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WETLAND MITIGATION PLAN

SANDY CREEK SITE
Randolph County, North Carolina

State Project No. 8.U492301
TIP No. I-2402

Prepared for:

North Carolina Department of Transportation
Project Development and Environmental Analysis Branch
Raleigh, North Carolina

APRIL 1999

EXECUTIVE SUMMARY

The North Carolina Department of Transportation (NCDOT) proposes to construct the Greensboro Bypass - Southern Loop (I-2402), a multi-lane freeway, on a new location from I-85 south of Greensboro to south of SR 3041. Construction of this project will result in unavoidable impacts to wetlands occurring within the proposed corridor. Approximately 13.5 acre of wetland impacts are associated with the construction of Sections A, B, and C of the freeway.

The Sandy Creek Site has been selected as a mitigation site for these wetland impacts. The Sandy Creek Site consists of an approximately 12.9 acre parcel consisting of pastureland, stream, and a forested riparian area within the floodplain of Sandy Creek. The 10-acre field is used for hay production and is part of the larger 33.5-acre Snider Farm. The field has been previously ditched and bedded to provide better drainage. According to the landowner the field is frequently flooded by Sandy Creek and is often difficult to work due to wetness. DRAINMOD modeling of the site indicates that wetland hydrology is no longer present.

Wetland hydrology can be restored to this field by removal of the raised beds and by filling of the lateral and perimeter ditches. Once the beds are removed, ditches filled, and ground surface graded to form shallow, water holding depressions, the DRAINMOD model indicates that wetland hydrologic conditions can be met on the site. Once the site has been contoured, it will be planted with selected bottomland hardwood species.

Restoration of this site will provide 10 acres of bottomland hardwood restoration to mitigate for I-2402 wetland impacts. If not used for I-2402 impacts this site provides 5 credits (10 acres restoration at a 2:1 ratio) for use on other NCDOT projects within the Cape Fear River Basin. In addition, restoration of wetlands on this site will provide water quality benefits to Sandy Creek and the downstream Ramseur Water Supply.

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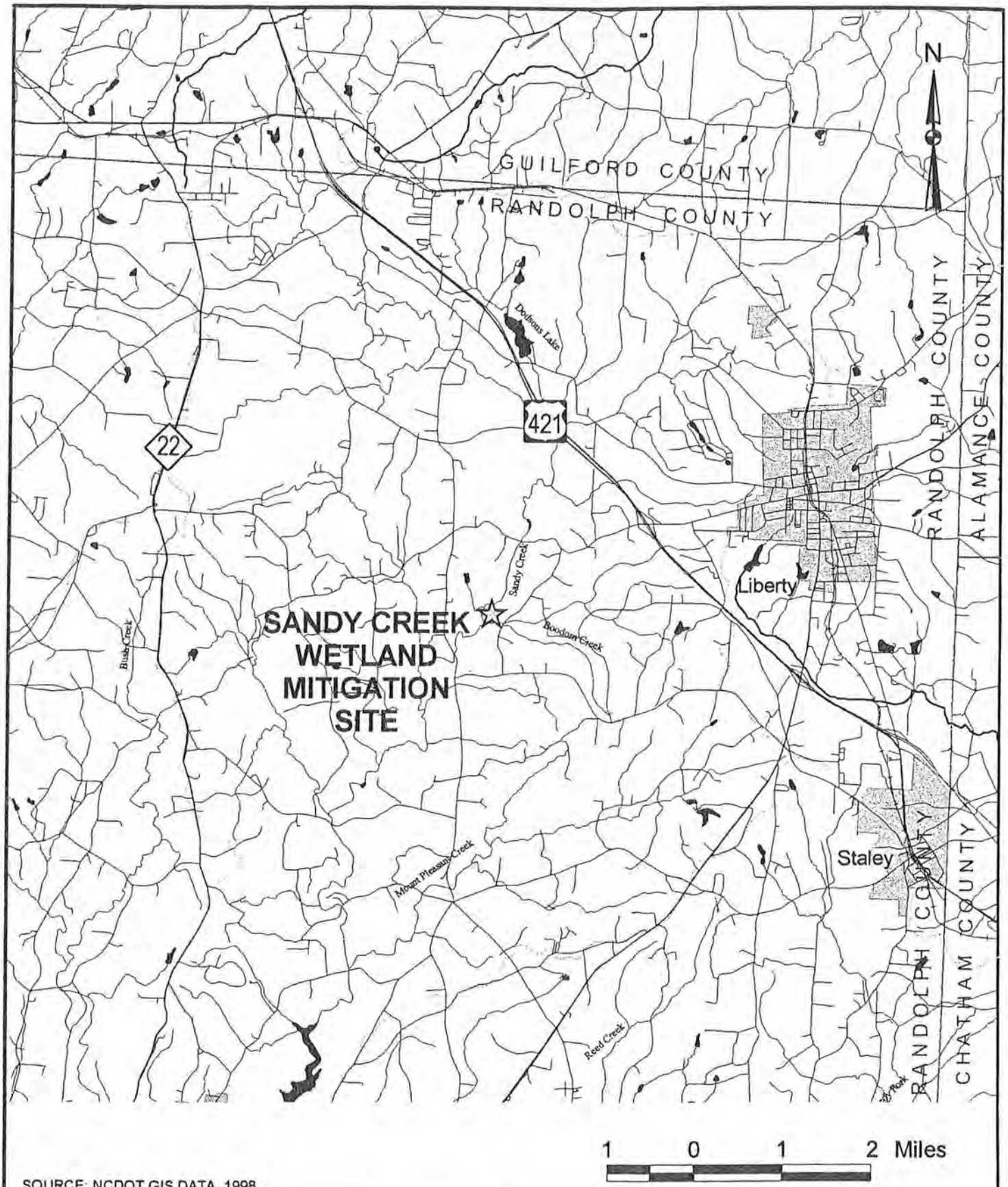
1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to construct the Greensboro Bypass - Southern Loop (I-2402), a multi-lane freeway, on a new location from I-85 south of Greensboro to south of SR 3041. Construction of this project will result in unavoidable impacts to wetlands that occur within the proposed corridor. Approximately 13.5 acre of wetland impacts are associated with the construction of Sections A, B, and C of the freeway.

The Sandy Creek Site was initially identified during a site search of the Piedmont region of the Cape Fear River Basin by Earth Tech (formerly Rust Environment & Infrastructure), as a possible mitigation site for a portion of the I-2402 wetland impacts. The Sandy Creek Site is located in a rural area of northeast Randolph County (Figures 1 and 2). The site consists of an approximately 12.9 acre tract, including a 10-acre field, within the floodplain of Sandy Creek. The field is used for hay production. The proposed mitigation site is currently part of a larger 33.5-acre farm.

Earth Tech was retained by the NCDOT Project Development and Environmental Analysis Branch to prepare a wetland mitigation plan for the site. The purpose of this study was to determine if this site would be suitable for use as a wetland mitigation site and to prepare a mitigation plan to restore wetlands on the site. This report describes the results of a natural resources assessment, a wetland determination, a Phase 1 Environmental Site Assessment (ESA), and a groundwater investigation.



SOURCE: NCDOT GIS DATA, 1998.

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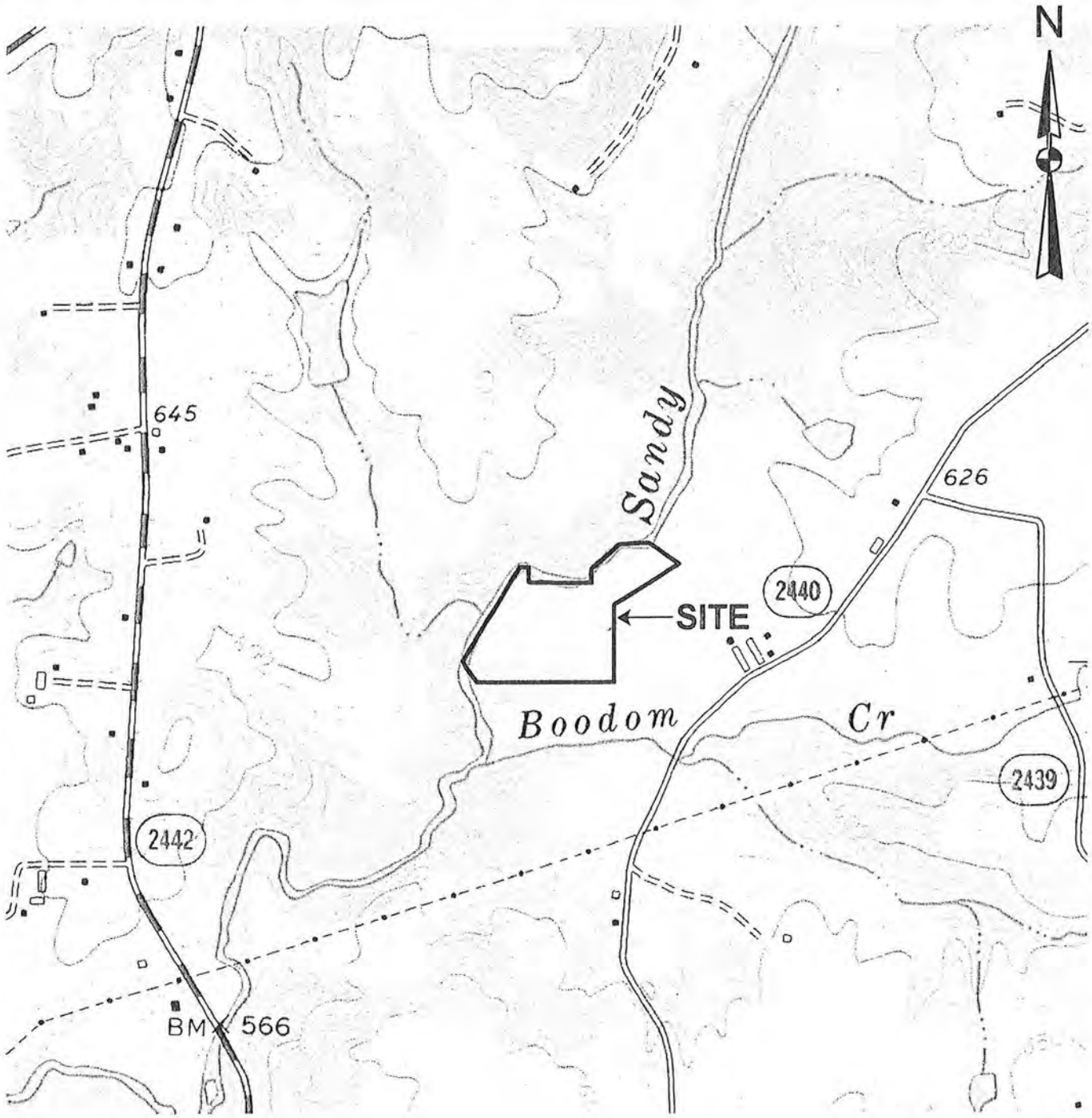
FIGURE 1
LOCATION MAP

Sandy Creek Wetland Mitigation Site

Randolph County, North Carolina



2000 0 2000 Feet

SOURCE: □U.S. GEOLOGICAL SURVEY MAPS:
7.5 MINUTE QUADRANGLE: GRAYS CHAPEL NC 1974

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FIGURE 2
VICINITY MAP
Sandy Creek Wetland Mitigation Site
Randolph County, North Carolina

2.0 METHODOLOGY

This mitigation plan was developed based on the analysis of existing materials and mapping, and data collected during field investigations from August 1998 through February 1999. The following sections present the methodology used for collecting data and evaluating the property's suitability as a wetland mitigation site.

2.1 PRELIMINARY DATA COLLECTION

Prior to conducting the field activities, information concerning the site and surrounding area was collected. This information included the following:

- U.S. Geological Survey (USGS) Grays Chapel (1974) topographic quadrangle map.
- U.S. Fish and Wildlife Service (FWS) National Wetlands Inventory (NWI) Maps; Grays Chapel (1995).
- Randolph County Tax Office aerial photograph of the project areas (1"=400') 1982.
- Soil Conservation Service [now known as the Natural Resource Conservation Service (NRCS)] soil maps for Randolph County, 1990
- U.S. Fish and Wildlife Service (FWS) list of protected species.
- North Carolina Natural Heritage Programs (NCNHP) database of uncommon species and unique habitats.
- FEMA floodplain maps of the project area.

Water resource information was obtained from publications of the North Carolina Department of Environment, and Natural Resources (DENR- formerly DEHNR, 1993), Division of Water Quality (DWQ). Information concerning the occurrence of federal and state protected species in the study area was obtained from the FWS list of protected species and Federal Species of Concern (May, 1999) and from the NCNHP database of rare species and unique habitats. The NCNHP files were reviewed for documented occurrences of state or federally listed species and locations of significant natural areas and Natural Heritage Priority Areas.

2.2 FIELD SURVEYS

Earth Tech personnel conducted field surveys during the late summer and fall of 1998 and early winter of 1999.

2.2.1 General Field Surveys

A general field survey was conducted by Earth Tech biologists in August, 1998. Water resources were identified and their physical characteristics were recorded. Plant communities and their associated wildlife were identified using a variety of observation techniques, including active searching, visual observations, and identifying characteristic signs of wildlife (sounds, tracks, scats, and burrows). Terrestrial community classifications generally follow Schafale and

Weakley (1990) where appropriate, and plant taxonomy follows Radford *et al.* (1968). Animal taxonomy follows Robbins *et al.* (1966), Martof *et al.* (1980), Thompson (1985), Palmer and Braswell (1995), and Webster *et al.* (1985). Wildlife community composition was described based on observations in the field and predictions of habitat based on existing vegetative communities.

2.2.2 Soil and Topographical Surveys

A detailed topographic survey of the site was conducted by W.K. Dickson, Raleigh, North Carolina, a licensed surveying firm. This survey was the basis for the site map.

Detailed soil surveys were performed by Earth Tech personnel. Three transects across the site were established and soil borings performed along the transects. Borings were performed in the bottoms of all ditches and in several raised bedded areas. Soil properties and profiles were described, and the depth to groundwater or hydric indicators noted.

2.3 DRAINMOD MODELING

The groundwater modeling software selected for simulating shallow subsurface conditions and groundwater conditions for the site is DRAINMOD. This model was developed by Dr. R. W. Skaggs of NC State University to simulate the performance of agricultural drainage and water table control systems on sites with shallow water table conditions. DRAINMOD has been modified for application to wetland studies by adding a counter that accumulates the number of events wherein the water table rises above a specified depth and remains above that depth for a given duration during the growing season. Model results are analyzed to determine whether wetland criteria are satisfied during the growing season for more than half of the years modeled (10 years). DRAINMOD models were run to simulate both existing site conditions as well as to predict post restoration conditions.

2.4 PHASE 1 ENVIRONMENTAL ASSESSMENT

A Phase 1 Environmental Assessment was conducted for the site. The objective of the Environmental Assessment was to identify, to the extent feasible, environmental conditions that may create environmental liability to a potential owner of the property. In general, the Phase I environmental assessment was conducted in accordance with the scope and limitations of the guidelines established in the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM 1527-94).

The environmental assessment included interviews with persons knowledgeable of the site, a review of a computer search of selected federal and state environmental databases, and visual observation of the site and surrounding areas. Earth Tech obtained environmental database information, published by the United States Environmental Protection Agency (EPA), and the

North Carolina Department of Environment and Natural Resources (DENR) from Environmental Data Resources, Inc. (EDR) to determine if any known sites producing, storing, and/or disposing of toxic or hazardous materials have affected or have the potential to affect the subject property. EDR provided a site location map identifying all regulated facilities within the ASTM radii for the site (Appendix A). Earth Tech also completed a reconnaissance of the area surrounding the subject property to confirm the EDR data and to ensure there were no other obvious regulated facilities.

3.0 EXISTING CONDITIONS

The following sections describe the various plant and animal communities, soils, groundwater conditions, and other physical features of the site.

3.1 STUDY AREA

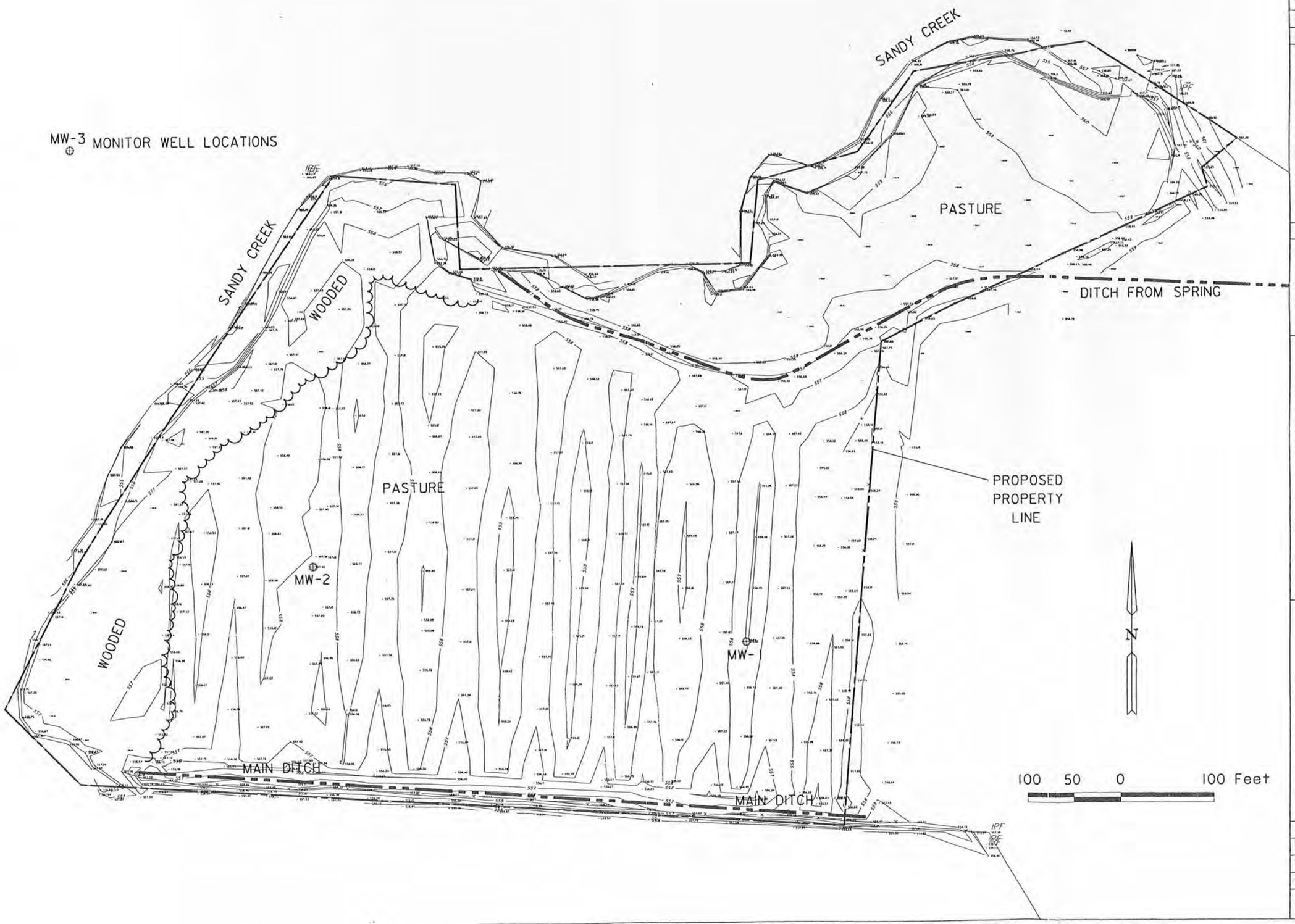
The proposed mitigation site is located within the Piedmont portion of the Cape Fear River basin. The Cape Fear River Basin is the largest drainage basin in North Carolina, covering 9,149 mi^2. The Cape Fear River is formed on the border of Chatham and Lee Counties at the confluence of the Haw and the Deep Rivers. The river flows southeast from the north central Piedmont region through the Coastal Plain to the Atlantic Ocean.

