaluation projects agreed upon by FHWA, ALSHPO and the ALDoT. A copy of the signed MOU is attached.
February 29, 2016

Ms. Lee Anne Wofford
Deputy State Historic Preservation Officer
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130

RE: Phase I Cultural Resource Survey of the Proposed Improvements to Memorial Parkway in Huntsville, ALDoT Project NHF-8510(009)
Madison County, Alabama

Dear Ms. Wofford:

Please find enclosed one printed and one CD copy of the above referenced cultural resource report A Phase I Cultural Resources Assessment of the Proposed Memorial Parkway Improvement Project in Huntsville, Madison County, Alabama prepared by MRS Consultants, LLC. As detailed in the enclosed report, no structures or archaeological resources on or eligible for listing in the National Register of Historic Places are within the project APE.

We respectfully request concurrence with the project, the report, and its findings that the proposed undertaking will have no adverse effect on properties on or eligible for the National Register of Historic Places.

Sincerely,

William F. Adams, P.E.
State Design Engineer

By: [Signature]

Alfredo Acoff, Coordinator
Environmental Technical Section

cc: Lynne Urquhart, FHWA
    Dolha Kaysavera
    PELA GeoEnvironmental, Inc.
    Project file

Concur: [Signature] Date: 3/17/16
August 21, 2019

Ms. Natasha Clay
ALDOT Design Bureau
1409 Coliseum Boulevard
Montgomery, AL 36130

RE: Project No. NHF-0001()
Memorial Parkway from 3.1 miles south of CR-75 to CR-65 including an overpass at CR-75 to CR-65 including an overpass at CR-75 and access improvements to CR-65
Madison County

Dear Ms. Clay:

Information received from your office on June 16, 2006 identified eight (8) potentially hazardous material sites on the above referenced project. This project has been previously cleared several times, most recently in a letter dated August 24, 2017 which showed an environmental remediation cost of $51,250. A preliminary investigation was performed on September 4, 2008 with our consultant Thompson Engineering as part of the previous investigation of this project. Updated plans and a request for reevaluation were received from your office on July 16, 2019 which included an additional site. The addition of that site and several additional sites identified in previous investigations bring the total to fifteen (15) potentially hazardous material sites on this project. Personnel from the Environmental Services Section visited the project on July 24, 2019 and it was determined that none of the sites along this project would warrant further investigation. The following is the results of the investigation:

**Site #1 - Advanced Auto Parts #9220 (Lt. of Sta. 101+75)**
This site is an Advanced Auto Parts automotive parts store located on the west side of Memorial Parkway, south of Mastin Lake Road. The most recent plans received show that additional right-of-way (ROW) will not be acquired from this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

**Site #2 - Big Lots/Tractor Supply Co. (Former Wal-mart) (Rt. of Sta. 107+00)**
This site currently contains a Big Lots and a Tractor Supply Company and formerly contained a Walmart store and is located on the east side of Memorial Parkway, south of Mastin Lake Road. The most recent plans received show that additional ROW will not be acquired from this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.
Site #3 – Gander Mountain (Formerly Sam's Club) (Rt. of Sta. 115+00)
This site is a Gander Mountain retail store located on the east side of Memorial Parkway, south of Mastin Lake Road. The most recent plans received show that a small amount of ROW will be acquired from this site which is not located near the facility; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

Site #4 – Victory Handy Food Mart – (Right of Station 118+50)
Victory Fuels is an active gasoline service station located on the southeast corner of the intersection of Memorial Parkway and Mastin Lake Road. According to the Alabama Department of Environmental Management (ADEM), two (2) underground storage tanks (USTs) were removed from this site in July of 1991. The site does not appear on ADEM’s Leaking Underground Storage Tank list. This site currently contains three (3) 8,000 gallon tanks located on the north side of the property, within the proposed right-of-way. Three (3) borings were made in the area surrounding the USTs and two (2) borings were made near the dispensing islands, for a total of five (5) borings. The boring locations can be seen in Figure 2 of Thompson Engineering’s Preliminary Investigation Report. Each boring was advanced to 12 feet below ground surface (bgs). No groundwater was encountered during the boring. Soil samples were taken from each boring at 4 ft. intervals for a total of fifteen (15) samples. Each sample was tested for total petroleum hydrocarbons (TPH). The results of these tests can be seen in Table 1 of the report. The results show that TPH levels were detected above the regulatory limit of 100 parts per million for one (1) of the samples. The contaminated sample was taken at 8 to 12 feet bgs from boring B-3, located near the active USTs. The USTs are located within the proposed right-of-way in an area where construction will be taking place, therefore, a UST closure site assessment will need to be performed at this site. The contamination area will be further investigated during this closure. Please see the following cost estimate for the required closure:

Bureau of Materials and Tests, Environmental Services Division:
Professional Services (Provided under current contracts)

<table>
<thead>
<tr>
<th>Description of Service</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide professional services for the collection and analytical testing for all soil/groundwater samples required during removal/closure activities.</td>
<td>$7,500.00</td>
</tr>
<tr>
<td>Provide professional services for the completion and submittal of the “Underground Storage Tank Closure Site Assessment” to the ADEM.</td>
<td>$7,500.00</td>
</tr>
</tbody>
</table>

Total: $15,000.00

General Contractor:
In Accordance with the “Standard Specifications for Highway Construction, 2018 Edition” Section 250 “Removal of Underground Storage Tanks and Contaminated Soil”

<table>
<thead>
<tr>
<th>Description of Service</th>
<th>Quantity</th>
<th>Unit Amount</th>
<th>Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide services for pumping/disposal of any contents in the tank prior to removal.</td>
<td>1,500 gallons</td>
<td>$5.00/gallon</td>
<td>$7,500.00</td>
</tr>
<tr>
<td>(SECTION 250.03(c))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide services for the excavation/disposal of petroleum contaminated soil.</td>
<td>150 yd³</td>
<td>$125/yd³</td>
<td>$18,750.00</td>
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<td>(SECTION 250.03(d))</td>
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</tr>
<tr>
<td>Provide services for the removal/disposal of the UST.</td>
<td>3</td>
<td>$7,500.00</td>
<td>$22,500.00</td>
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<tr>
<td>(SECTION 250.03(e))</td>
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</tbody>
</table>
Again, it is the Bureau of Materials and Tests, Environmental Services Division's recommendation that a complete "Underground Storage Tank Closure Site Assessment", per the ADEM's standards, be conducted at this site, with an estimated total cost of $63,750.00.

**Note for Hazmat Sheet:**

<table>
<thead>
<tr>
<th>General UST Type &amp; Size Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique Tank Number</td>
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<tr>
<td>#42161</td>
</tr>
<tr>
<td>#42162</td>
</tr>
<tr>
<td>#42163</td>
</tr>
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</table>

**Site #5 – Shell Food Mart**
This site is a service station located on the west side of Memorial Parkway, north of Mastin Lake Road. There are several active USTs located at this site. The most recent plans received show that additional ROW will not be acquired from this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. **Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.**

**Site #6 – Ultracean Cleaners**
This site is currently operating as a dry cleaning facility located on the south side of Mastin Lake Road, west of Memorial Parkway. The most recent plans received show that additional ROW will not be acquired from this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. **Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.**

**Site #7 – Pennzoil 10 Minute Oil Change (Lt. of Sta. 109+00)**
This site is an automobile oil change facility located on the west side of Memorial Parkway, south of Mastin Lake Road. The most recent plans received show that additional ROW will not be acquired from this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. **Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.**

**Site #8 – Express Oil Change (Lt. of 103+50)**
This site is an automobile oil change facility located on the west side of Memorial Parkway, south of Mastin Lake Road. The most recent plans received show that additional ROW will not be acquired from this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. **Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.**
Site #9 – All American Printing
This site is a printing company facility located on Memorial Parkway, south of Mastin Lake Road. The most recent plans received show that additional ROW will not be acquired from this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

Site #10 – Bio-chem Analysis, Inc. (Rt. of Sta. 190+69)
This site is currently operating as a soil testing lab. The most recent plans received show that additional ROW will be acquired from this site. There were no USTs or other potential hazardous material indicators identified at this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