The Deep River originates as the West Fork Deep River in eastern Forsyth County and the East Fork Deep River in Guilford County. The Deep River flows 116 miles through the Piedmont, draining approximately 1,442 mi^2. Its confluence with the Haw River is at the fall line that separates the Piedmont from the Coastal Plain. The Haw River, which drains 1,526 mi^2, originates in Guilford County as Troublesome and Little Troublesome Creeks.

Randolph County has a land area of 787.3 mi^2 and a total area of 790.1 mi^2. Randolph County is in the Central Piedmont physiographic region, in the foothills of the Uwharrie Mountains. The terrain is characterized by rolling hills, with an average elevation across the county of 870 ft above mean sea level (MSL). The climate is mild, with an annual average temperature of about 60° F and an annual average rainfall of about 46 inches per year (Asheboro Chamber of Commerce 1998).

3.2 GENERAL SITE DESCRIPTION

The Sandy Creek Site is located 4 miles southwest of Liberty, North Carolina in a rural area of Randolph County (Figure 1). The proposed mitigation site consists of a 13-acre tract containing a10-acre field adjacent to Sandy Creek and is currently part of a larger 33.5-acre farm. The site is located in the floodplain of Sandy Creek and is bounded to the north and northwest by Sandy Creek. In this area, Sandy Creek is bordered by a 5 to 100 foot wooded corridor. The adjacent pasture slopes gently up towards the east. The field has been ditched and bedded for hay production. Bedding consists of forming long rows (or beds) that are slightly higher in elevation and crowned, to facilitate surface drainage for crop or hay production. The north-south ditches drain into a perpendicular main ditch along the southern perimeter of the field. The main ditch empties into Sandy Creek. According to the current landowner, these beds were in place in the 1950's when he purchased the property. A map showing details of the site is provided as Figure 3.



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North Carolina Department of Transportation
RALEIGH, NORTH CAROLINA

SITE MAP
SANDY CREEK

DATE	MARCH 1999
PROJECT NO	32777
FILENAME	base.dgn
SHEET NO	

FIGURE 3

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3.3 SOILS

Information concerning soils was obtained from both the NRCS and from field investigations.

3.3.1 NRCS Mapping

Soil information for Randolph County was obtained from the Natural Resource Conservation Service (NRCS). According to mapping, the detailed map unit along the floodplain of Sandy Creek consists of Chewacla loam (4A) with 0 to 2 percent slopes (Figure 4). These soils are somewhat poorly drained and are located in floodplains of major streams. Chewacla soils are formed in fine loamy materials washed from soils on uplands. Permeability is moderate to moderately rapid and surface runoff is slow. The seasonally high water table is 1.5 feet below ground surface. These soils are frequently flooded for brief to long periods. Chewacla soils are classified as a hydric soil by the NRCS.

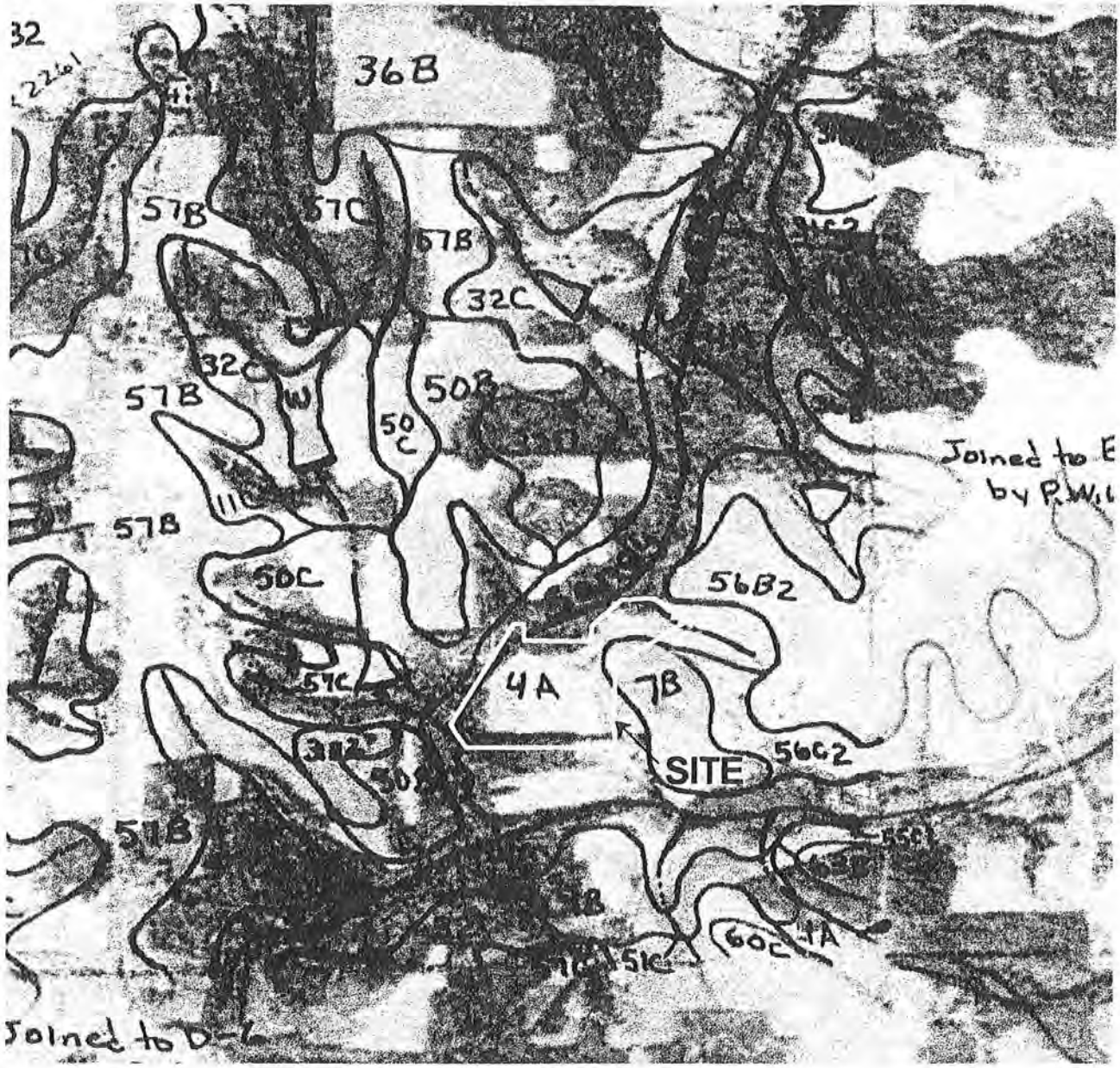
A smaller area of Altavista sandy loam (7B) with slopes of 2 to 6 percent is mapped adjacent to the lower floodplain area. Altavista is described as gently sloping, very deep, moderately well drained soils on low stream terraces. These soils are formed in alluvial deposits under forest vegetation. Permeability is moderate. Infiltration is good and surface runoff is slow to medium. The seasonally high water table ranges from 1.5 to 2.5 feet below ground surface. Soils are subject to rare flooding. This soil is not classified as hydric by the NRCS

The adjacent upland area consists of Cullen clay loam (56B2 and 56C2) with slopes of 2 to 8 percent. These well-drained soils are generally eroded and are gently sloping and very deep. Occurring in upland areas, they form in residuum from mixed felsic and mafic rock. Permeability is moderate and surface runoff is medium to rapid. Seasonal high water table is 6 ft below ground surface. This soil is not classified as hydric by the NRCS

3.3.2 Field Surveys

A detailed field survey was conducted to map the soils within the mitigation area (See Section 2.2.2 for a description of the field methodology). The onsite soils have been heavily disturbed through past agricultural practices. The major disturbance has been the formation of raised beds to help facilitate surface drainage. The beds average 62 feet in width and average 1.3 feet higher than the adjacent ditch or drainage way. The beds consist primarily of topsoil taken from the adjacent ditches.

In the southern portion of the field, soils consist of a dark yellowish brown silt loam (10 YR 4/4) with light brownish gray mottles (10 YR 6/2). Towards Sandy Creek (in the northern portion of the field) the soils have a slightly lower chroma, consisting of a light brownish gray (10 YR 6/2) to very pale brown (10 YR 7/3) silty clay loam with yellowish brown (10 YR 5/6) mottles. In the eastern portion of the field, soils consist of a dark yellowish brown (10 YR 4/4) clay loam with brown (10 YR 5/3) mottles.



LEGEND

4A - Chewacla loam
7B - Altavista sandy loam
50B - Zion variant Enon complex
56B2 - Cullen clay loam
56C2 - Cullen clay loam

NOT TO SCALE

SOURCE: □RANDOLPH COUNTY SOIL SURVEY, NRCS

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FIGURE 4
SOIL MAP
Sandy Creek Wetland Mitigation Site
Randolph County, North Carolina

A typical soil profile in the raised beds is as follows:

0 to 20 inches, brown loam (10YR 4/4)
20 to 24 inches, brown loam (10YR 3/4) with few (10%) mottles
24 to 30 inches, brown clay loam (10YR 5/4 to 2/4) with few (10%) mottles and few to many Mg concretions

In the bottom of the ditch a typical soil profile is as follows:

0 to 7 inches, brown clay loam (10 YR 5/3 to 4/3)
7 to 10 inches, brown clay loam (2.5 Y 6/3) with 30% reddish brown (10YR 4/6 and 5/3) mottles, and few to many Mg concretions.
10 to 16 inches, brown clay loam (2.5 Y 6/3 to 6/2) with 30-40% mottles (10 YR 5/3), numerous Mg concretions
16 to 20+ inches 2.5 Y 6/2 mottles 30% 10 YR 5/6, numerous Mg concretions

Soils toward the eastern portion of the site were slightly sandier than those found over the majority of the site.

Based on field measurements and a basemark elevation established by the surveyors, the tops of the beds range from 557.8 feet to 559.6 feet in elevation. The ditch bottoms range from 557.1 to 558.2 feet in elevation. On an average the ditch bottoms are 1.3 feet lower than the top of the bed. Indicators of high (but fluctuating) water table (low chroma soil colors and Mg concretions) were encountered at elevations of 556 to 556.8 feet, or about 1 feet below the bottom of the ditches and up to 2 feet below the tops of the beds.

3.4 NATURAL COMMUNITIES

Two communities are present on the site: farm field and alluvial forest. An additional alluvial forest present on an adjacent property has also been described as a reference area.

3.4.1 Farm Field

The farm field, which is 10 acres in size, lies in the floodplain of Sandy Creek, and is bounded by the creek to the north and northwest. The field has been planted by the owner and is currently in hay production. Vegetation consists of fescue (*Festuca* sp.) and bermuda grass (*Cynodon dactylon*). According to the NRCS records, this field has not been classified as Prior Converted (PC) wetlands, as no classification request has been made to the NRCS by the property owner.

Soils in the farm field have been heavily disturbed in the past by bedding and ditching and may not reflect natural conditions. According to the landowner the field was bedded when he purchased the property in the 1950's.

A small inclusion of hydric soils approximately 15 feet long and 4 to 10 feet wide, occurs in a ditch along the northeastern corner of the floodplain, adjacent to the fence. According to the owner, standing water is present approximately 90 percent of the year. Prior to ditching, the area was a low, wet spot in the field. Soils consist of a clay loam which is a combination of a brown (10 YR 4/3) and dark yellowish brown (10 YR 4/6) matrix with 10 percent gley (1 gley 3/5 GY) mottles. Wetland hydrology indicators include oxidized rhizospheres. Vegetation includes smartweed (*Polygonum* sp.) and grasses.

3.4.2 Alluvial Forest

An alluvial forest is located on either side of Sandy Creek. Within the site boundaries, the forest extends to the east approximately 100 feet from the creek to the farm field edge and encompasses about 2.9 acres. Along the northwestern portion of the creek, the tree line moves closer to the stream bank as the farm field encroaches and eventually ends on the north side of the field. Livestock actively graze the area.

The tree species in this community include green ash (*Fraxinus pennsylvanica*), sweetgum (*Liquidambar styraciflua*), southern sugar maple (*Acer barbatum*), boxelder (*Acer negundo*), riverbirch (*Betula nigra*), sycamore (*Platanus occidentalis*), tulip-poplar (*Liriodendron tulipifera*), hackberry (*Celtis laevigata*), American elm (*Ulmus americana*), and ironwood (*Carpinus caroliniana*). Overall stand age is young with most trees ranging from 4 to 10 inches in diameter. According to the property owner, wind-thrown trees scattered throughout the area are a result of Hurricane Fran in 1996. Virtually no saplings or seedlings are present in the understory due to the grazing by cattle. The shrub and herb layers include blackberry (*Rubus* sp.), pokeberry (*Phytolacca americana*), tickweed (*Verbesina alternifolia*), Chinese privet (*Ligustrum sinense*), trumpet creeper (*Campsis radicans*), poison-ivy (*Toxicodendron radicans*), smartweed, false nettle (*Boehmeria cylindrica*), jewelweed (*Impatiens capensis*), and thick tangles of vines such as greenbrier (*Smilax* spp.) and Japanese honeysuckle (*Lonicera japonica*). Bur-reed (*Sparganium americanum*) is present in shallow areas of the creek. This community corresponds with a Piedmont Alluvial Forest as described in Schafale and Weakley (1990).

Soils in this community are alluvial and range from a pale brown (10 YR 6/3) to a strong brown (7.5 YR 4/6) silt loam. Due to animal grazing, soils have been compacted.

According to NWI mapping (Figure 5), no wetland areas have been mapped on the mitigation site. However, forested wetlands (PFO1A) are shown on the west side of Sandy Creek immediately north of the mitigation site.

3.4.3 Adjacent Bottomland Wetlands

Immediately south of the site is a wooded area. It is separated from the pasture by a barbed-wire fence. A large drainage ditch abuts the fence and drains into Sandy Creek. This wooded area has previously been under cultivation as evidenced by the shallow ditches and mounds. The tree species in this community include Shumard oak (*Quercus shumardii*), green ash, sweetgum,

southern sugar maple, boxelder, riverbirch, sycamore, tulip-poplar, hackberry, American elm, and ironwood. Stand size is mostly uniform with tree diameters ranging between 10 to 12 inches, however, selected individuals are 30 to 35 inches in diameter. Many saplings and seedlings are present in the understory. The shrub and herb layers include pawpaw (*Asimina triloba*), bladdernut (*Staphylea trifolia*), possumhaw (*Ilex decidua*), elderberry (*Sambucus canadensis*), cardinal flower (*Lobelia cardinalis*), cross vine (*Anisostichus capreolata*), false nettle, tickweed, blackberry, pokeberry, Chinese privet, trumpet creeper, poison-ivy, greenbrier, and Japanese honeysuckle.

Soils in this area consist of a light gray (10 YR 7/1) clay loam with dark yellowish brown (10 YR 4/6) mottles. Due to animal grazing, soils have been compacted. This area is not shown on the NWI mapping as wetlands. However, according to the landowner of the mitigation site, this wooded area was flagged as wetlands by NRCS personnel.

3.5 SITE HYDROLOGY

3.5.1 Sandy Creek

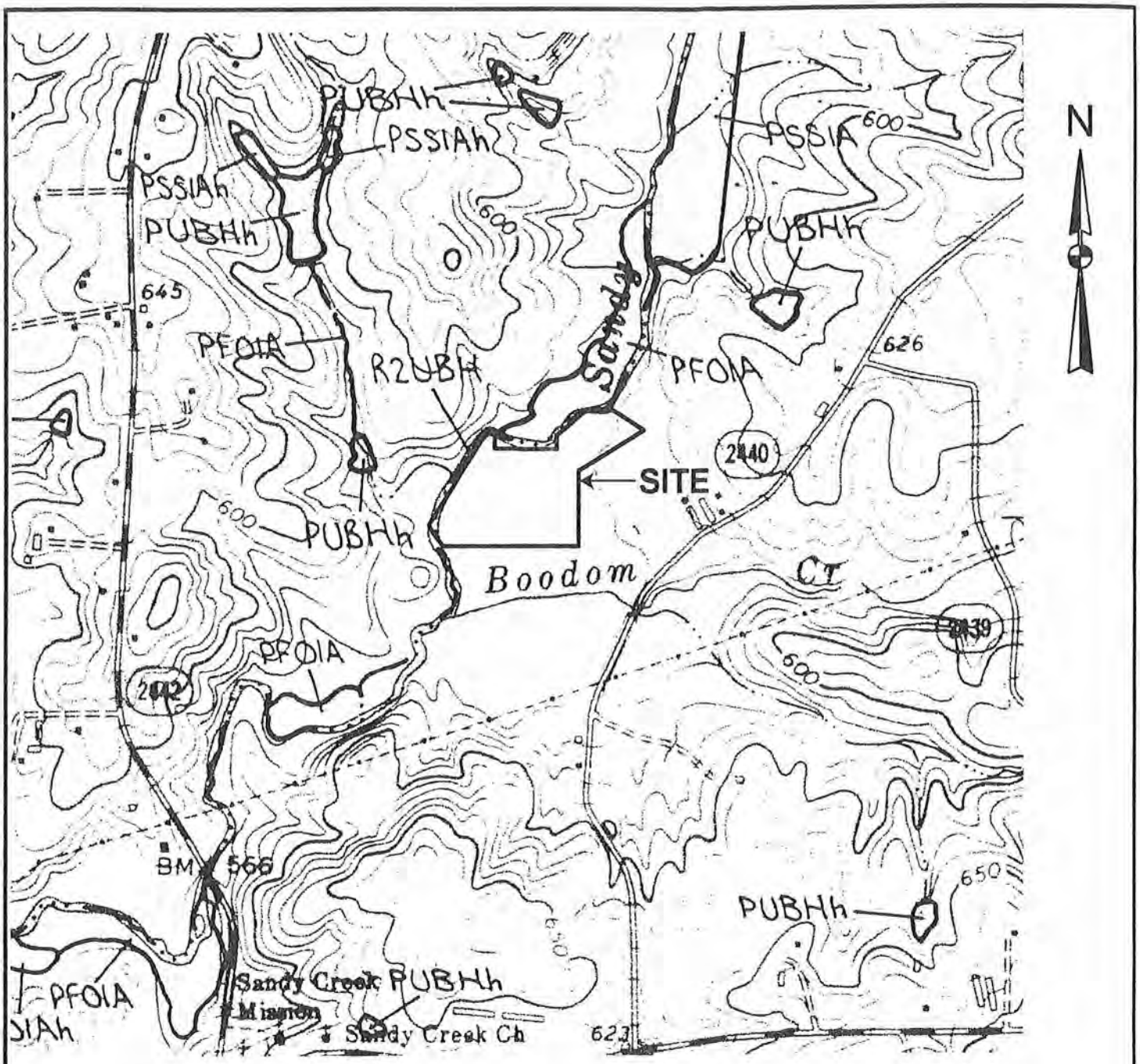
Sandy Creek originates about 7 miles northwest of the project area and flows into the Deep River about 8 miles to the southwest. Both Sandy Creek and the Deep River are part of the Cape Fear River Basin system, the largest river basin in North Carolina, which covers 9,149 square miles. The Cape Fear River is formed at the confluence of the Haw and the Deep Rivers.

Sandy Creek [Index # 17-16-(1)] is classified as a Class WS-III waterbody. Class WS-III indicates waters used as sources of water supply for drinking, culinary, or food processing purposes for those users where a more protective WS-I or II classification is not feasible. WS-III waters are generally in low to moderately developed watersheds. Sandy Creek is impounded approximately 7 miles downstream of the project area. This reservoir serves as the water supply for Ramseur and is designated as a critical area (CA).

According to NWI mapping (Figure 5), Sandy Creek is classified at R2UBH, which represents a lower perennial riverine system with an unconsolidated bottom.

Sandy Creek ranges from approximately 20 to 27 feet wide within the project area, and has moderate streamflow. The substrate of the creek is sandy with a few cobbles. At the time of the field survey, the creek averaged 12 to 24 inches in depth. On the day of the site visit the water clarity was good. According to the landowner, the creek frequently floods the mitigation site.

The banks are approximately 3 to 5 feet high and are well vegetated in some areas and less vegetated in others. Canopy cover over the creek is about 70 percent, with some open areas due to hurricane damaged and fallen trees. Storm damage also accounts for much of the debris in the stream channel and along the banks. A beaver dam is located on the northern portion of the stream; however, water flow has not been restricted. Erosion is evident along selected areas of the creek, especially where livestock congregate to drink water.



LEGEND

PFO1A - Deciduous Forest, Temporarily Flooded
R2UBH - River, Unconsolidated Bottom
PUBHh - Pond
PSS1A - Scrub/Shrub, Temporarily Flooded

SOURCE: □U.S. FISH AND WILDLIFE SERVICE, 1995, AND
U.S. GEOLOGICAL SURVEY MAPS:
7.5 MINUTE QUADRANGLE: GRAYS CHAPEL NC 1974

2000 0 2000 Feet

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FIGURE 5
NATIONAL WETLANDS INVENTORY MAP

Sandy Creek Wetland Mitigation Site

Randolph County, North Carolina

3.5.2 Ditches

The field has been ditched and bedded to provide field drainage for hay production. According to the property owner, the majority of the field was wet before the ditches were constructed. However, most of the bedding had occurred prior to his acquiring the land in the early 1950's. He indicated that he had deepened the "main" ditch, and his father-in-law dug a parallel ditch along the property line about 4 feet to the south of his main ditch.

The main ditch, located along the southern edge of the hayfield, runs from east to west and drains into Sandy Creek. This U-shaped ditch is approximately 10 feet wide from the tops of banks and 4 feet wide at the bottom. Depth is approximately 18 to 24 in. This main ditch is about 1 foot lower than the smaller ditches in the field. In the field, 10 beds and 10 ditches run the length of the field and are oriented north-south. The elevated beds average 62 feet wide from center of ditch to center of ditch. The ditches average 1.2 feet deep (0.6 to 1.9 feet) from top of bed to bottom of ditch and drain into a main ditch along the southern boundary.

These ditches were dry during the fall of 1998. Water was observed in all the on-site ditches during a preliminary walkover of the site earlier in May, 1998 and during a site visit in January, 1999.

The adjacent wooded area to the south has also been bedded and ditched. These beds and ditches, however, are oriented east-west. Another U-shaped ditch, ranging from approximately 5 feet wide at the top of the banks and 3 feet wide at the ditch bottom and 24 to 36 in deep borders the boundary just south of the fence. This ditch drains into Sandy Creek.

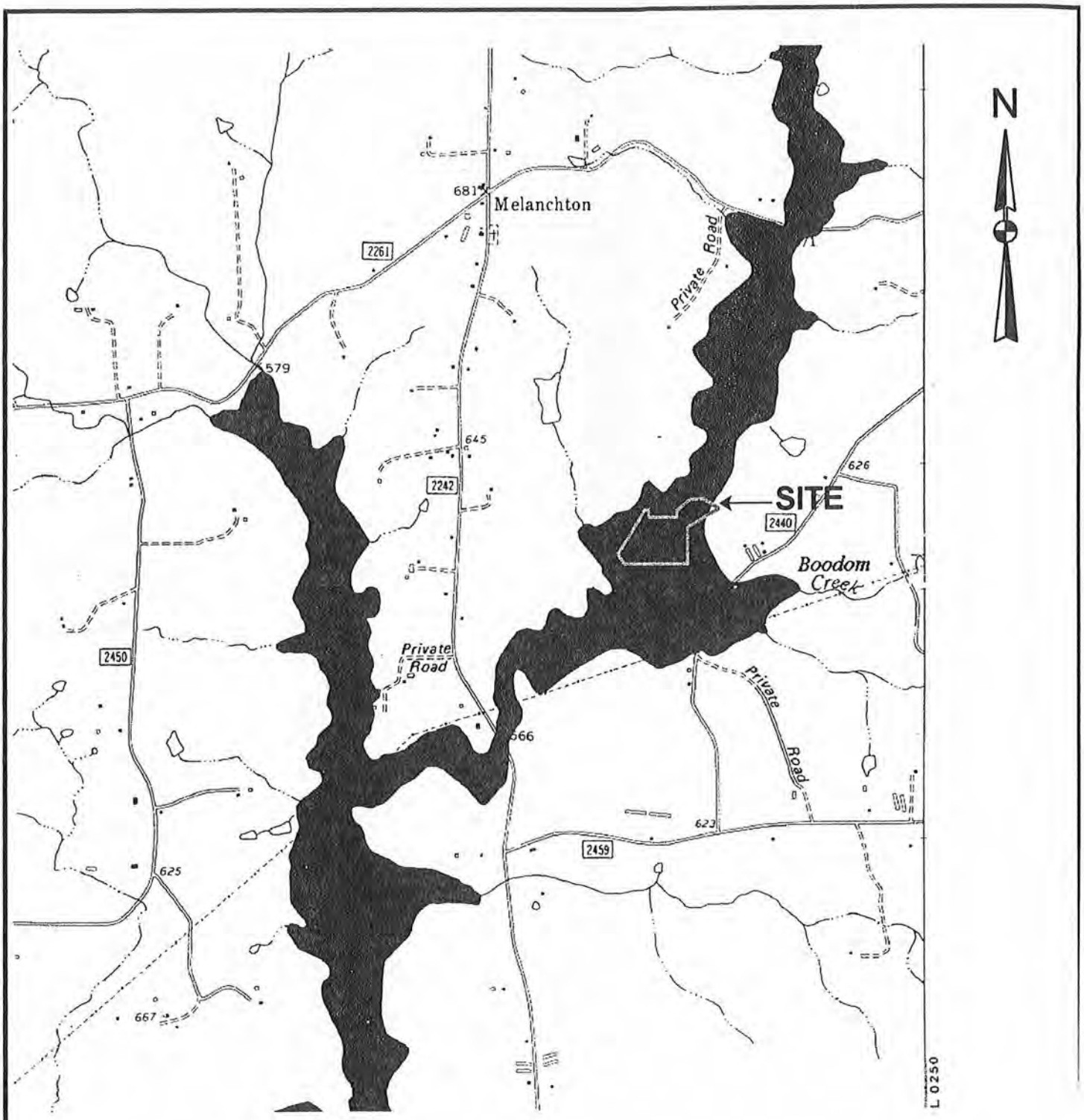
3.5.3 National Flood Insurance Program Mapping

The FEMA map floodplain along Sandy Creek is within "Zone A", which indicates special flood hazard areas inundated by 100-year flood where base flood elevations have not been determined. The flood hazard area encompasses the majority of the site and is shown on Figure 6.

According to the landowner, the field frequently floods. During site activities in January and February 1999 evidence of flooding, such as drift lines and debris, was observed in the field.

3.5.4 Groundwater

Three groundwater wells were installed across the site and in an adjacent bottomland area in August 1998. Two of the wells are located in the mitigation area and the third is in a wooded area immediately to the south of the site. The locations of the wells are shown on Figure 3. Due to both dry conditions and technical difficulties, incomplete groundwater data was collected during the fall of 1998 and early winter 1999.



LEGEND

100-Year Flood Plain

2000 0 2000 Feet

SOURCE: □FEMA Flood Insurance Rate Map, Randolph County, North Carolina, Community-Panel Number 370195 0225 B, July 16, 1981

EARTH TECH

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FIGURE 6
FLOOD INSURANCE RATE MAP

Sandy Creek Wetland Mitigation Site

Randolph County, North Carolina

Sporadic data collected from MW-1 (Elevation 559.1 feet) indicates that during the winter months groundwater levels are relatively stable and occur about 24 inches below the ground surface. Groundwater levels in MW-2 (Elevation 557.8 feet) are closer to the surface with levels range from 14 to 5 inches below the ground surface in February. There are some signs of flooding around well MW-2, such as drift lines and surface debris.

Data collected from MW-3 in the adjacent wooded area to the south indicates that groundwater levels fluctuate with rainfall and flooding. Ground water levels have varied from ground surface to a low of 14 inches below ground surface. Since the beginning of the year standing water has been present five times.

3.5.5 Spring

A small spring is located off-site to the east. The spring flows in a westerly direction onto the northern portion of the site (Figure 3). The water collects in a wide depression before eventually flowing through a small ditch into Sandy Creek.

3.6 PHASE 1 ENVIRONMENTAL ASSESSMENT

The Phase 1 Environmental Assessment did not reveal any areas of environmental concern associated with the site or the surrounding area. Detailed information collected and resources utilized in the assessment are presented in Appendix A.

3.7 CULTURAL RESOURCES

According to Ms. Debbie Bevin, Survey and Planning Branch, State Historic Preservation Office (SHPO) no known sites of historic architectural significance are located on the subject site. Ms. Susan Myers of the SHPO Archaeology Branch, indicated that no sites of archaeological significance are known to be located within the project area.

3.8 PROTECTED SPECIES

Protected species for Randolph County and typical habitat for these species are discussed below.

3.8.1 Federally Protected Species

Plants and animals with federal classification of Endangered (E), Threatened (T), Proposed Endangered (PE) and Proposed Threatened (PT) are protected under provisions of Section 7 and Section 9 of the Endangered Species Act of 1973, as amended.

The Fish and Wildlife Service (FWS) lists two federally protected species for Randolph County as of May 14, 1998. These species are listed in Table 1.

Table 1
Federally Protected Species for Randolph County

Scientific Name	Common Name	Federal Status	Preferred Habitat
Notropis mekistocholas	Cape Fear Shiner	E	Cape Fear Drainage
Helianthus schweinitizii	Schweinitz's Sunflower	E	Open woods and roadsides

Notes: "E" Denotes Endangered (a species that is threatened with extinction throughout all or a significant portion of its range).

Cape Fear Shiner

The Cape Fear shiner (*Notropis mekistocholas*) is federally-listed as Endangered. This small minnow rarely exceeds 2 inches in length. The fish's body is flushed with a pale silvery yellow, and a black band runs along its sides. The fins are yellowish and somewhat pointed. The upper lip is black and the lower lip bears a thin black bar along its margin.

The Cape Fear shiner is known from four small populations in the Cape Fear drainage in Randolf, Moore, Lee, Harnett, and Chatham Counties, North Carolina. This species is generally associated with gravel, cobble, and boulder substrates and has been observed to inhabit slow pools, riffles, and slow runs. In these habitats, the species is typically associated with schools of other related species, but is never the numerically dominant species. Juveniles are often found in slackwater, among large rock outcrops in midstream, and in flooded side channels and pools. Plant material forms the primary part of the Cape Fear shiner's diet.

Biological Conclusion: **No Effect**

The project site consists of a pasture with a forested area bordered by Sandy Creek to the west. While Sandy Creek may provide suitable habitat for the Cape Fear shiner, a search of the NHP database found no occurrence of the Cape Fear shiner in the project vicinity. Additionally, no restoration work is to be conducted in the creek erosion control measures will be utilized to prevent sediments from entering the creek. It can be concluded that the project will not impact this endangered species.

Schweinitz's Sunflower

Schweinitz's sunflower (*Helianthus schweinitzii*) is federally-listed as Endangered. This rhizomatous perennial herb grows from 1 to 2 meters tall from a cluster of carrot-like tuberous roots. Stems are usually solitary, branching only at or above mid-stem, with the branches departing from the stem at about a 45-degree angle. Leaves are narrowly lanceolate, scabrous above, resin-dotted and loosely soft-white-hairy beneath. Texture of the leaves is rather thick and stiff. The lower stem leaves are opposite and are about 20 centimeters long and 1.5 to 2.5 centimeters wide. Upper stem leaves are alternate and smaller only 5 centimeters long and 1 centimeter wide. Schweinitz's sunflower blooms from September to frost, forming comparatively small heads of yellow flowers.

Schweinitz's sunflower is endemic to the piedmont of the Carolinas. The North Carolina populations are located in Union, Stanley, Cabarrus, Mecklenberg, and Rowan Counties. This sunflower occurs in clearings and edges of upland woods on moist to dryish clays, clay-loams, or sandy clay-loams that often have a high gravel content and are moderately podzolized. The underlying rock types are highly weatherable, generally contain low amounts of resistant minerals such as quartz, and generally weather to fine-textured soils. Soils supporting this species are mainly of the Iredell series. Like most sunflowers, this species is a plant of full sun or the light shade of open stands of oak-pine-hickory. Some of the associated species, many of which are also rare, have affinities to glade and prairie habitats of the Midwest. The habitat of this sunflower tends to be dominated by members of the aster, pea, and grass families. Most remaining populations occur in road and power line right-of-ways, and are maintained by artificial disturbance.

Biological Conclusion: **No Effect**

The project site consists of a pasture with a forested area along a stream with soils consisting of Chewacla loam. No suitable habitat for Schweinitz's sunflower is present on the site. A search of the NHP database found no occurrence of the sunflower in the project vicinity. It can be concluded that the project will not impact this endangered species

3.8.2 Federal Species of Concern and State Listed Species

Federal Species of Concern (FSC) are not legally protected under the Endangered Species Act and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as Threatened or Endangered. Table 2 includes FSC species listed for Randolph County and their state classifications. Species which are State-listed as Endangered (E), Threatened (T), or Special Concern (SC) by the NCNHP list of Rare Plant and Animal Species are afforded state protection under the State Endangered Species Act and the North Carolina Plant Protection and Conservation Act of 1979.

Table 2
Federal Species of Concern and NC Protected Species for Randolph County

Scientific Name	Common Name	NC Status	Preferred Habitat
Alasmidonta varicosa	Brook Floater	T	Piedmont systems
Fusconaia masoni	Atlantic Pigtoe	T	Lower Piedmont
Dactylocythere peedeensis	Pee Dee Crayfish Ostracod	SR	Symbiotic on crayfish in Pee Dee drainage

Notes: Source: LeGrand and Hall, 1997
T - Threatened, SR - State Rare

No habitat exists on the mitigation site for any federally protected or State-listed species. A review of the Natural Heritage Program database of rare species and unique habitats revealed no occurrences of any state protected species or Federal Species of Concern within the project area. Therefore, the construction of this mitigation site should have no adverse effect on any State-listed species or Federal Species of Concern.

4.0 DRAINMOD MODELING

DRAINMOD predicts water balances in the soil-water regime at the midpoint between two drains of equal elevation. The model calculates hourly values for water table depth, surface runoff, subsurface drainage, infiltration, and actual evapotranspiration over long periods of climatological data. The reliability of DRAINMOD has been tested for a wide variety of soil, crop, and climatological conditions.

The water balance in DRAINMOD involves two basic equations. The first equation is a water balance in the soil profile:

$$\Delta V_a = D + ET + DS - F$$

Where:
- ΔV_a = Change in air volume (cm)
- D = Lateral Drainage from the profile (cm)
- ET = Evapotranspiration from the profile (cm)
- DS = Deep seepage from the profile (cm)
- F = Infiltration into the profile (cm)

The terms on the right-hand side of the equation are calculated based on water table elevation, soil water content, soil properties, site and drainage system parameters, vegetation, and atmospheric conditions.

The amount of runoff and storage on the surface is calculated from a second equation:

$$\Delta S = P - F - RO$$

Where:
- ΔS = Change in volume of water stored at the soil surface (cm)
- P = Precipitation (cm)
- F = Infiltration volume (cm)
- RO = Surface runoff (cm)

Methods for evaluating these variables are discussed in detail in Skaggs (1980).

The DRAINMOD model was used to predict groundwater conditions at the site once the beds are removed, the ditches filled, and depressions are formed for holding water. The DRAINMOD program was initially "calibrated" to existing site conditions by modeling the site as it currently exists. When the model output reflects groundwater conditions currently being observed then there is a degree of certainty that the assumptions and inputs used in modeling post restoration conditions are also likely correct.

One of the limitations of the DRAINMOD model is that it can not account for surface water inputs onto the site from either overbank flooding of Sandy Creek or from the off-site spring. Not including these inputs into the model builds in a certain amount of safety. That is, if

hydrological conditions can be met without these inputs then the addition of this "extra" water will only serve to increase the wetland hydrology.

DRAINMOD models were run to model both existing conditions and restored conditions. The existing condition model was run to calibrate the model for soil and groundwater inputs. Once the appropriate inputs were established the model was run to predict conditions when the ditches and beds are removed. Copies of summary information from the DRAINMOD outputs for each scenario are provided in Appendix B.

4.1 EXISTING CONDITIONS

The DRAINMOD model shows that wetland conditions are currently not being met on the site. There are several days a year when hydric conditions (groundwater above 12 inches) are met; however, it is not for a long duration. Figure 7 presents the predicted levels for 1992, a year with a "typical" rainfall of 42.5 inches.