Site #11 – McDonald’s (Former BP Station) (Lt. of Sta. 200+32)
This site is currently operating as a fast food restaurant and formerly operated as a service station. There are three (3) USTs located at this site. The dispensers have been removed but the canopy remains in place. The most recent plans received show that additional ROW will be acquired from this site. The proposed ROW is not located near the USTs; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

Site #12 – Chevron (Rt. of Sta. 201+13)
This site is currently operating as a service station. There are three (3) USTs located at this site. The most recent plans received show that additional ROW will be acquired from this site. The proposed ROW is not located near the USTs; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

Site #13 – Quick Stop (formerly Kangaroo Express) (Rt. of Sta. 205+19)
This site is currently operating as a service station. There are four (4) USTs located at this site. The most recent plans received indicate that this site is outside the project construction limits. The proposed construction limits and ROW shown on the most recent plans received may not be final; therefore, no further investigation is warranted at this time but will possibly be required once the plans are finalized. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

Site #14 – Greg’s Used Auto (Rt. of Sta. 208+42)
This site is currently operating as an automobile sales lot. The most recent plans received show that additional ROW will be acquired from this site. There were no USTs or other potential hazardous material indicators identified at this site; therefore, no further investigation was warranted. Based on all available information, there should not be any hazardous material problems at this site. Based on the above referenced information, this site is environmentally cleared for construction with no known environmental remediation costs.

Based on the latest information, no additional sites that required subsurface investigation were noted on this project. Therefore, this project is environmentally cleared for construction work with an estimated remedial cost of $63,750.
If there is an alignment or design change, please contact this office for a re-evaluation of the project area.

If you have any questions, please contact Lawson Brown at (334) 206-2282.

Sincerely,

Adam S. Anderson, P.E.
Environmental Services Engineer

By:  
Lawson Brown, P.E.
Assistant Environmental Services Engineer

ASA/VLB/dkg

cc:  Mr. Curtis W. Vincent, P.E., North Region Engineer
     File
<table>
<thead>
<tr>
<th>Project Number, County</th>
<th>NHF-001(610) &amp; NHF-001(611), Madison County</th>
</tr>
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<tbody>
<tr>
<td>Prior Project No.</td>
<td>NHF-8510 (009)</td>
</tr>
<tr>
<td>Project Description</td>
<td>SR-1 (Memorial Parkway) from 0.31 mi. S of CR-75 (Mastin Lake Rd.) to CR-65 (Winchester Rd.) including an overpass at CR-75 and access improvements to CR-65. UT relocation- NHF-001(610) &amp; CN structural removal &amp; clear and grub only - NH-001(611) between CR-75 (Mastin Lake Rd) and CR-65 (Winchester Rd.)</td>
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<tr>
<td>Project History</td>
<td>RW authorized 7/20/2017. Presently, RW has been bought from 0.31 mi. S of CR-75 (Mastin Lake Rd.) to Gilbreath/Stallworth Rd.</td>
</tr>
<tr>
<td>Document Type</td>
<td>CE ☑ EAFONSI ☐ EIS ☐</td>
</tr>
<tr>
<td>Date Approved</td>
<td>6/23/2017</td>
</tr>
<tr>
<td>Reason For Consultation (23 CFR 771.129)</td>
<td>☑ No Changes</td>
</tr>
<tr>
<td></td>
<td>☐ Change in design or scope</td>
</tr>
<tr>
<td></td>
<td>☐ Change to project setting or area</td>
</tr>
<tr>
<td></td>
<td>☐ Change to environmental circumstances/impacts</td>
</tr>
<tr>
<td></td>
<td>☐ 3-year timeline (EIS only)</td>
</tr>
<tr>
<td></td>
<td>☐ Older document</td>
</tr>
<tr>
<td>Major Action Requested</td>
<td>☐ Final Design Authorization</td>
</tr>
<tr>
<td></td>
<td>☐ Right of Way Authorization</td>
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<tr>
<td></td>
<td>☑ Utility Authorization NHF-001(510) - 11/1/19</td>
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<tr>
<td></td>
<td>☑ Construction Authorization Clear &amp; grub NH-001(611) - 1/31/20</td>
</tr>
</tbody>
</table>
NEPA VALIDITY and CONCLUSION:

Based on the changed conditions and supporting information, the following conclusion has been reached regarding appropriate documentation:

☐ Original environmental determination remains valid. No further consultation is required.