4.2 RESTORED CONDITIONS

When all the beds are removed, the ditches filled, and the ground surface graded to form shallow, water holding depressions, the DRAINMOD model shows that hydric conditions (above 12 inches for 14 consecutive days of the growing season) can be met on the site. Figure 8 presents the predicted levels for 1992, a year with a "typical" rainfall of 42.5 inches. The model results indicate the site will likely "dry out" during the summer and fall, with groundwater levels recharging in the winter and spring. This is typical of Piedmont bottomland hardwood wetland systems. Additionally, groundwater levels tend to fluctuate with rainfall.

Figure 7
Sandy Creek Wetland Mitigation Site
Modeled Rainfall and Groundwater Levels for 1992 - Existing Conditions

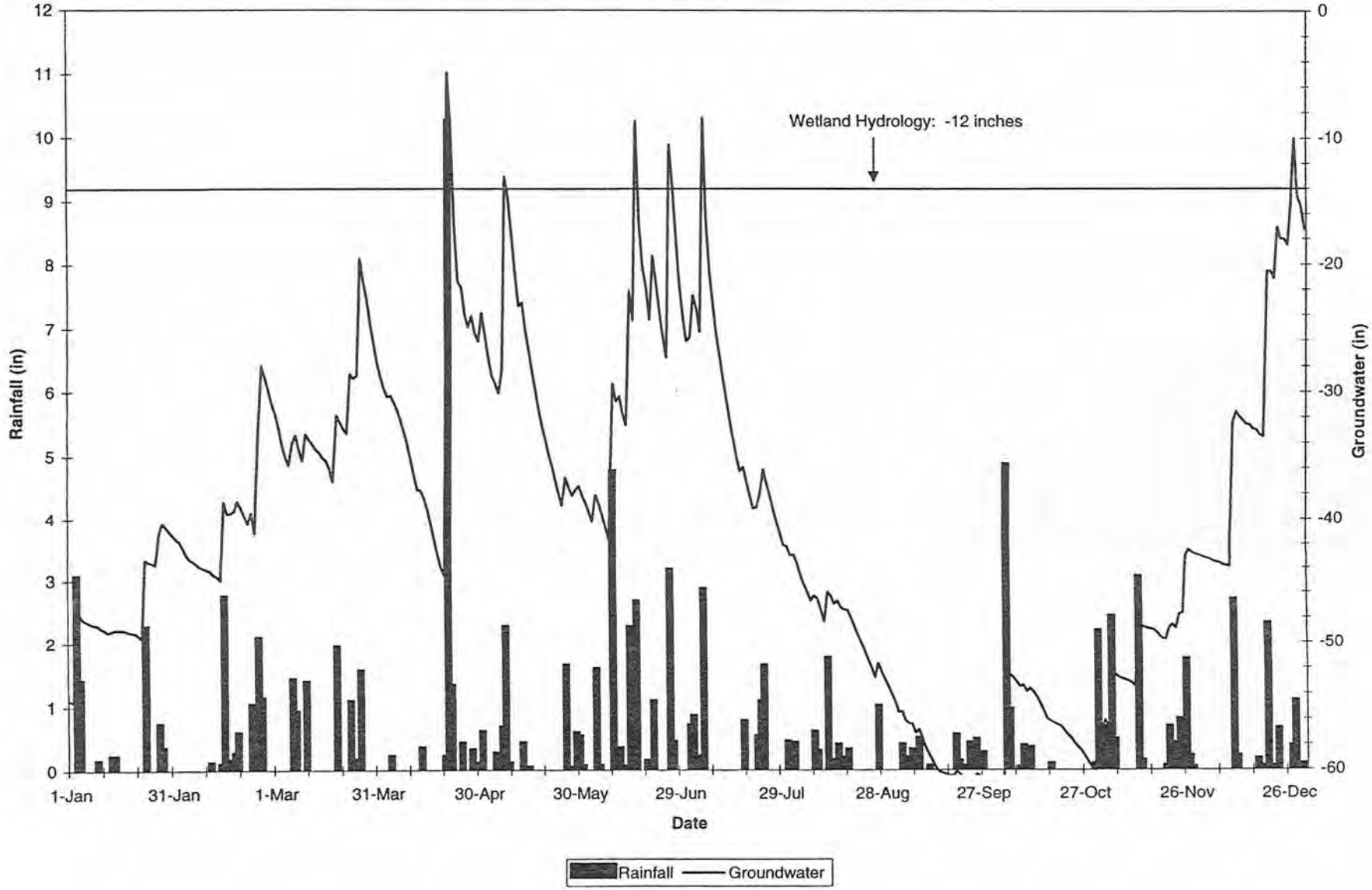
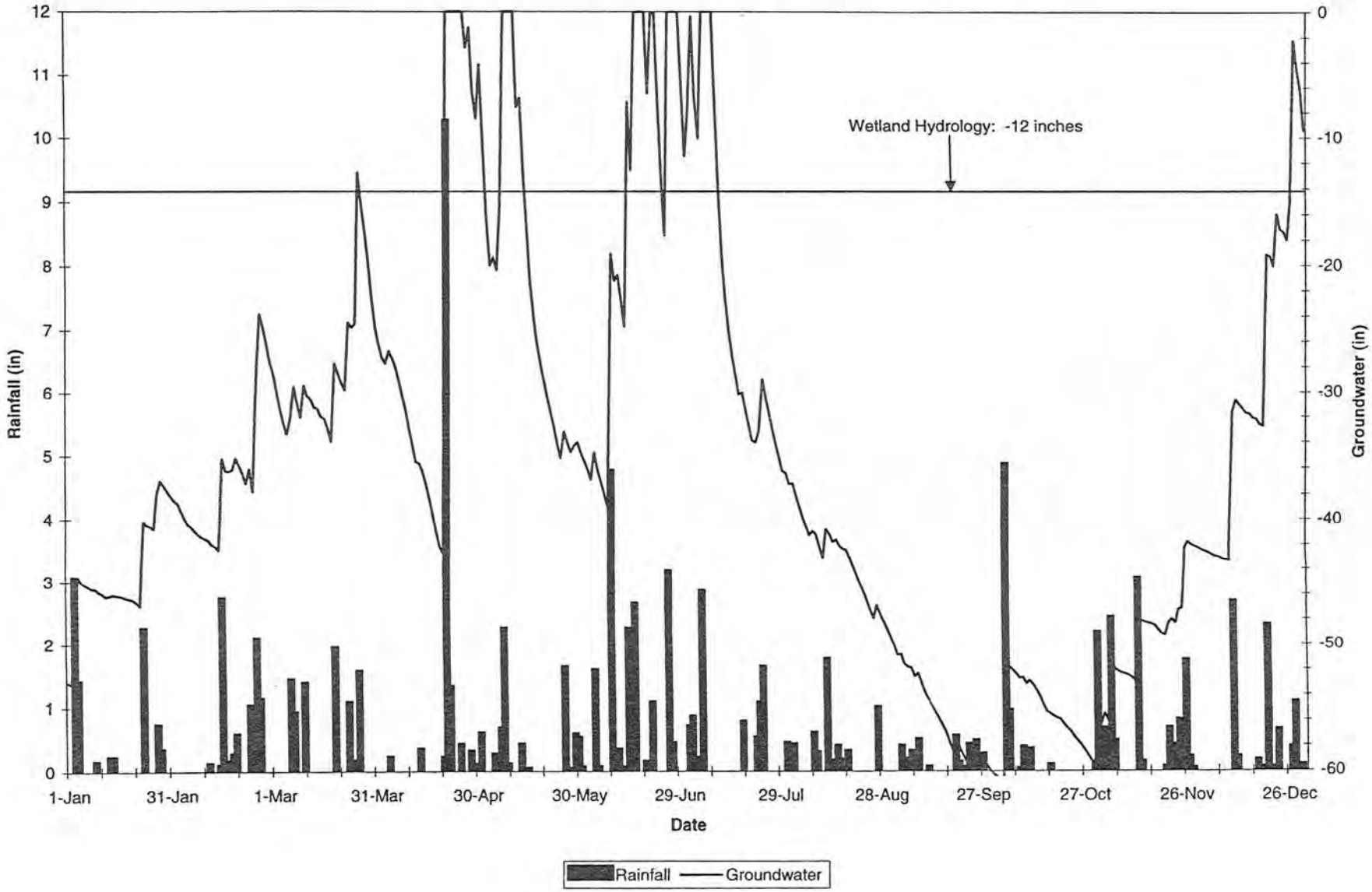


Figure 8
Sandy Creek Wetland Mitigation Site
Modeled Rainfall and Groundwater Levels for 1992 - Restored Conditions



5.0 MITIGATION PLAN

The mitigation plan for the site will consist of restoring 10 acres of wetlands within the floodplain of Sandy Creek. Pre-bedding hydrology will be restored through the removal of the raised beds and the plugging and filling of the lateral and perimeter ditches. Once hydrology has been restored, bottomland hardwood tree species will be planted to reproduce the community type that previously existed on this site.

Benefits of this mitigation plan include:

- Water quality benefits to Sandy Creek and the Ramseur water supply.
- Flood storage.
- Elimination of pastureland and cattle grazing along a portion of Sandy Creek.

5.1 HYDROLOGY RESTORATION

Based on an evaluation of the surrounding plant communities, prior to conversion to pasture, the site sustained a bottomland hardwood forest. Hydrological restoration will consist of "undoing" the work that was done to convert it to cropland.

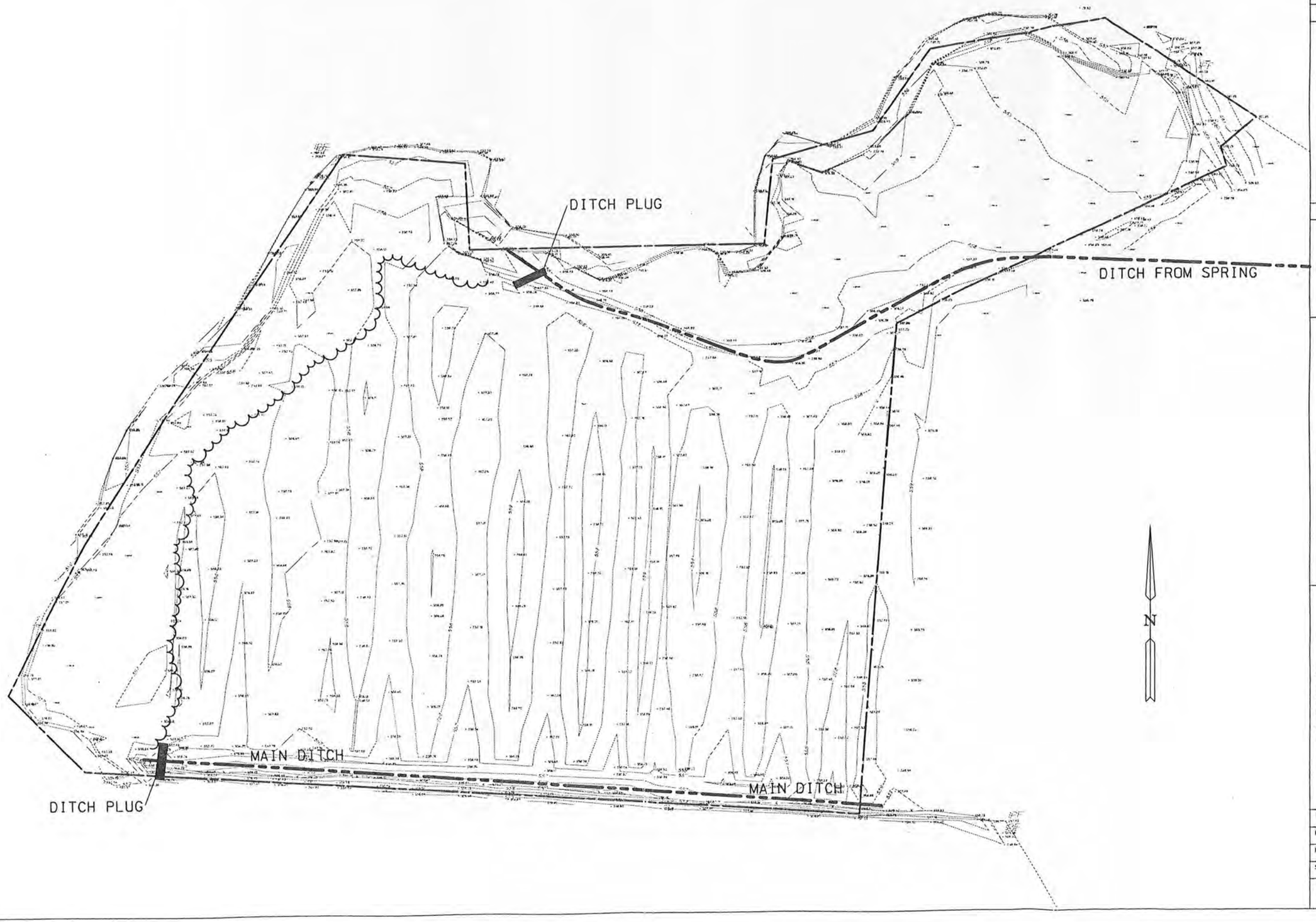
5.1.1 Groundwater

A primary mitigation goal will be to restore wetland hydrology to hydric soils currently lacking wetland hydrology. A ditch plug will be constructed in the main ditch (Figures 9 and 10). The ditch will be backfilled with soil. The lateral ditches on the site will be backfilled with the soil that was piled up on the "beds", and the beds may be removed. Removal of these ditches will then permit infiltration of precipitation and floodwater to recharge the groundwater and help to raise groundwater elevations in the central portion of the site. The DRAINMOD modeling as presented indicates that wetland hydrology should be restored to the field by these activities.

5.1.2 Surface Water

Currently a small but constant supply of surface water is provided to the site from a small spring to the east of the site. Water from the spring is currently drained from the site via a small ditch into Sandy Creek. A ditch plug will be placed in this ditch and the water from the spring will be directed into depressions created on the site.

DRAINMOD modeling does not allow for surface water inputs. Therefore, the inflow from the spring, as well as water from overbank flooding from Sandy Creek, can be viewed as an "insurance factor" providing "extra" water to the site to help produce and maintain wetland hydrology.



NO	REVISIONS	DRN	CHK	DATE

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E A R T H T E C H
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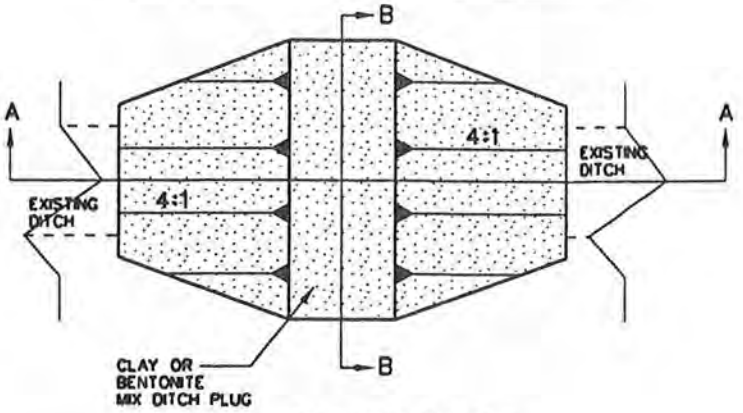
North Carolina
Department of Transportation
RALEIGH, NORTH CAROLINA

DITCH PLUG LOCATION
SANDY CREEK

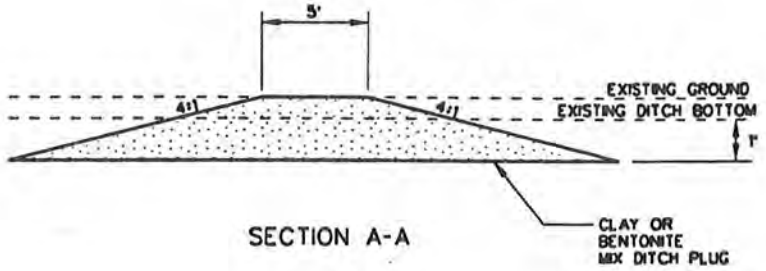
DATE MARCH 1999
PROJECT NO 32777
FILENAME dplugloc.dgn
SHEET NO

FIGURE 9

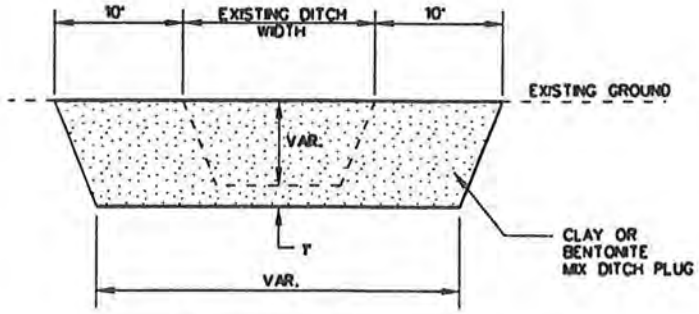
DETAIL OF DITCH PLUG



PLAN VIEW OF EXISTING DITCH WITH DITCH PLUG



SECTION A-A



SECTION B-B

NOTE: DITCH PLUGS TO BE LOCATED AS SHOWN ON THE PLANS & AT OTHER LOCATIONS AS DIRECTED BY THE ENGINEER.

EARTH TECH

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FIGURE 10
DITCH PLUG

Sandy Creek Wetland Mitigation Site

Randolph County, North Carolina

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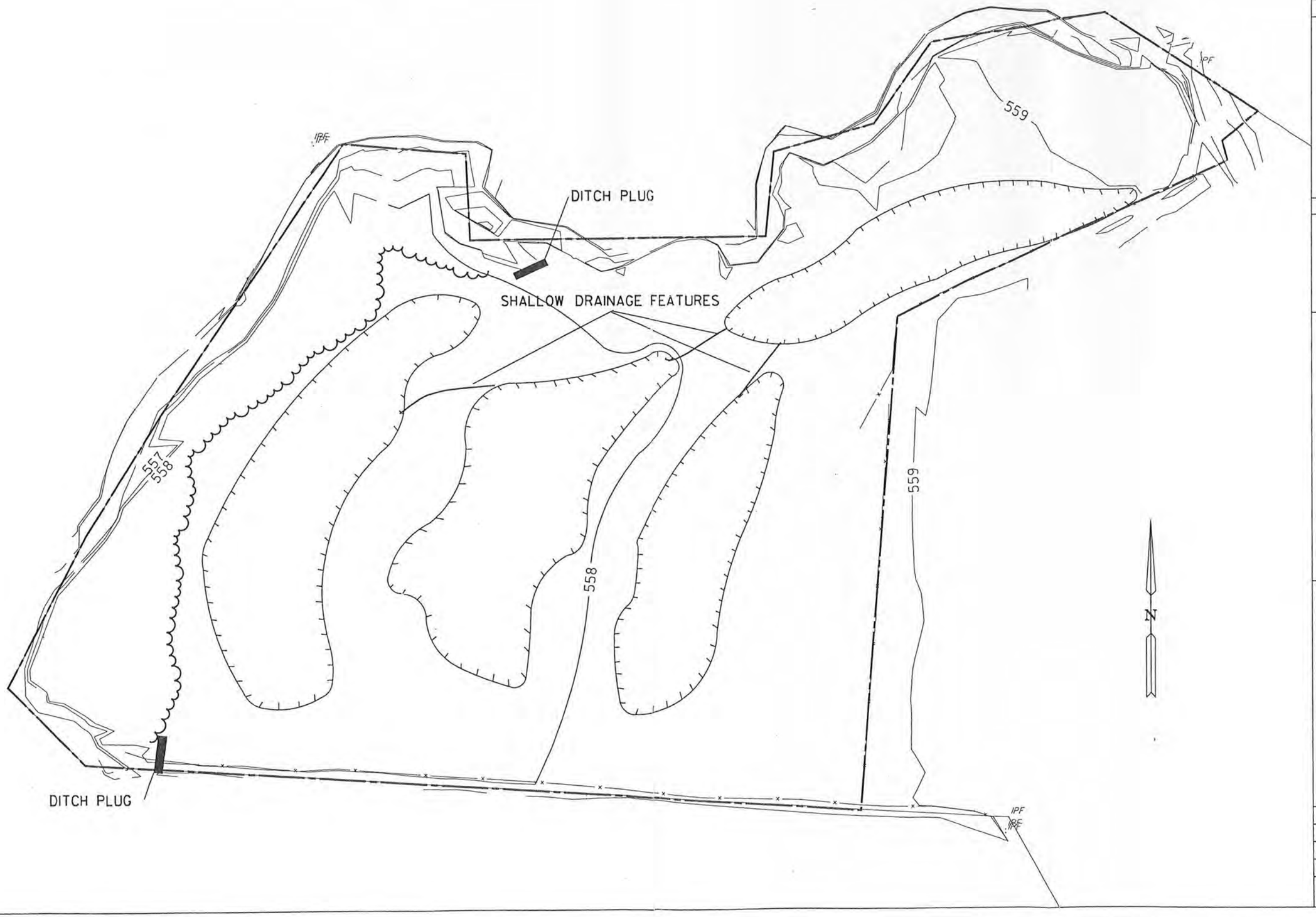

NO	REVISIONS	DRN	CHK	DATE

DRN
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E A R T H T E C H
A tyco INTERNATIONAL LTD. COMPANY

North Carolina
Department of Transportation
RALEIGH, NORTH CAROLINA

PROPOSED TOPOGRAPHY AND
SWALE LOCATIONS
SANDY CREEK

DATE MARCH 1999
PROJECT NO 32777
FILENAME proptopo.dgn
SHEET NO

FIGURE II

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5.4 MONITORING AND SUCCESS CRITERIA

Monitoring of the wetland mitigation site will be performed for 5 years or until success criteria are met. Monitoring is proposed of both vegetation and hydrology. The monitoring plan has been designed in accordance with the US Army Corps of Engineers Compensatory Hardwood Mitigation Guidelines (1993a).

5.4.1 Vegetation

Prior to planting, the site will be inspected and checked for proper elevation and suitability of soils. Availability of acceptable, good quality plant species will be determined. The site will be inspected at completion of planting to determine proper planting methods, including proper plant spacing, density, and species composition.

During the first year, vegetation will receive a cursory, visual examination to evaluate the degree of overtopping of the saplings by herbaceous plants. Quantitative sampling of the vegetation will be performed between August 1 and November 30 at the end of the first year and after each growing season until the vegetation criteria are met.

In preparation for the quantitative sampling, 0.05-acre vegetative plots will be established in the reforested area. Plots will be evenly distributed throughout the wetland mitigation site. Sample plot distribution will be correlated with the hydrological monitoring locations to help correlate data between vegetation and hydrology parameters. For each plot, species composition and density will be reported. Photo points will be established for each plot. Monitoring will take place once each year for five years.

Success will be determined by survival of target species within the sample plots. A minimum of 240 trees/acre must survive for at least five years after initial planting. At least six different representative tree species should be present on the entire site. If the vegetative success criteria are not met, the cause of failure will be determined and appropriate corrective action will be taken.

5.4.2 Hydrology

Monitoring wells will be installed in creation/restoration areas to monitor site hydrology. Monitoring wells will be installed in accordance with USACE guidelines (USACE 1993b). Four monitoring wells are proposed for this site. The approximate locations of these monitoring wells are shown on Figure 11.

The hydrologic goal is for the soil to be ponded, flooded, or saturated within 12 inches of the surface for at least 12.5 percent of the growing season under average climatic conditions. However, the site will be considered successful if the soil is ponded, flooded, or saturated within

12 inches of the surface for 5 to 12.5 percent of the growing season under average climatic conditions.

5.5 DISPENSATION OF THE PROPERTY

NCDOT will maintain ownership of the site until all mitigation activities are completed and the site is determined to be successful. Although no plan for dispensation of the Sandy Creek mitigation site has been developed, NCDOT will deed the site to a resource agency (public or private) acceptable to the appropriate regulatory agencies. Covenants and/or restrictions on the deed will insure adequate management and protection of the site in perpetuity.

5.6 WETLAND MITIGATION CREDIT

This mitigation plan is proposed to fulfill compensatory mitigation requirements for wetland impacts associated with I-2402. The 10 acres of wetland restoration will partially meet the 1:1 requirement for the DWQ and will be used to offset wetland impacts associated with I-2402. Wetland functions restored by this plan include, flood storage, wildlife habitat, and water quality improvement.

Draft guidelines published by the EPA (1992) recommend a 2:1 ratio for restoration. Therefore, if the Sandy Creek site is not used for I-2402 wetland impacts, 5 mitigation credits (10 acres at a 2:1 ratio) will be available for use by NCDOT on other projects within the Cape Fear Basin.

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Appendix A

Phase 1 Environmental Evaluation

PHASE 1 ENVIRONMENTAL ASSESSMENT

At the request of the North Carolina Department of Transportation, Earth Tech performed a Phase 1 Environmental Site Assessment of the Snider Farm (Sandy Creek Wetland Mitigation Site), at 3319 Brower Meadow Road, Randolph County, North Carolina.

OBJECTIVES

The objective of the assessment was to identify, to the extent feasible, environmental conditions that may create environmental liability to the potential purchaser of the property. In general, the Phase I environmental assessment was conducted in accordance with the scope and limitations of the guidelines established in the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process (ASTM 1527-97).

The environmental assessment included interviews with persons knowledgeable of the site, a review of a computer search of selected federal and state environmental databases, and visual observation of the property and surrounding area.

FINDINGS

Property History

Interviews

Mr. Snider, the current owner of the property was interviewed regarding the history of the property. He has owned the property since November 25, 1960. At that time the lower pasture was already bedded. He thought that it had been originally been bedded in the 1940's. He has used the area for growing hay and as pasture for cattle and horses. He was not aware of any environmental problems on or in the vicinity of the site.

Aerial Photo Review

Historic aerial photographs were reviewed to gain insight into the past use and history of the property. A 1982 aerial photograph (scale of 1 inch = 400 feet) from the Randolph County Tax Office shows the property as an open agricultural field. Surrounding land is wooded or pasture as well

Deed Review

Deeds were reviewed at the Randolph County Register of Deeds to obtain insight on the past ownership history and use of the property. This deed review revealed the following owners:

Ellis Darrell and Josie Snider 3319 Brower Meadow Road Staley, NC 27355 Parcel # 8715-19-8146 41-acre tract	November 25, 1960 to present
J.C. and Pearl Key 41-acre tract	1953 to1960
Donnie Williams 41-acre tract	1950 to 1953
Dan and Emma Kivett Describes 3 tracts purchased: 41-acre tract, 60-acre tract, 22-acre tract. Also, additional 30 acres purchased for a total of 153 acres.	1948 to 1950
R. C. and Dorothy Millikan Three tracts purchased.	1944 to 1948
W. A. Fox Three tracts purchased.	1918 to 1944
Murphy Burris Three tracts described.	before 1918

Site Overview

Property Description

The entire tract owned by Mr. Snider includes pastureland, wooded areas, a residence, and farm buildings. The mitigation area on this property is a 13.2 acre parcel along the floodplain of Sandy Creek, which contains a 10-acre field which is used for hay production. This area is regularly maintained and is enclosed by a barbed-wire fence. Wooded areas surround the pasture on the north, south, and west. The area to the east includes a pasture and the farm buildings. This area was not investigated, as it will not be included in the mitigation area. The field and some adjacent upland forested buffer area will likely be subdivided out of the parcel and purchased by NCDOT.

Adjacent and Surrounding Properties

The property to the south is also in active pasture. Adjacent properties are largely wooded or agricultural. Livestock roam freely throughout these properties.

Regulatory Review

Earth Tech obtained environmental database information published by the United States Environmental Protection Agency (EPA), the North Carolina Department of Environment and Natural Resources (NCDENR), and from E Data Resources, Inc. (EDR) to determine if any known sites producing, storing, and/or disposing of toxic or hazardous materials have affected or have the potential to affect the subject property. EDR provided a site location map identifying all regulated facilities within the ASTM radii for the site (Appendix A). Earth Tech also completed a reconnaissance of the area surrounding the subject property to confirm the EDR data and to ensure there were no other obvious regulated facilities.

Databases searched by EDR include the following:

- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), August 1998
- Emergency Response Notification System (ERNS), June 30, 1998
- National Priority List for Uncontrolled Hazardous Waste Sites (NPL), March 6, 1998
- Resource Conservation and Recovery Information System (RCRIS), Small Quantity Generators (SG), Large Quantity Generators (LG), and Treatment, Storage, and/or Disposal (TSD) Sites, July 1, 1998
- Superfund (CERCLA) Consent Decrees, Date of government version varies
- Corrective Action Report (CORRACTS), December 15, 1997
- Facility Index System (FINDS), April 1, 1997
- Hazardous Materials Information Reporting System (HMIRS), December 31, 1997
- Material Licensing Tracking System (MLTS), July 28, 1998
- Federal Superfund Liens (NPL Liens), October 15, 1991
- Polychlorinated Biphenyl (PCB) Activity Database System (PADS), September 22, 1997
- RCRA Administrative Action Tracking System (RAATS), April 17, 1995
- Records of Decision (ROD), March 31, 1995
- Toxic Chemical Release Inventory System (TRIS), December 31, 1995
- Toxic Substances Control Act (TSCA), January 31, 1995
- North Carolina, DENR, Leaking Underground Storage Tank (LUST) Data, July 1, 1998
- North Carolina, DENR, Underground Storage Tank (UST) Data, May 1, 1998
- North Carolina, DENR, State Inactive Hazardous Sites (SHWS), March 25, 1997
- North Carolina, DENR, Permitted Solid Waste Management Facilities (SWF/LF), January 2, 1998
- North Carolina, Center for Geographic Information and Analysis, Hazardous Substance Disposal Sites, June 21, 1995

A description of each database is included with the EDR Report at the end of this report.

Environmental Database Review

The EDR report did not identify any facilities on the various environmental databases as occurring in the vicinity of the study site. However, seven unplottable ("orphan") facilities (those facilities without map coordinates reported) were identified in the surrounding area (same zip code) by the EDR report. It was determined through a review of the partial addresses in the report combined with a windshield survey of the area that none of the sites are within ASTM distances of the property.

Agency File Review

Based on the database report it was determined that review of agency files was not necessary for this property.

CONCLUSIONS AND RECOMMENDATIONS

Based on the activities and research performed by Earth Tech during the Phase 1 Environmental Site Assessment of the subject property. This assessment indicates that the property has been used as farmland for many years. No environmental risks were identified. Based on the information presented in this report, Earth Tech does not recommend additional investigations at this time.

The EDR-Radius Map™ Report

Ellis Snider Farm
3319 Brower Meadow Road
Staley, NC 27355

Inquiry Number: 0302443.1r

October 14, 1998

Environmental Data Resources, Inc.
an edr company

The Source For Environmental Risk Management Data

3530 Post Road
Southport, Connecticut 06490

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer and Other Information

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc. (EDR). The report meets the government records search requirements of ASTM Standard Practice for Environmental Site Assessments, E 1527-97. Search distances are per ASTM standard or custom distances requested by the user.

The address of the subject property for which the search was intended is:

3319 BROWER MEADOW ROAD
STALEY, NC 27355

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the subject property or within the ASTM E 1527-97 search radius around the subject property for the following Databases:

NPL:..... National Priority List
Delisted NPL:..... NPL Deletions
RCRIS-TSD:..... Resource Conservation and Recovery Information System
SHWS:..... State Haz. Waste
CERCLIS:..... Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP:..... Comprehensive Environmental Response, Compensation, and Liability Information System
CORRACTS:..... Corrective Action Report
SWF/LF:..... Solid Waste Facilities
LUST:..... Incidents Management Database
UST:..... Petroleum Underground Storage Tank Database
RAATS:..... RCRA Administrative Action Tracking System
RCRIS-SQG:..... Resource Conservation and Recovery Information System
RCRIS-LQG:..... Resource Conservation and Recovery Information System
HMIRS:..... Hazardous Materials Information Reporting System
PADS:..... PCB Activity Database System
ERNS:..... Emergency Response Notification System
FINDS:..... Facility Index System
TRIS:..... Toxic Chemical Release Inventory System
NPL Lien:..... NPL Liens
NC HSDS:..... Hazardous Substance Disposal Site
IMD:..... Incident Management Database
TSCA:..... Toxic Substances Control Act
MLTS:..... Material Licensing Tracking System
ROD:..... ROD
CONSENT:..... Superfund (CERCLA) Consent Decrees
Coal Gas:..... Former Manufactured gas (Coal Gas) Sites.

Unmapped (orphan) sites are not considered in the foregoing analysis.

Search Results:

Search results for the subject property and the search radius, are listed below:

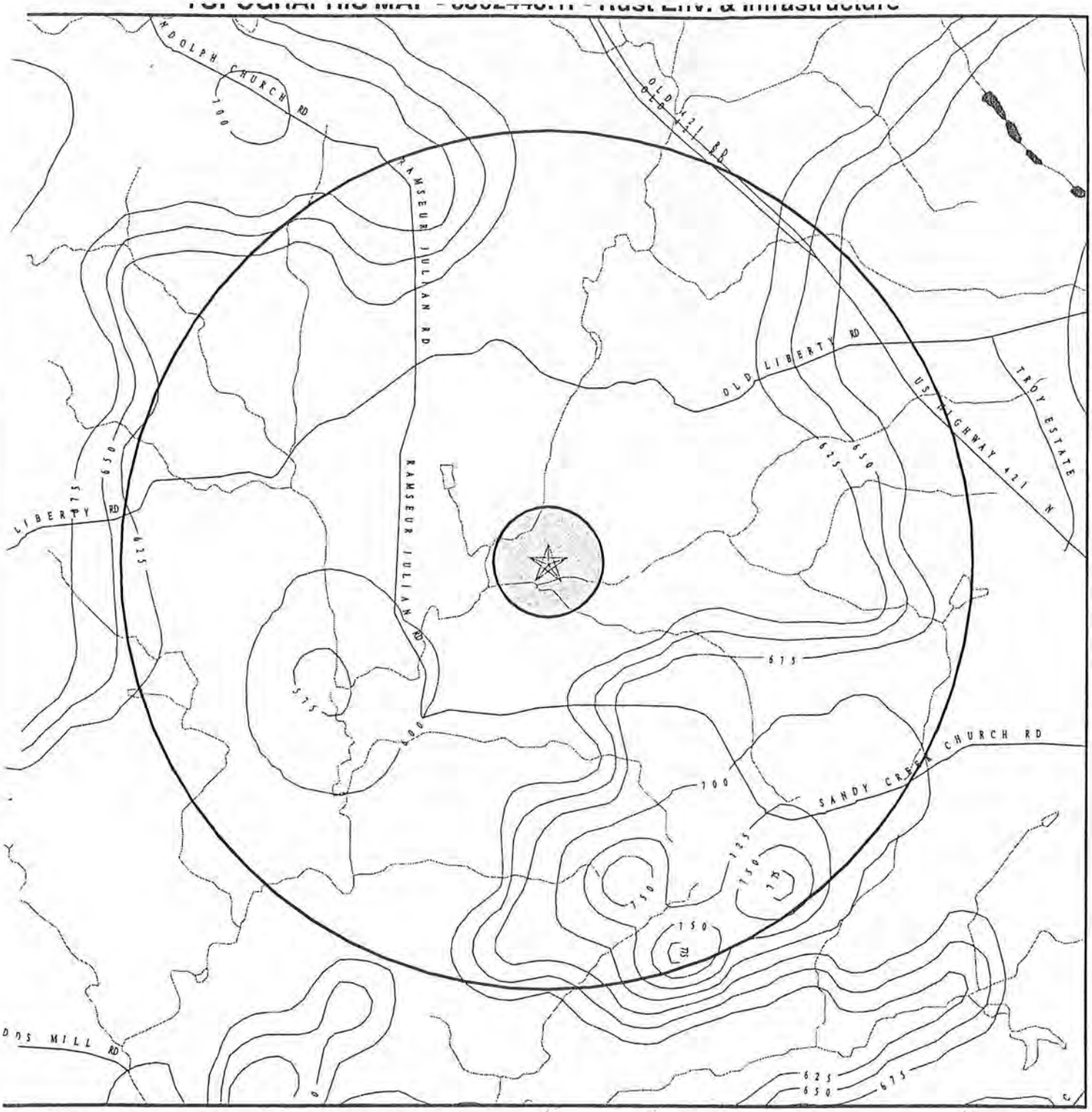
Subject Property:

The subject property was not listed in any of the databases searched by EDR.