☐ Updates are required. Minor changes to the previous documentation include: (Briefly describe)

☐ Attachments (if applicable)

☐ Additional information is needed. (Describe below)

Additional public review is warranted (23 CFR 771.111(h) (3))  Yes ☐ No ☐

☐ Original determination is no longer valid. Reasons include:

New Level of Documentation: CE ☐ EA ☐ EIS ☐

☐ Environmental Commitments: YES ☐ NO ☒

☐ Attachments (if applicable)

Certification Statement

ALDOT certifies they have performed the necessary tasks to determine whether or not the NEPA document, determination, or final project decision remains valid. Based on the consultation and documentation for the referenced project, the original determination remains valid.

Disha Kayisavera

ALDOT Project Manager

Date: 2019.10.23 13:47:06 -05'00'

For: Mark D. Bartlett, PE
Division Administrator
FHW A, Alabama Division
III.a. Project Specific Best Management Practices

The scope of work for this project consists of removing structures, clearing and grubbing the property around these structures. Clearing and grubbing and select clearing will also be done around the east and west sides of Memorial parkway. This project will consist of select clearing, grubbing, and structure removal. All erosion and sediment control items shall be placed as shown on the plans unless otherwise directed by the Project Manager and/or the Qualified Credentialed Professional.

The following plan sheets are relevant to the environmental protection:
Sheet 2A (See notes 900 and 906)
Sheet 3B (Required Erosion and Sediment Control Quantities)
Sheets 14-141 (Erosion and Sediment Control Plan Sheets)

The site disturbance area is approximately 8 acres within the project limits. All discharge points drain into Normal Branch or Pinhook Creek. The Erosion and Sediment Control Plan for this project is for the intermediate phase only.

All BMP’s shall be installed as detailed in the 2020 ALDOT Special and Standard Drawings. All BMP’s shall be implemented and maintained in accordance with the "2018 Alabama Handbook for Erosion, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas."

The placement of BMP’s are shown on the Erosion Control and Sediment Sheets 14-141 within the plans assembly.
III.b. Standard Best Management Practices


Contract specification requirements regarding environmental protection during construction may be found in the ALDOT Standard Specifications for Highway Construction or in the contract document in the form of a special provision. Special provisions may be General Application Special Provisions approved for general use and incorporation into the standard specifications in the future or as Project Specific Special Provisions created specifically for the project at hand. Please reference the following applicable 2018 ALDOT Standard Specifications sections.

106.01(b) Clearances and Acknowledgements for the Use of Offsite Areas
106.01(c) Operation of Offsite Pits and Waste Areas.
107.09 Construction Over or Adjacent to Waters of the United States.
107.12 Protection and Restoration of Property, Landscape and Utility Facilities.
107.13 Woodland Protection, Conservation, Abatement of Water Pollution and Quarantine Regulations.
107.14 Responsibility for Damage Claims.
107.21 Stormwater Management.
107.22 Environmental Protection and Spill Prevention.
107.23 Temporary Construction Encroachment into Streams, Water Bodies and Wetlands.
107.24 Permits for Pesticide Application.
108.04 Prosecution of Work.

201.03 Clearing and Grubbing.
205.03 Removal and Relocation of Structures.
206.04 Disposal of Materials.
210.03 Excavation and Embankment.
250.03 Removal of Underground Storage Tanks and Contaminated Soil.

521.04 Blast Cleaning, Mechanical Cleaning and Surface Roughness.
521.05 Containment System for Removal of Coating from Existing Bridge.
521.06 Collection and Disposal of Coating Material Waste from Existing Bridge.
521.07 Surface Preparation Plan Submittal for the Removal of Existing Coatings.
521.08 Final Cleaning of Blast Cleaned Surfaces.
521.14 Worker Protection.
524.03(a)2. Water Quality Protection
534 Cleaning Existing Drainage Structures.