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
GREGSON FUNITURE	SHWS
PUMP-N-PAK	LUST
CHEEK RESIDENCE (WILLIAM)	LUST
JUNE KENNEDY RESIDENCE	LUST
WILLIAM KIVETT	UST
LIB VOR	UST
NCDOT-SITE #43 RILEY PAVING	IMD

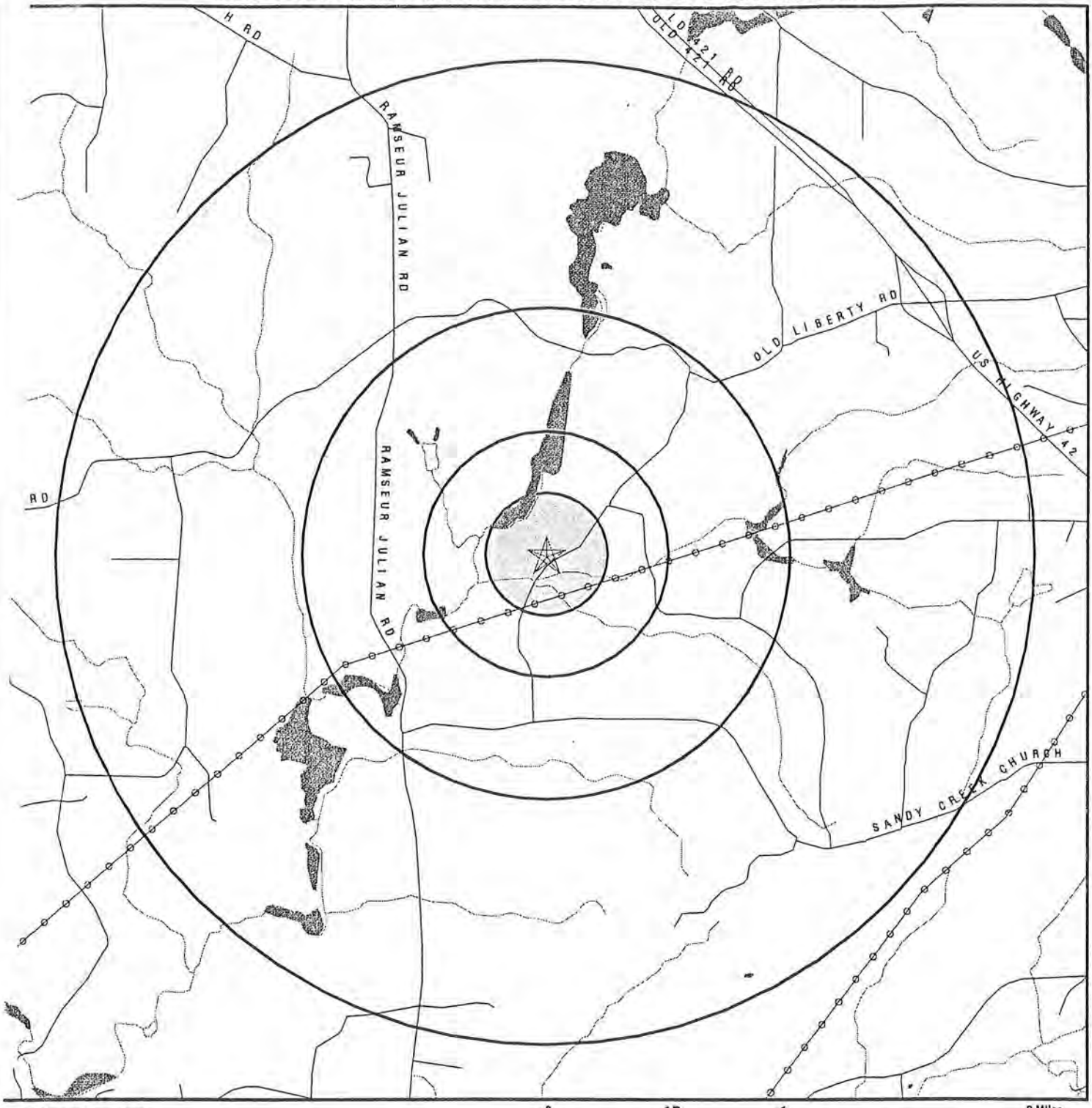


Source: US Geological Survey 1-Degree Digital Elevation Model
Compiled 09/15/92

- Major Roads
- Contour lines (25 foot interval unless otherwise shown)
- Waterways

TARGET PROPERTY:	Ellis Snider Farm	CUSTOMER:	Rust Env. & Infrastructure
ADRESS:	3319 Brower Meadow Road	CONTACT:	Ron Johnson
CITY/STATE/ZIP:	Staley NC 27355	INQUIRY #:	0302443.1r
LAT/LONG:	35.83330 / 79.63330	DATE:	October 14, 1998

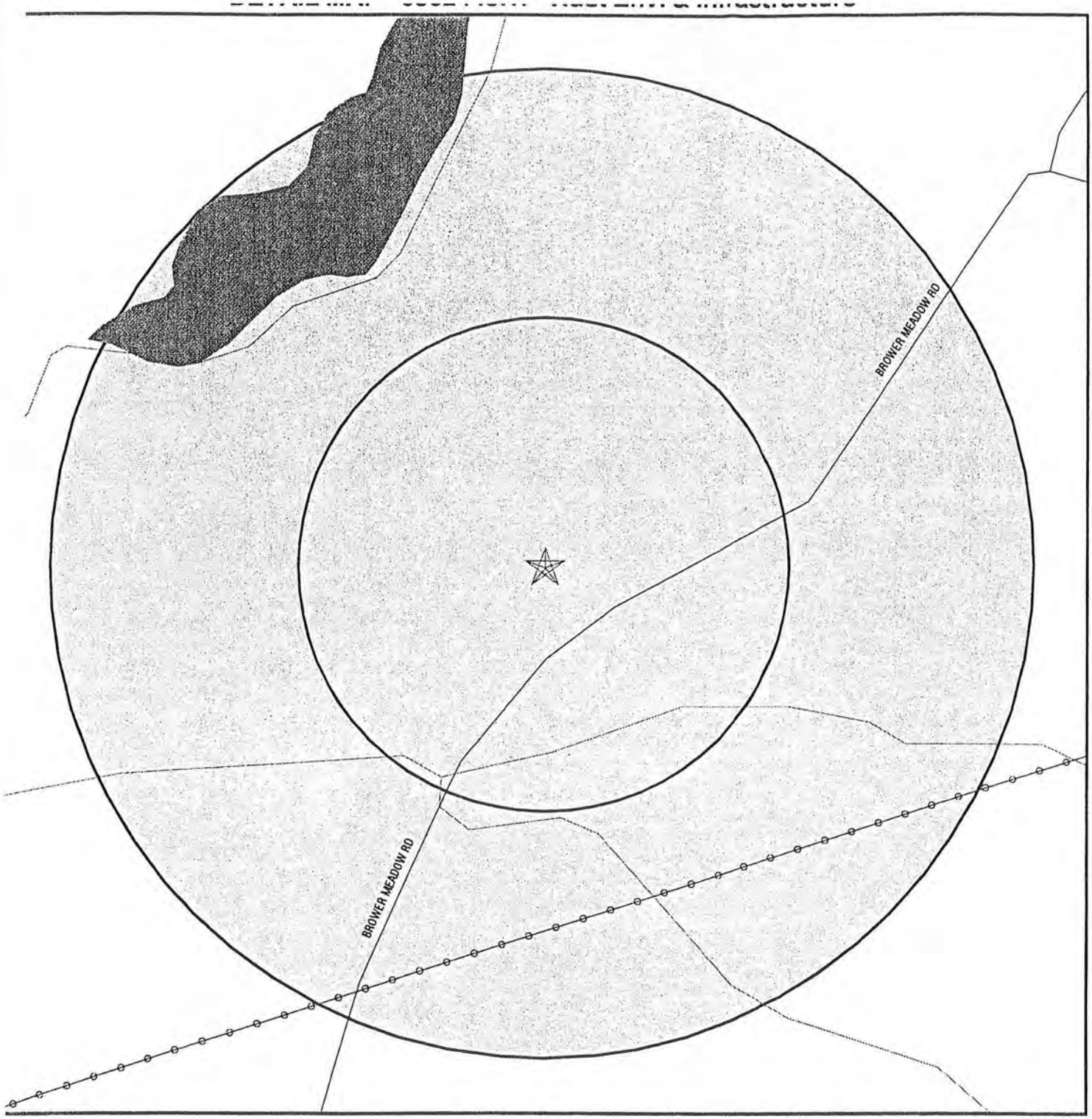
OVERVIEW MAP - 0302443.1r - Rust Env. & Infrastructure



0 1/2 1 2 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Coal Gasification Sites (if requested)
- National Priority List Sites
- Landfill Sites
- Power transmission lines
- Oil & Gas pipelines
- Wetlands per National Wetlands Inventory (1994)
- Hazardous Substance Disposal Sites

TARGET PROPERTY:	Ellis Snider Farm	CUSTOMER:	Rust Env. & Infrastructure
ADDRESS:	3319 Brower Meadow Road	CONTACT:	Ron Johnson
CITY/STATE/ZIP:	Staley NC 27355	INQUIRY #:	0302443.1r
LAT/LONG:	35.8333 / 79.6333	DATE:	October 14, 1998 12:49 pm



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Coal Gasification Sites (if requested)

Sensitive Receptors

National Priority List Sites

Landfill Sites

0 1/16 1/8 1/4 Miles

Power transmission lines

Oil & Gas pipelines

Wetlands per National Wetlands Inventory (1994)

Hazardous Substance Disposal Sites

TARGET PROPERTY:	Ellis Snider Farm	CUSTOMER:	Rust Env. & Infrastructure
ADDRESS:	3319 Brower Meadow Road	CONTACT:	Ron Johnson
CITY/STATE/ZIP:	Staley NC 27355	INQUIRY #:	0302443.1r
LAT/LONG:	35.8333 / 79.6333	DATE:	October 14, 1998 12:49 pm

MAP FINDINGS SUMMARY SHOWING ALL SITES

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
NPL		1.250	0	0	0	0	0	0
Delisted NPL		TP	NR	NR	NR	NR	NR	0
RCRIS-TSD		0.750	0	0	0	0	NR	0
State Haz. Waste		1.250	0	0	0	0	0	0
CERCLIS		0.750	0	0	0	0	NR	0
CERC-NFRAP		TP	NR	NR	NR	NR	NR	0
CORRACTS		1.250	0	0	0	0	0	0
State Landfill		0.750	0	0	0	0	NR	0
LUST		0.750	0	0	0	0	NR	0
UST		0.500	0	0	0	NR	NR	0
RAATS		TP	NR	NR	NR	NR	NR	0
RCRIS Sm. Quan. Gen.		0.500	0	0	0	NR	NR	0
RCRIS Lg. Quan. Gen.		0.500	0	0	0	NR	NR	0
HMIRS		TP	NR	NR	NR	NR	NR	0
PADS		TP	NR	NR	NR	NR	NR	0
ERNS		TP	NR	NR	NR	NR	NR	0
FINDS		TP	NR	NR	NR	NR	NR	0
TRIS		TP	NR	NR	NR	NR	NR	0
NPL Liens		TP	NR	NR	NR	NR	NR	0
NC HSDS		1.250	0	0	0	0	0	0
IMD		0.500	0	0	0	NR	NR	0
TSCA		TP	NR	NR	NR	NR	NR	0
MLTS		TP	NR	NR	NR	NR	NR	0
ROD		1.250	0	0	0	0	0	0
CONSENT		1.250	0	0	0	0	0	0
Coal Gas		1.250	0	0	0	0	0	0

TP = Target Property

NR = Not Requested at this Search Distance

* Sites may be listed in more than one database

MAP FINDINGS SUMMARY SHOWING ONLY SITES HIGHER THAN OR THE SAME ELEVATION AS TP

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
NPL		1.250	0	0	0	0	0	0
Delisted NPL		TP	NR	NR	NR	NR	NR	0
RCRIS-TSD		0.750	0	0	0	0	NR	0
State Haz. Waste		1.250	0	0	0	0	0	0
CERCLIS		0.750	0	0	0	0	NR	0
CERC-NFRAP		TP	NR	NR	NR	NR	NR	0
CORRACTS		1.250	0	0	0	0	0	0
State Landfill		0.750	0	0	0	0	NR	0
LUST		0.750	0	0	0	0	NR	0
UST		0.500	0	0	0	NR	NR	0
RAATS		TP	NR	NR	NR	NR	NR	0
RCRIS Sm. Quan. Gen.		0.500	0	0	0	NR	NR	0
RCRIS Lg. Quan. Gen.		0.500	0	0	0	NR	NR	0
HMIRS		TP	NR	NR	NR	NR	NR	0
PADS		TP	NR	NR	NR	NR	NR	0
ERNS		TP	NR	NR	NR	NR	NR	0
FINDS		TP	NR	NR	NR	NR	NR	0
TRIS		TP	NR	NR	NR	NR	NR	0
NPL Liens		TP	NR	NR	NR	NR	NR	0
NC HSDS		1.250	0	0	0	0	0	0
IMD		0.500	0	0	0	NR	NR	0
TSCA		TP	NR	NR	NR	NR	NR	0
MLTS		TP	NR	NR	NR	NR	NR	0
ROD		1.250	0	0	0	0	0	0
CONSENT		1.250	0	0	0	0	0	0
Coal Gas		1.250	0	0	0	0	0	0

TP = Target Property

NR = Not Requested at this Search Distance

* Sites may be listed in more than one database

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number

Coal Gas Site Search: No site was found in a search of Real Property Scan's ENVIROHAZ database.

NO SITES FOUND

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)	Facility ID
LIBERTY	U001198524	WILLIAM KIVETT	SR 1006 S	27298	UST	0-019313
LIBERTY	U001198208	LIB VOR	S.R. 2459	27298	UST	0-018847
LIBERTY	S103131760	NCDOT-SITE #43 RILEY PAVING	HWY 421	27298	IMD	17390
LIBERTY	S102868518	PUMP-N-PAK	4994 HWY 49 S.	27298	LUST	17768
LIBERTY	S101425635	GREGSON FUNITURE	206 E FRAIZER AVENUE	27298	SHWS	SIS760100992
LIBERTY	S102611243	CHEEK RESIDENCE (WILLIAM)	5720 RAMSEUR RD.	27298	LUST	17354
LIBERTY	S101523018	JUNE KENNEDY RESIDENCE	SANDY CREEK RD.	27298	LUST	6368

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Elapsed ASTM days: Provides confirmation that this EDR report meets or exceeds the 90-day updating requirement of the ASTM standard.

FEDERAL ASTM RECORDS:

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
Source: EPA
Telephone: 703-413-0223
CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 08/27/98
Date Made Active at EDR: 10/06/98
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 09/03/98
Elapsed ASTM days: 33
Date of Last EDR Contact: 08/27/98

ERNS: Emergency Response Notification System
Source: EPA/NTIS
Telephone: 202-260-2342
Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 06/30/98
Date Made Active at EDR: 07/20/98
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 07/14/98
Elapsed ASTM days: 6
Date of Last EDR Contact: 07/10/98

NPL: National Priority List
Source: EPA
Telephone: 703-603-8852
National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC).

Date of Government Version: 03/06/98
Date Made Active at EDR: 07/09/98
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 06/09/98
Elapsed ASTM days: 30
Date of Last EDR Contact: 09/21/98

RCRIS: Resource Conservation and Recovery Information System
Source: EPA/NTIS
Telephone: 800-424-9346
Resource Conservation and Recovery Information System. RCRIS includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

Date of Government Version: 07/01/98
Date Made Active at EDR: 10/06/98
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 08/27/98
Elapsed ASTM days: 40
Date of Last EDR Contact: 08/14/98

CORRACTS: Corrective Action Report
Source: EPA
Telephone: 800-424-9346
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/15/97
Date Made Active at EDR: 02/02/98
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 01/05/98
Elapsed ASTM days: 28
Date of Last EDR Contact: 08/14/98

FEDERAL NON-ASTM RECORDS:

BRS: Biennial Reporting System
Source: EPA/NTIS
Telephone: 800-424-9346
The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/95
Database Release Frequency: Biennially
Date of Last EDR Contact: 09/22/98
Date of Next Scheduled EDR Contact: 12/21/98

CONSENT: Superfund (CERCLA) Consent Decrees
Source: EPA Regional Offices
Telephone: Varies
Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: Varies
Database Release Frequency: Varies
Date of Last EDR Contact: Varies
Date of Next Scheduled EDR Contact: N/A

FINDS: Facility Index System
Source: EPA/NTIS
Telephone: 703-908-2493
Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 04/01/97
Database Release Frequency: Quarterly
Date of Last EDR Contact: 08/19/98
Date of Next Scheduled EDR Contact: 12/21/98

HMIRS: Hazardous Materials Information Reporting System
Source: U.S. Department of Transportation
Telephone: 202-366-4526
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/31/97
Database Release Frequency: Annually
Date of Last EDR Contact: 07/22/98
Date of Next Scheduled EDR Contact: 10/26/98

MLTS: Material Licensing Tracking System
Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 07/28/98
Database Release Frequency: Quarterly
Date of Last EDR Contact: 07/13/98
Date of Next Scheduled EDR Contact: 10/12/98

NPL LIENS: Federal Superfund Liens
Source: EPA
Telephone: 205-564-4267
Federal Superfund Liens. Under the authority granted the USEPA by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/91
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 08/28/98
Date of Next Scheduled EDR Contact: 11/23/98

PADS: PCB Activity Database System
Source: EPA
Telephone: 202-260-3936
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 09/22/97
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 08/18/98
Date of Next Scheduled EDR Contact: 11/16/98

RAATS: RCRA Administrative Action Tracking System
Source: EPA
Telephone: 202-564-4104
RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/95
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 09/14/98
Date of Next Scheduled EDR Contact: 12/14/98

ROD: Records Of Decision
Source: NTIS
Telephone: 703-416-0223
Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 03/31/95
Database Release Frequency: Annually
Date of Last EDR Contact: 09/03/98
Date of Next Scheduled EDR Contact: 11/30/98

TRIS: Toxic Chemical Release Inventory System
Source: EPA/NTIS
Telephone: 202-260-1531
Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/95
Database Release Frequency: Annually
Date of Last EDR Contact: 09/28/98
Date of Next Scheduled EDR Contact: 12/28/98

TSCA: Toxic Substances Control Act
Source: EPA/NTIS
Telephone: 202-260-1444
Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site. USEPA has no current plan to update and/or re-issue this database.

Date of Government Version: 12/31/94
Database Release Frequency: Annually
Date of Last EDR Contact: 07/22/98
Date of Next Scheduled EDR Contact: 10/26/98

STATE OF NORTH CAROLINA ASTM RECORDS:

LUST: Incidents Management Database
Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-1315
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 07/01/98
Date Made Active at EDR: 09/10/98
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 08/07/98
Elapsed ASTM days: 34
Date of Last EDR Contact: 07/09/98

SHWS: Inactive Hazardous Sites Inventory
Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-2801
State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 03/25/97
Date Made Active at EDR: 06/30/97
Database Release Frequency: Annually
Date of Data Arrival at EDR: 04/28/97
Elapsed ASTM days: 63
Date of Last EDR Contact: 07/20/98

LF: List of Solid Waste Facilities
Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-0692
Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 01/02/98
Date Made Active at EDR: 04/10/98
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 03/11/98
Elapsed ASTM days: 30
Date of Last EDR Contact: 07/28/98

UST: Petroleum Underground Storage Tank Database
Source: Department of Environment, Health and Natural Resources
Telephone: 919-733-1308
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 05/01/98
Date Made Active at EDR: 07/30/98
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 07/01/98
Elapsed ASTM days: 29
Date of Last EDR Contact: 08/12/98

STATE OF NORTH CAROLINA NON-ASTM RECORDS:

IMD: Incident Management Database
Source: Department of Health and Natural Resources
Telephone: 919-733-1315

Date of Government Version: 07/01/98
Database Release Frequency: N/A
Date of Last EDR Contact: 07/09/98
Date of Next Scheduled EDR Contact: 11/02/98

HSDS: Hazardous Substance Disposal Site
Source: North Carolina Center for Geographic Information and Analysis
Telephone: 919-733-2090
Locations of uncontrolled and unregulated hazardous waste sites. The file includes sites on the National Priority List as well as those on the state priority list.

Date of Government Version: 06/21/95
Database Release Frequency: Biennially
Date of Last EDR Contact: 09/10/98
Date of Next Scheduled EDR Contact: 12/07/98

Historical and Other Database(s)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Former Manufactured Gas (Coal Gas) Sites: The existence and location of Coal Gas sites is provided exclusively to EDR by Real Property Scan, Inc. ©Copyright 1993 Real Property Scan, Inc. For a technical description of the types of hazards which may be found at such sites, contact your EDR customer service representative.

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The information contained in this report has predominantly been obtained from publicly available sources produced by entities other than Real Property Scan. While reasonable steps have been taken to insure the accuracy of this report, Real Property Scan does not guarantee the accuracy of this report. Any liability on the part of Real Property Scan is strictly limited to a refund of the amount paid. No claim is made for the actual existence of toxins at any site. This report does not constitute a legal opinion.

DELISTED NPL: NPL Deletions
Source: EPA
Telephone: 703-603-8769
The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 03/06/98
Date Made Active at EDR: 07/09/98
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 06/09/98
Elapsed ASTM days: 30
Date of Last EDR Contact: 09/28/98

NFRAP: No Further Remedial Action Planned
Source: EPA
Telephone: 703-413-0223
As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration. EPA has removed approximately 25,000 NFRAP sites to lift the unintended barriers to the redevelopment of these properties and has archived them as historical records so EPA does not needlessly repeat the investigations in the future. This policy change is part of the EPA's Brownfields Redevelopment Program to help cities, states, private investors and affected citizens to promote economic redevelopment of unproductive urban sites.

Date of Government Version: 08/27/98
Date Made Active at EDR: 10/03/98
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 09/03/98
Elapsed ASTM days: 30
Date of Last EDR Contact: 08/27/98

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1996 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in March 1997 from the U.S. Fish and Wildlife Service.

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)	Facility ID
LIBERTY	U001198524	WILLIAM KIVETT	SR 1006 S	27298	UST	0-019313
LIBERTY	U001198208	LIB VOR	S.R. 2459	27298	UST	0-018847
LIBERTY	S103131760	NCDOT-SITE #43 RILEY PAVING	HWY 421		IMD	17390
LIBERTY	S102868518	PUMP-N-PAK	4994 HWY 49 S.		LUST	17768
LIBERTY	S101425635	GREGSON FUNITURE	206 E FRAIZER AVENUE		SHWS	SIS760100992
LIBERTY	S102611243	CHEEK RESIDENCE (WILLIAM)	5720 RAMSEUR RD.		LUST	17354
LIBERTY	S101523018	JUNE KENNEDY RESIDENCE	SANDY CREEK RD.		LUST	6368

Site	Database(s)	EDR ID Number EPA ID Number

WILLIAM KIVETT
SR 1006 S
LIBERTY, NC 27298

UST **U001198524** / **N/A**

UST:

Facility ID:	0-019313	Telephone:	(919) 622-4344
Tank ID:	1	Tank Size:	2000
Interior:	Unknown	Exterior:	Unknown
Material:	Steel	Piping:	Steel
Date installed:	04/14/1949	Date removed:	07/31/1987
Status:	Permanent Closed	Product:	Gasoline, Gasoline Mixture
Tank Leak Det.:	Not reported	Pipe Leak Det.:	Not reported
Tank Corr. Prot.:	Not reported	Pipe Corr. Prot.:	Not reported
Overfill Prot.:	Not reported	Financial Resp.:	Not reported
CAS/CERCLA:	Not reported		
Certification:	Not reported		
Region:	04		
Owner:	WILLIAM KIVETT SR 1006 S LIBERTY, NC 27298		

Facility ID:	0-019313	Telephone:	(919) 622-4344
Tank ID:	2	Tank Size:	2000
Interior:	Unknown	Exterior:	Unknown
Material:	Steel	Piping:	Steel
Date installed:	04/14/1949	Date removed:	07/31/1987
Status:	Permanent Closed	Product:	Gasoline, Gasoline Mixture
Tank Leak Det.:	Not reported	Pipe Leak Det.:	Not reported
Tank Corr. Prot.:	Not reported	Pipe Corr. Prot.:	Not reported
Overfill Prot.:	Not reported	Financial Resp.:	Not reported
CAS/CERCLA:	Not reported		
Certification:	Not reported		
Region:	04		
Owner:	WILLIAM KIVETT SR 1006 S LIBERTY, NC 27298		

LIB VOR
S.R. 2459
LIBERTY, NC 27298

UST **U001198208** / **N/A**

UST:

Facility ID:	0-018847	Telephone:	(919) 333-5132
Tank ID:	1	Tank Size:	500
Interior:	Unknown	Exterior:	Unknown
Material:	Steel	Piping:	Copper
Date installed:	04/18/1970	Date removed:	10/01/1988
Status:	Permanent Closed	Product:	Gasoline, Gasoline Mixture
Tank Leak Det.:	Not reported	Pipe Leak Det.:	Not reported
Tank Corr. Prot.:	Not reported	Pipe Corr. Prot.:	Not reported
Overfill Prot.:	Not reported	Financial Resp.:	Not reported
CAS/CERCLA:	Not reported		
Certification:	Not reported		
Region:	04		
Owner:	DOT/FEDERAL AVIATION ADMIN. P.O. BOX 8147 GREENSBORO, NC 27410		

Site	Database(s)	EDR ID Number EPA ID Number
NCDOT-SITE #43 RILEY PAVING **HWY 421** **LIBERTY, NC**	**IMD**	**S103131760** **N/A**

IMD:

Incident #:	17390	Region:	WS
Date Occurred:	06/22/96	Submit Date:	06/06/97
GW Contam:	Y	Soil Contam:	Not reported
Incident Desc:	SITE ASSESSMENT IN 1996 FOUND SOIL AND GW CONTAMINATION.		
Operator:	CHRIS NIVER		
Owner:	NCDOT 1429 WESTOVER TERRACE GREENSBORO, NC 27408 GUILF County		
Contact Phone:	Not reported		
Ownership:	Private	Operation:	Industrial
Material:	CHLORINATED SOLVENTS		
Qty Lost:	Not reported	Qty Recovered:	Not reported
Source:	Spill-surface	Type:	Other organics
Location:	Facility	Setting:	Residential
Priority Code:	B	Priority Update:	Not reported
Site Priority:	125B		
Dem Contact:	Not reported		
Wells Affected:	No	Num Affected:	0
Wells Contam:	Not reported		
Sampled By:	Responsible Parties	Samples Include:	Groundwater Samples
7.5 Min Quad:	Not reported	5 Min Quad:	K50
Lat/Long:	354935 / 793450	Risk Site	No

PUMP-N-PAK **4994 HWY 49 S.** **LIBERTY, NC**	**LUST**	**S102868518** **N/A**

Site	Database(s)	EDR ID Number EPA ID Number

PUMP-N-PAK (Continued) S102868518

LUST:

Incident #:	17768	Region:	WS
Date Occurred:	02/18/97	Submit Date:	09/08/97
GW Contam:	Y	Soil Contam:	Not reported
Incident Desc:	A PRE BUY ASSESSMENT FOUND GW SAMPLES CONTAMINATED WITH BENZENE.		
Operator:	JIM WILSON		
Owner:	PUMP-N-PAK, INC. P.O. BOX 368 LIBERTY, NC 27298 RANDO County		
Contact Phone:	Not reported		
Ownership:	Private	Operation:	Commercial
Material:	GASOLINE		
Qty Lost:	Not reported	Qty Recovered:	Not reported
Source:	Leak-underground	Type:	Gasoline/diesel
Location:	Facility	Setting:	Rural
Priority Code:	H	Priority Update:	05/30/98
Dem Contact:	Not reported		
Wells Affected:	No	Num Affected:	0
Wells Contam:	Not reported		
Sampled By:	Responsible Parties	Samples Include:	Groundwater Samples
7.5 Min Quad:	Not reported	5 Min Quad:	K50
Lat/Long:	354218 / 793428	Risk Site	Yes

GREGSON FUNITURE **SHWS** **S101425635**
206 E FRAIZER AVENUE **N/A**
LIBERTY, NC

SHWS:

Facility ID:	SIS760100992
EPA ID:	NCD982124646

CHEEK RESIDENCE (WILLIAM) **LUST** **S102611243**
5720 RAMSEUR RD. **N/A**
LIBERTY, NC

Site	Database(s)	EDR ID Number EPA ID Number

CHEEK RESIDENCE (WILLIAM) (Continued) S102611243

LUST:

Incident #:	17354	Region:	WS
Date Occurred:	11/18/96	Submit Date:	05/27/97
GW Contam:	Y	Soil Contam:	Not reported
Incident Desc:	LAB RESULTS CONFIRMED CONTAMINATION IN CHEEK'S WATER SUPPLY WELL.		
Operator:	RUBY MURPHY		
Owner:	Not reported 5732 RAMSEUR-JULIAN RD. LIBERTY, NC 27298 RANDO County		
Contact Phone:	Not reported		
Ownership:	Private	Operation:	Agricultural
Material:	GASOLINE		
Qty Lost:	Not reported	Qty Recovered:	Not reported
Source:	Leak-underground	Type:	Gasoline/diesel
Location:	Residence	Setting:	Rural
Priority Code:	A	Priority Update:	Not reported
Dem Contact:	Not reported		
Wells Affected:	Yes	Num Affected:	1
Wells Contam:	WILLIAM CHEEK RESD.		
Sampled By:	Dept. of Health Services	Samples Include:	Groundwater Samples
7.5 Min Quad:	Not reported	5 Min Quad:	J51
Lat/Long:	355236 / 793834	Risk Site	No

JUNE KENNEDY RESIDENCE **LUST** **S101523018**
SANDY CREEK RD. **N/A**
LIBERTY, NC

Site	Database(s)	EDR ID Number EPA ID Number
JUNE KENNEDY RESIDENCE (Continued)		S101523018

LUST:

Incident #:	6368	Region:	WS
Date Occurred:	07/15/90	Submit Date:	02/13/91
GW Contam:	Y	Soil Contam:	Not reported
Incident Desc:	THE KENNEDYS STARTED TO NOTICE A GASOLINE LIKE TASTE AND SMELL IN THE WATER SUPPLY WELL ABOUT 1 YR. AGO.		
Operator:	JUNE KENNEDY		
Owner:	Not reported RT 4, BOX 474 LIBERTY, NC 27298 RANDO County		
Contact Phone:	Not reported		
Ownership:	Private	Operation:	Agricultural
Material:	GASOLINE		
Qty Lost:	UNK	Qty Recovered:	UNK
Source:	Leak-underground	Type:	Gasoline/diesel
Location:	Residence	Setting:	Rural
Priority Code:	H	Priority Update:	05/30/98
Dem Contact:	Not reported		
Wells Affected:	Yes	Num Affected:	1
Wells Contam:	JUNE KENNEDY RESIDEN		
Sampled By:	Dept. of Env. Management	Samples Include:	Groundwater Samples
7.5 Min Quad:	Not reported	5 Min Quad:	Not reported
Lat/Long:	354849 / 793450	Risk Site	Yes

Appendix B

DRAINMOD Output

```
-----------------------------------------------------
*                DRAINMOD version 4.60a               *
* Copyright 1990-91 North Carolina State University *
-----------------------------------------------------
```

SANDY CREEK MITIGATION SITE, EXISTING CONDITIONS

****

```
 ----------RUN STATISTICS ----------          time:  3/ 4/1999  @ 15:40
 input file:   C:\WINDOWS\DM46\INPUT46\SANDY1.LIS
 parameters:       free drainage              and yields not calculat
              drain spacing =    1890. cm   drain depth =   37.0 cm
-----------------------------------------------------------------------
```

D R A I N M O D --- HYDROLOGY EVALUATION

Number of periods with water table closer than 30.00 cm
for at least 14 days. Counting starts on day
74 and ends on day 319 of each year

YEAR	Number of Periods of 14 days or more with WTD < 30.00 cm	Longest Consecutive Period in Days
1988	0.	2.
1989	0.	3.
1990	0.	1.
1991	0.	1.
1992	0.	2.
1993	0.	2.
1994	0.	1.
1995	0.	1.
1996	0.	2.
1997	0.	2.

Number of Years with at least one period = 0. out of 10 years.

```
*****************************************************************************

                                D R A I N M O D

                   Copyright 1990-91 North Carolina State University
                        VERSION: NORTH CAROLINA MICRO-UNIX 4.60a
                              LAST UPDATE: Sept. 1991
                         LANGUAGE: MS FORTRAN v 5.0 & UNIX f77

             DRAINMOD IS A FIELD-SCALE HYDROLOGIC MODEL DEVELOPED FOR
             THE DESIGN OF SUBSURFACE DRAINAGE SYSTEMS. THE MODEL WAS
             DEVELOPED BY RESEARCHERS AT THE DEPT. OF BIOLOGICAL AND
             AGRICULTURAL ENGINEERING, NORTH CAROLINA STATE UNIVERSITY
             UNDER THE DIRECTION OF R. W. SKAGGS.

*****************************************************************************



                        ***************************
                        * D R A I N M O D -- 4.60a *
                        ***************************
     Copyright 1990-91 North Carolina State University

  DATA READ FROM INPUT FILE: C:\WINDOWS\DM46\INPUT46\SANDY1.LIS
  Cream selector (0=no, 1=yes) =  0

                          TITLE OF RUN
                          ************


 SANDY CREEK MITIGATION SITE, EXISTING CONDITIONS



                         CLIMATE INPUTS
                         ******* ******

     DESCRIPTION                                  (VARIABLE)     VALUE   UNIT
 ---------------------------------------------------------------------------
--
 FILE FOR RAINDATA ..............  C:\WINDOWS\DM46\WEATHER\ASHBORO.RAI
 FILE FOR TEMPERATURE/PET DATA ..  C:\WINDOWS\DM46\WEATHER\ASHBORO.TEM
 RAINFALL STATION NUMBER.........................(RAINID)     310286
 TEMPERATURE/PET STATION NUMBER..................(TEMPID)     310286
 STARTING YEAR OF SIMULATION.................(START YEAR)       1988   YEAR
 STARTING MONTH OF SIMULATION...............(START MONTH)          1   MONTH
 ENDING YEAR OF SIMULATION....................(END YEAR)       1997   YEAR
 ENDING MONTH OF SIMULATION...................(END MONTH)         12   MONTH
 TEMPERATURE STATION LATITUDE..................(TEMP LAT)      35.47
DEG.MIN
 HEAT INDEX.........................................(HID)      75.00


 ET MULTIPLICATION FACTOR FOR EACH MONTH
    2.52  3.30  2.49  1.69  1.31   .99   .90   .87   .94  1.20  1.45  2.01
```

DRAINAGE SYSTEM DESIGN
****

*** CONVENTIONAL DRAINAGE ***

JOB TITLE:

SANDY CREEK MITIGATION SITE, EXISTING CONDITIONS

```
            STMAX = 1.00 CM                    SOIL SURFACE
+       __/)_____________________________________________________/)__
              :                                                 :
              :                                                 :
              :                                                 :
              :                                                 :
              :                                                 :
       ADEPTH =**** CM                                  DDRAIN = 37. CM
              :                                                 :
              :                                                 :
              :     O-------------SDRAIN = 1890. CM -----------O  -
              :     *                                           :
              : EFFRAD =**** CM                                 :
              :                                         HDRAIN =**** CM
              :                                                 :
              :                                                 :
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
              :
              :
              :
              :                                   IMPERMEABLE LAYER
+       ____________________________________________________________
        ////////////////////////////////////////////////////////////
```

DEPTH (CM)	SATURATED HYDRAULIC CONDUCTIVITY (CM/HR)
.0 - 30.0	.800
30.0 - 2437.0	.800

DEPTH TO DRAIN = 37.0 CM
EFFECTIVE DEPTH FROM DRAIN TO IMPERMEABLE LAYER = ***** CM
DISTANCE BETWEEN DRAINS = 1890.0 CM
MAXIMUM DEPTH OF SURFACE PONDING = 1.00 CM
EFFECTIVE DEPTH TO IMPERMEABLE LAYER = 2437.0 CM
DRAINAGE COEFFICIENT(AS LIMITED BY SUBSURFACE OUTLET) = 2.50 CM/DAY
ACTUAL DEPTH FROM SURFACE TO IMPERMEABLE LAYER = ***** CM
SURFACE STORAGE THAT MUST BE FILLED BEFORE WATER
CAN MOVE TO DRAIN = 1.00 CM
FACTOR -G- IN KIRKHAM EQ. 2-17 = 4.24

*** SEEPAGE LOSS INPUTS ***

No seepage due to field slope

No seepage due to vertical deep seepage

No seepage due to lateral deep seepage

*** end of seepage inputs ***

WIDTH OF DITCH BOTTOM = 60.0 CM
SIDE SLOPE OF DITCH (HORIZ:VERT) = .50 : 1.00

INITIAL WATER TABLE DEPTH = 73.0 CM

DEPTH OF WEIR FROM THE SURFACE

DATE	1/ 1	2/ 0	3/ 0	4/ 0	5/ 0	6/ 0
WEIR DEPTH	37.0	37.0	37.0	37.0	37.0	37.0

DATE	7/ 0	8/ 0	9/ 0	10/ 0	11/ 0	12/ 0
WEIR DEPTH	37.0	37.0	37.0	37.0	37.0	37.0

SOIL INPUTS
****

TABLE 1

DRAINAGE TABLE

VOID VOLUME (CM)	WATER TABLE DEPTH (CM)
.0	.0
1.0	34.2
2.0	56.1
3.0	71.2
4.0	84.3
5.0	95.8
6.0	106.8
7.0	117.3
8.0	127.6
9.0	137.6
10.0	147.4
11.0	157.0
12.0	166.3
13.0	175.4
14.0	184.3
15.0	192.9
16.0	201.5
17.0	210.1
18.0	218.7
19.0	227.3
20.0	235.8
21.0	244.4
22.0	253.4
23.0	262.9
24.0	272.5
25.0	282.1
26.0	291.6
27.0	301.2

28.0	310.8
29.0	320.4
30.0	329.9
35.0	377.8
40.0	425.7
45.0	473.5
50.0	521.4
60.0	617.1
70.0	712.8
80.0	808.6
90.0	904.3