650 Topsoil.
652 Ground Preparation, Vegetation Establishment and Mowing.
654 Solid Sodding.
656 Mulching for Vegetation Establishment.
659 Rolled and Hydraulic Erosion Control Products.
665 Temporary Soil Erosion and Sediment Control
666 Pest Control.
668 Pre-Emergent Herbicide Treatment.
669 Post-Emergent Herbicide Treatment.
672 Stormwater Turbidity Control

810 Geotextiles.
814 Riprap Materials.
860.01 Seed.
860.03 Mulching Material.
860.05 Solid Sod.
860.11 Rolled and Hydraulic Erosion Control Products.
**ALDOT Special Drawings**

Contract requirements regarding environmental protection during construction may be found in the form of construction detail drawings in the plan set or in the applicable ALDOT Special and Standard Highway Drawings book. Detail drawings found in the plan set are referred to as Special Project Details and consist of details that are not included in the Special and Standard Drawings book. Please reference the following applicable 2020 ALDOT Special Drawings.

<table>
<thead>
<tr>
<th>Drawing No.</th>
<th>Description</th>
<th>Index No.</th>
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<tbody>
<tr>
<td>ESC-100-1</td>
<td>Best Management Practice Reference Matrix</td>
<td>66501</td>
</tr>
<tr>
<td>ESC-100-2</td>
<td>Best Management Practice Reference Matrix</td>
<td>66502</td>
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<tr>
<td>ESC-200-1</td>
<td>Typical Temporary Erosion/Sediment Control Applications</td>
<td>66505</td>
</tr>
<tr>
<td>ESC-200-2</td>
<td>Details of Temporary Slope Drain, Berms and Energy Dissipator</td>
<td>66506</td>
</tr>
<tr>
<td>ESC-200-3</td>
<td>Details of Sediment Barrier Applications</td>
<td>66507</td>
</tr>
<tr>
<td>ESC-200-4</td>
<td>Details of Silt Fence Installation</td>
<td>66508</td>
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<tr>
<td>ESC-200-5</td>
<td>Details of Sediment Retention Barrier</td>
<td>66509</td>
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<tr>
<td>ESC-300-1</td>
<td>Ditch Check Structures, Typical Applications and Details</td>
<td>66512</td>
</tr>
<tr>
<td>ESC-300-2</td>
<td>Details of Hay Bale Ditch Checks</td>
<td>66513</td>
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<tr>
<td>ESC-300-3</td>
<td>Details of Sandbag Ditch Check</td>
<td>66514</td>
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<tr>
<td>ESC-300-4</td>
<td>Details of Erosion Control Wattle Ditch Check</td>
<td>66515</td>
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<tr>
<td>ESC-300-5</td>
<td>Details of Silt Dike Ditch Check</td>
<td>66516</td>
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<td>ESC-300-6</td>
<td>Details of Rock Ditch Check</td>
<td>66517</td>
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<td>ESC-300-7</td>
<td>Details of Rock Ditch Check with Sump Excavation</td>
<td>66518</td>
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<td>ESC-300-8</td>
<td>Details of Silt Fence Ditch Check</td>
<td>66519</td>
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<td>ESC-400-1</td>
<td>Inlet Protection Typical Applications and Details</td>
<td>66522</td>
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<td>ESC-400-2</td>
<td>Inlet Protection Details for Coarse Aggregate on Grades &amp; Sags</td>
<td>66523</td>
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<tr>
<td>ESC-400-3</td>
<td>Inlet Protection Details of Wattles</td>
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<tr>
<td>ESC-400-4</td>
<td>Inlet Protection Details of Silt Fence</td>
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<td>Inlet Protection Details of Sand Bags</td>
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<td>ESC-501</td>
<td>Floating Basin Boom</td>
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<td>ESC-502</td>
<td>Stabilized Construction Entrance</td>
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<td>ESC-503</td>
<td>Temporary Dewatering Structures</td>
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<td>ESC-504</td>
<td>Temporary Culvert Stream Crossing</td>
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<td>ESC-505</td>
<td>Temporary Stream Diversion</td>
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<td>ESC-506-1</td>
<td>Suspended Pipe Diversion (Downstream)</td>
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<td>ESC-506-2</td>
<td>Suspended Pipe Diversion (Upstream)</td>
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<td>ESC-507</td>
<td>Temporary Sedimentation Basin</td>
<td>66548</td>
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<td>ESC-508</td>
<td>Flocculant Usage Guide</td>
<td>67201</td>
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<tr>
<td>ESC-509</td>
<td>Details of Rolled and Hydraulic Erosion Control Product Installation</td>
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</table>