1

TABLE 2

SOIL WATER CHARACTERISTIC VS VOID VOLUME VS UPFLUX

HEAD (CM)	WATER CONTENT (CM/CM)	VOID VOLUME (CM)	UPFLUX (CM/HR)
.0	.3655	.00	1.0000
10.0	.3325	.19	.5000
20.0	.3270	.49	.2000
30.0	.3205	.83	.0625
40.0	.3155	1.23	.0306
50.0	.3105	1.69	.0142
60.0	.3070	2.20	.0112
70.0	.3035	2.91	.0073
80.0	.3000	3.62	.0035
90.0	.2974	4.49	.0024
100.0	.2949	5.36	.0012
110.0	.2923	6.31	.0007
120.0	.2897	7.25	.0001
130.0	.2871	8.24	.0000
140.0	.2846	9.23	.0000
150.0	.2820	10.27	.0000
160.0	.2804	11.31	.0000
170.0	.2788	12.41	.0000
180.0	.2772	13.51	.0000
190.0	.2756	14.66	.0000
200.0	.2740	15.82	.0000
210.0	.2721	16.99	.0000
220.0	.2702	18.15	.0000
230.0	.2683	19.32	.0000
240.0	.2664	20.49	.0000
250.0	.2645	21.65	.0000
260.0	.2626	22.69	.0000
270.0	.2607	23.74	.0000
280.0	.2588	24.78	.0000
290.0	.2569	25.83	.0000
300.0	.2550	26.87	.0000
350.0	.2440	32.10	.0000
400.0	.2330	37.32	.0000
450.0	.2208	42.54	.0000
500.0	.2085	47.77	.0000
600.0	.1900	58.21	.0000
700.0	.1838	68.66	.0000
800.0	.1775	79.11	.0000
900.0	.1713	89.55	.0000

GREEN AMPT INFILTRATION PARAMETERS

W.T.D.	A	B

(CM)	(CM)	(CM)
.000	.000	.000
50.000	1.200	.750
100.000	6.500	1.200
150.000	10.000	1.500
200.000	12.000	1.500
500.000	15.000	1.500
1000.000	15.000	1.500

TRAFFICABILITY

REQUIREMENTS	FIRST PERIOD	SECOND PERIOD
-MINIMUM AIR VOLUME IN SOIL (CM):	3.00	3.00
-MAXIMUM ALLOWABLE DAILY RAINFALL(CM):	1.20	1.20
-MINIMUM TIME AFTER RAIN BEFORE TILLING CAN CONTINUE:	2.00	2.00
WORKING TIMES		
-DATE TO BEGIN COUNTING WORK DAYS:	3/15	12/31
-DATE TO STOP COUNTING WORK DAYS:	8/30	12/31
-FIRST WORK HOUR OF THE DAY:	8	0
-LAST WORK HOUR OF THE DAY:	20	0

CROP

SOIL MOISTURE AT CROP WILTING POINT = .13

HIGH WATER STRESS: BEGIN STRESS PERIOD ON 4/10
END STRESS PERIOD ON 11/16
CROP IS IN STRESS WHEN WATER TABLE IS ABOVE 30.0 CM

DROUGHT STRESS: BEGIN STRESS PERIOD ON 4/10
END STRESS PERIOD ON 11/16

MO	DAY	ROOTING DEPTH(CM)
1	1	45.0
12	31	45.0

WASTEWATER IRRIGATION

NO WASTEWATER IRRIGATION SCHEDULED:

***** Wetlands Parameter Estimation *****

Start Day = 74 End Day = 319
Threshold Water Table Depth (cm) = 30.0

```
              Threshold Consecutive Days       =    14


  Mrank indicator =  1


****************************** END OF INPUTS ******************************

 ----------RUN STATISTICS ----------          time:  3/ 4/1999  @ 15:40
input file:   C:\WINDOWS\DM46\INPUT46\SANDY1.LIS
parameters:       free drainage              and yields not calculat
              drain spacing =    1890. cm   drain depth =   37.0 cm
-----------------------------------------------------------------------



**> Computational Statistics       <**
**> Start Computations    = 940.329
**> End Computations      = 940.371
**> Total simulation time =     2.5 seconds.
```

```
-----------------------------------------------------
*                DRAINMOD version 4.60a               *
* Copyright 1990-91 North Carolina State University *
-----------------------------------------------------

SANDY CREEK MITIGATION SITE, RESTORED CONDITIONS

*************************************************************************


 ----------RUN STATISTICS ----------          time:  3/ 4/1999  @ 15:31
 input file:   C:\WINDOWS\DM46\INPUT46\SANDY2B.LIS
 parameters:       free drainage              and yields not calculat
             drain spacing =   16764. cm   drain depth =   60.0 cm
-----------------------------------------------------------------------


                D R A I N M O D --- HYDROLOGY EVALUATION

          Number of periods with water table closer than  30.00 cm
                for at least   14 days.  Counting starts on day
                 74 and ends on day  319 of each year

          YEAR          Number of Periods       Longest Consecutive
                        of   14 days or           Period in Days
                          more with WTD
                             < 30.00 cm
                        ------------------      --------------------

          1988                 1.                      15.
          1989                 1.                     114.
          1990                 2.                      98.
          1991                 1.                      64.
          1992                 1.                      15.
          1993                 1.                     105.
          1994                 1.                      76.
          1995                 3.                      61.
          1996                 3.                     110.
          1997                 4.                     112.

        Number of Years with at least one period =    10. out of   10 years.
```

```
*****************************************************************************

                                D R A I N M O D

                    Copyright 1990-91 North Carolina State University
                         VERSION: NORTH CAROLINA MICRO-UNIX 4.60a
                                LAST UPDATE: Sept. 1991
                           LANGUAGE: MS FORTRAN v 5.0 & UNIX f77

            DRAINMOD IS A FIELD-SCALE HYDROLOGIC MODEL DEVELOPED FOR
            THE DESIGN OF SUBSURFACE DRAINAGE SYSTEMS. THE MODEL WAS
            DEVELOPED BY RESEARCHERS AT THE DEPT. OF BIOLOGICAL AND
            AGRICULTURAL ENGINEERING, NORTH CAROLINA STATE UNIVERSITY
            UNDER THE DIRECTION OF R. W. SKAGGS.

*****************************************************************************


                        ***************************
                        * D R A I N M O D -- 4.60a *
                        ***************************
    Copyright 1990-91 North Carolina State University


  DATA READ FROM INPUT FILE: C:\WINDOWS\DM46\INPUT46\SANDY2B.LIS
  Cream selector (0=no, 1=yes) =  0

                          TITLE OF RUN
                          ************


          SANDY CREEK MITIGATION SITE, RESTORED CONDITIONS


                         CLIMATE INPUTS
                         ******* ******

     DESCRIPTION                                  (VARIABLE)     VALUE   UNIT
 ---------------------------------------------------------------------------
--
 FILE FOR RAINDATA ..............  C:\WINDOWS\DM46\WEATHER\ASHBORO.RAI
 FILE FOR TEMPERATURE/PET DATA ..  C:\WINDOWS\DM46\WEATHER\ASHBORO.TEM
 RAINFALL STATION NUMBER.........................(RAINID)     310286
 TEMPERATURE/PET STATION NUMBER..................(TEMPID)     310286
 STARTING YEAR OF SIMULATION.................(START YEAR)       1988   YEAR
 STARTING MONTH OF SIMULATION................(START MONTH)         1   MONTH
 ENDING YEAR OF SIMULATION...................(END YEAR)        1997   YEAR
 ENDING MONTH OF SIMULATION..................(END MONTH)         12   MONTH
 TEMPERATURE STATION LATITUDE................(TEMP LAT)       35.47
DEG.MIN
 HEAT INDEX..........................................(HID)      75.00


 ET MULTIPLICATION FACTOR FOR EACH MONTH
    2.52  3.30  2.49  1.69  1.31   .99   .90   .87   .94  1.20  1.45  2.01
```

DRAINAGE SYSTEM DESIGN
****

*** CONVENTIONAL DRAINAGE ***

JOB TITLE:

SANDY CREEK MITIGATION SITE, RESTORED CONDITIONS

```
            STMAX =15.00 CM                    SOIL SURFACE
+       __/)_____________________________________________________/)__
              :                                                 :
              :                                                 :
              :                                                 :
              :                                                 :
              :                                                 :
       ADEPTH =**** CM                                DDRAIN = 60. CM
              :                                                 :
              :                                                 :
              :     O-------------SDRAIN =16764. CM -----------O  -
              :     *                                           :
              : EFFRAD =**** CM                                 :
              :                                        HDRAIN =**** CM
              :                                                 :
              :                                                 :
      - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
              :
              :
              :
              :                                IMPERMEABLE LAYER
+     ____________________________________________________________________
      ////////////////////////////////////////////////////////////////////
```

DEPTH (CM)	SATURATED HYDRAULIC CONDUCTIVITY (CM/HR)
.0 - 30.0	.800
30.0 - 2460.0	.800

DEPTH TO DRAIN = 60.0 CM
EFFECTIVE DEPTH FROM DRAIN TO IMPERMEABLE LAYER = ***** CM
DISTANCE BETWEEN DRAINS = 16764.0 CM
MAXIMUM DEPTH OF SURFACE PONDING = 15.00 CM
EFFECTIVE DEPTH TO IMPERMEABLE LAYER = 2460.0 CM
DRAINAGE COEFFICIENT(AS LIMITED BY SUBSURFACE OUTLET) = 2.50 CM/DAY
ACTUAL DEPTH FROM SURFACE TO IMPERMEABLE LAYER = ***** CM
SURFACE STORAGE THAT MUST BE FILLED BEFORE WATER
CAN MOVE TO DRAIN =15.00 CM
FACTOR -G- IN KIRKHAM EQ. 2-17 = 4.24

*** SEEPAGE LOSS INPUTS ***

No seepage due to field slope

No seepage due to vertical deep seepage

No seepage due to lateral deep seepage

*** end of seepage inputs ***

WIDTH OF DITCH BOTTOM = 60.0 CM
SIDE SLOPE OF DITCH (HORIZ:VERT) = .50 : 1.00

INITIAL WATER TABLE DEPTH = 60.0 CM

DEPTH OF WEIR FROM THE SURFACE

DATE	1/ 1	2/ 0	3/ 0	4/ 0	5/ 0	6/ 0
WEIR DEPTH	60.0	60.0	60.0	60.0	60.0	60.0

DATE	7/ 0	8/ 0	9/ 0	10/ 0	11/ 0	12/ 0
WEIR DEPTH	60.0	60.0	60.0	60.0	60.0	60.0

SOIL INPUTS
****

TABLE 1

DRAINAGE TABLE

VOID VOLUME (CM)	WATER TABLE DEPTH (CM)
.0	.0
1.0	34.2
2.0	56.1
3.0	71.2
4.0	84.3
5.0	95.8
6.0	106.8
7.0	117.3
8.0	127.6
9.0	137.6
10.0	147.4
11.0	157.0
12.0	166.3
13.0	175.4
14.0	184.3
15.0	192.9
16.0	201.5
17.0	210.1
18.0	218.7
19.0	227.3
20.0	235.8
21.0	244.4
22.0	253.4
23.0	262.9
24.0	272.5
25.0	282.1
26.0	291.6
27.0	301.2

28.0	310.8
29.0	320.4
30.0	329.9
35.0	377.8
40.0	425.7
45.0	473.5
50.0	521.4
60.0	617.1
70.0	712.8
80.0	808.6
90.0	904.3

1 TABLE 2

SOIL WATER CHARACTERISTIC VS VOID VOLUME VS UPFLUX

HEAD (CM)	WATER CONTENT (CM/CM)	VOID VOLUME (CM)	UPFLUX (CM/HR)
.0	.3655	.00	1.0000
10.0	.3325	.19	.5000
20.0	.3270	.49	.2000
30.0	.3205	.83	.0625
40.0	.3155	1.23	.0306
50.0	.3105	1.69	.0142
60.0	.3070	2.20	.0112
70.0	.3035	2.91	.0073
80.0	.3000	3.62	.0035
90.0	.2974	4.49	.0024
100.0	.2949	5.36	.0012
110.0	.2923	6.31	.0007
120.0	.2897	7.25	.0001
130.0	.2871	8.24	.0000
140.0	.2846	9.23	.0000
150.0	.2820	10.27	.0000
160.0	.2804	11.31	.0000
170.0	.2788	12.41	.0000
180.0	.2772	13.51	.0000
190.0	.2756	14.66	.0000
200.0	.2740	15.82	.0000
210.0	.2721	16.99	.0000
220.0	.2702	18.15	.0000
230.0	.2683	19.32	.0000
240.0	.2664	20.49	.0000
250.0	.2645	21.65	.0000
260.0	.2626	22.69	.0000
270.0	.2607	23.74	.0000
280.0	.2588	24.78	.0000
290.0	.2569	25.83	.0000
300.0	.2550	26.87	.0000
350.0	.2440	32.10	.0000
400.0	.2330	37.32	.0000
450.0	.2208	42.54	.0000
500.0	.2085	47.77	.0000
600.0	.1900	58.21	.0000
700.0	.1838	68.66	.0000
800.0	.1775	79.11	.0000
900.0	.1713	89.55	.0000

GREEN AMPT INFILTRATION PARAMETERS

W.T.D.	A	B

(CM)	(CM)	(CM)
.000	.000	.000
50.000	1.200	.750
100.000	6.500	1.200
150.000	10.000	1.500
200.000	12.000	1.500
500.000	15.000	1.500
1000.000	15.000	1.500

TRAFFICABILITY
****

REQUIREMENTS	FIRST PERIOD	SECOND PERIOD
-MINIMUM AIR VOLUME IN SOIL (CM):	3.00	3.00
-MAXIMUM ALLOWABLE DAILY RAINFALL(CM):	1.20	1.20
-MINIMUM TIME AFTER RAIN BEFORE TILLING CAN CONTINUE:	2.00	2.00
WORKING TIMES		
-DATE TO BEGIN COUNTING WORK DAYS:	3/15	12/31
-DATE TO STOP COUNTING WORK DAYS:	8/30	12/31
-FIRST WORK HOUR OF THE DAY:	8	0
-LAST WORK HOUR OF THE DAY:	20	0

CROP
****

SOIL MOISTURE AT CROP WILTING POINT = .13

HIGH WATER STRESS: BEGIN STRESS PERIOD ON 4/10
END STRESS PERIOD ON 11/16
CROP IS IN STRESS WHEN WATER TABLE IS ABOVE 30.0 CM

DROUGHT STRESS: BEGIN STRESS PERIOD ON 4/10
END STRESS PERIOD ON 11/16

MO	DAY	ROOTING DEPTH(CM)
1	1	45.0
12	31	45.0

WASTEWATER IRRIGATION
****

NO WASTEWATER IRRIGATION SCHEDULED:

***** Wetlands Parameter Estimation *****

Start Day = 74 End Day = 319
Threshold Water Table Depth (cm) = 30.0

```
            Threshold Consecutive Days       =    14


  Mrank indicator =  1


****************************** END OF INPUTS ******************************

 ----------RUN STATISTICS ----------          time:  3/ 4/1999  @ 15:31
input file:   C:\WINDOWS\DM46\INPUT46\SANDY2B.LIS
parameters:       free drainage              and yields not calculat
              drain spacing =   16764. cm   drain depth =   60.0 cm
-----------------------------------------------------------------------



**> Computational Statistics       <**
**> Start Computations     = 931.977
**> End Computations       = 932.063
**> Total simulation time =     5.2 seconds.
```

Appendix C

USACE Mitigation Checklist

COMPENSATORY MITIGATION PLANNING
CHECKLIST
9/19/94

ACTION ID: _____

SITE NAME: Sandy Creek Wetland Mitigation site

LOCATION/WATERBODY/COUNTY: Sandy Creek, Randolph County, NC

USGS QUAD(S): Grays Chapel, NC 1974

SOIL SURVEY SHEET NOS.: Draft map D-4

PREPARED BY: Ron Johnson, Earth Tech DATE: 3/1/99

I. INTRODUCTION

A. Type of Mitigation (Circle / A separate checklist may be prepared if more than one type)

1. Restoration Creation Enhancement Preservation

a. In-kind Out-of-kind Both

b. On-site Off-site Both

2. Up-front Concurrent After-the-fact Bank

B. Wetland types and acreage Impacted / Attach or Describe:

13.6 acres

C. Wetland types and acreage Mitigated / Attach or Describe:

10 acres restoration of bottomland hardwood

D. Describe mitigation Ratios : 2:1 - For restoration

Will also satisfy 1:1 for NCDWQ requirements

	YES	NO
E. Will any Endangered Species, Archeological Resources, or Haz/Tox sites be impacted by this effort?		x
F. Has a wetland determination been undertaken and verified?		NA

II. TARGET GOALS AND FUNCTIONS

	YES	NO
A. Are there stated GOALS?	x	

Describe: Restoration of bottomland hardwood forest

B. Describe Success Criteria: See wetland mitigation plan

Are they:	YES	NO
1. Specific	x	
2. Measurable	x	
3. Attainable	x	

	YES	NO
C. Target FUNCTIONS chosen and indicated?		X

Describe:

	YES	NO
D. Was a Reference Ecosystem (RE) report prepared? (Attach)		x

1. Describe comparison between the RE and the

Mitigation Plan: NA

III. STRUCTURAL COMPONENT

A. VEGETATION:

		YES	NO
1.	Are plantings listed to species?	x	
2.	Are "local" (200 Miles North/South) propagules to be planted and verified by nursery certificate?		
3.	Have diversity and densities of species within the RE been considered in the plan?	X	
4.	Has consideration been given to planting the interface between the mitigation site and upland habitats with suitable transition zone species?		X

5. Describe Quality Control during planting: _____

B. SOILS:

		YES	NO
1.	Have the soils been mapped?	x	
2.	Soils Series/Phases Chewacla		
3.	Fertility Sampling undertaken in RE? (Attach Report)		x
4.	Fertility Sampling undertaken on mitigation site? (Attach Report)		x

	YES	NO
ılts within the proposed		
/ Amendments Required:		
ed during construction.		
; appropriate :land?	x	
ıs site been	YES	NO
:ry-over		
:em		
:s of HGM or on system	YES	NO
		x

trol Measures: _____

of Human Impacts: _____

of Herbivory/Noxious Plants:

	YES	NO
ıns built :ess these		
ll these contingencies be		

A. Describe Final Disposition of the property _____

Not yet determined (3/1/99) _____

_____

_____

B. Who will manage the site after the mitigation effort is deemed a success? _____ ( )

	YES	NO
C. Will wetland functions be impacted by current or future land use patterns?	____	X

Describe: _____

T _____

_____

D. Will this site have the opportunity to function as planned?	X	____

Describe: _____

_____

_____

E. Describe how this project rates ecologically: _____

_____

_____

_____

HIGHLIGHT AND ADDRESS ALL PROBLEMS AND/OR INADEQUACIES WITH THE MITIGATION PLAN/SITE AS INDICATED BY THIS CHECKLIST.