**ALDOT Construction Manual – Section 2.5 Construction Stormwater**

ALDOT Construction Manual, Section 2.5 contains internal policies and procedures relating to construction stormwater. This manual is intended as a job specific guidance resource for ALDOT inspectors. It is utilized in addition to standard specifications, standard drawings, and contract specific documents.
ALDOT Approved Treatment Chemicals

Contract requirements regarding flocculants and chemical stabilization during construction may be found in the form of contract pay items on the Quantities Sheets and their usage locations are shown on the Erosion and Sediment Control Sheets in the plan set. Proper usage requirements are included in the applicable 2020 ALDOT Special and Standard Highway Drawings book and applicable 2018 ALDOT Specifications. These products may only be used if they have been reviewed and included on the applicable approved products lists of the ALDOT Materials, Sources, and Devices with Special Acceptance Requirements Manual which is maintained on the ALDOT website. Safety Data Sheets and manufacturer’s dosage instructions for these products are also maintained on the ALDOT website. Please visit the applicable ALDOT webpages for the most current information. Specific products selected for use on a project and associated documentation is submitted as part of the Contractor’s Stormwater Management Plan and included in the CBMPP after project award.

**Flocculants**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Manufacturer</th>
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<tbody>
<tr>
<td>APS 700 Series</td>
<td>Applied Polymer Systems</td>
</tr>
<tr>
<td>EnviroPam (Granular)</td>
<td>Innovative Turf Solutions</td>
</tr>
<tr>
<td>FLOC</td>
<td>Innovative Turf Solutions</td>
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<tr>
<td>HaloKlear/StormKlear DBP-2100 &amp; Gel Floc (System)</td>
<td>HaloSource, Inc.</td>
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**Tackifiers**

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<thead>
<tr>
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<tbody>
<tr>
<td>FINN HydroStik</td>
<td>FINN Corporation</td>
</tr>
<tr>
<td>Tacking Agent 3</td>
<td>Profile Products</td>
</tr>
<tr>
<td>EnviroPam (Granular)</td>
<td>Innovative Turf Solutions</td>
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<tr>
<td>Enviro-Tak</td>
<td>Central Fiber</td>
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</table>

**Hydraulic Mulches**

<table>
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<tr>
<th>Product Name</th>
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<tbody>
<tr>
<td>Conwed Fibers Hydro Mulch 2000</td>
<td>Profile Products</td>
</tr>
<tr>
<td>EcoFibre Plus Tackifier</td>
<td>Profile Products</td>
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<tr>
<td>Enviro-Mix Wood Fiber Blend</td>
<td>Central Fiber</td>
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<tr>
<td>HydroCover Wood Fiber with Tack</td>
<td>Profile Products</td>
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<tr>
<td>Hydro-Spray Wood with Tack</td>
<td>Profile Products</td>
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<tr>
<td>Second Nature Wood Fiber Blend</td>
<td>Central Fiber</td>
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<td>SoilCover Wood Fiber with Tack</td>
<td>Profile Products</td>
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<td>Terra-Wood with Tacking Agent 3</td>
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**Hydraulic Erosion Control Products**

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<tr>
<td>Safe Slope Xtreme</td>
<td>Landmark Earth Solutions</td>
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<td>ProMatrix</td>
<td>Profile Products</td>
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<td>Ground Control HY-C3</td>
<td>East Coast</td>
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<td>HydraCM</td>
<td>North American Green</td>
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<tr>
<td>HydroStraw Bonded Fiber Matrix</td>
<td>HydroStraw, LLC</td>
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<td>Bindex BFM</td>
<td>American Excelsior</td>
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<td>Profile Products</td>
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<td>EarthGuard</td>
<td>Terra Novo, Inc.</td>
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