DEPARTMENT OF THE ARMY
DIRECTORATE OF PUBLIC WORKS
HEADQUARTERS, FORT BRAGG GARRISON COMMAND (AIRBORNE)
INSTALLATION MANAGEMENT AGENCY
FORT BRAGG, NORTH CAROLINA

FINAL

DECISION DOCUMENT

FOR RESOURCE CONSERVATION AND RECOVERY ACT
REMEDIAL ACTION
OPERABLE UNIT 7

SOLID WASTE MANAGEMENT UNIT 50, (AEDBCC #CCFTBR002)
FORT BRAGG, NORTH CAROLINA

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Prepared for:

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1.0 Basis And Purpose of Resource Conservation Recovery Act (RCRA) Remedial Action (RA).

a. This decision document (DD) describes the selected RA to be performed at Solid Waste Management Units (SWMU) 50 as part of the Fort Bragg Installation Restoration Program. This action will satisfy RCRA Facility Investigation (RFI), United States Environmental Protection Agency (EPA) and the State of North Carolina Department of Environment and Natural Resources (NCDENR) requirements.

b. Based on the results of sampling events performed during the 2005 RFI (ZAPATA RFI Report 2005); which performed extensive sampling of surface and sub-surface soils and groundwater and pursuant to 15A NCAC 2L .0106 (l), Fort Bragg has selected a Final Remedial Action (FRA) of soil removal to a depth of 2-3 feet below ground surface as the selected remedy for the site with a Cost-to-Complete of $250,000.00. SWMU 50 is the former Sludge Drying Beds located at the Fort Bragg Waste Water Treatment Plant (WWTP) located near building U-1708. The soil removal action will remove soil constituents exceeding North Carolina standards, mercury and silver, eliminating potential impacts on groundwater at the site. Concurrence by NCDENR is required for any selected remedy of these sites and for termination of selected remedy.

1.1 INTRODUCTION.

a. Groundwater sampling, and surface and subsurface soil sampling was performed to determine environmental conditions at the SWMUs. The RFI Report was prepared in consideration of RCRA Permit No. NC 8210020121 issued to Fort Bragg, RFI Guidance, and guidance for RCRA Corrective Action.

b. The WWTP has been in operation since 1941. Several components of the plant have been designated as SWMUs (USACE, 2004; US Army, 2005a):

- SWMU 38 (inactive) was the grit chamber where influent wastewater from various areas of Fort Bragg entered for reduction of velocity and removal of large particles from the stream.

- SWMU 39 (inactive) was the part of the plant that included four primary sedimentation tanks (three are intact; the fourth was destroyed). Wastewater from the grit chamber flowed directly into the primary sedimentation tanks.

- SWMU 40 (inactive) were the biofilters that wastewater flowed into from the primary sedimentation tanks. The biofilters were open to the atmosphere and contained rocks as surface area for supporting the growth of microorganisms that aided in breaking down the organic matter in the wastewater.

- SWMU 42 (active) is a set of four secondary clarifiers (polishing ponds) where secondary effluent disinfection by chlorine gas currently takes place.

- SWMU 43 (active) is the chlorine flash mix tank, where chlorine is injected to disinfect the water and mixed by a paddle in the middle (installed in 1979).

- SWMU 44 (active) is the chlorine contact tank where, after leaving the chlorine flash mix tank, wastewater enters for decreasing velocity to allow the chlorine sufficient time to react with the water. This SWMU also consists of two inoperable ultraviolet disinfection tanks.

- SWMU 45 (inactive) was the recirculation tank, which was installed in 1955.

- SWMU 46 (active) is the stepped cascade, which was installed in 1979. Water from the chlorination contact tank is directed to the stepped cascade for aeration prior to discharge into the Lower Little River.

- SWMU 50 (active) is a set of 15 sludge drying beds. Ten beds were installed in 1941. The additional five beds were installed in 1980. Each of the beds has been divided in half and reactivated in August 1999.

c. Area of Concern (AOC) A is associated with a fuel storage tank at the Water Treatment Plant (WTP). In 1988, a kerosene-fuel spill was located behind building V-3308 from an Aboveground Storage Tank (AST). The area was excavated by Horne Engineering Services, Inc. and the tank was replaced with a new 1,000-gallon AST (Horne, 2003).

1.2 AREA OF INVESTIGATION. Field activities between January and May 2005 consisted of a geophysical investigation at the WTP to find an area of less dense utilities to install one monitoring well, installation of 19 wells at the WWTP and one well at the WTP, collection of one soil sample from each of 17 monitoring well locations and two soil samples from each of 10 soil boring locations, development of each of 20 new monitoring wells, measurement of static water levels, groundwater sampling of 20 new wells, and disposal of Investigative Derived Waste. The investigation determined No Further Action (NFA) for all sites listed in paragraph 1.1 b except for SWMU 50. This DD will concentrate on SWMU 50 only. The NFA for the remaining sites was received from NCDENR in 2005.

a. Water supplies for Fort Bragg and surrounding areas primarily are obtained from surface water. Although Fort Bragg uses the Little River as its principal source of water, it does have 25 water-supply wells. Thirteen of the 25 wells are currently used for potable water;

however, they are three or more miles from either the WWTP or WTP and do not meet the requirements of a Public Drinking Water Source. Seven of the 25 water-supply wells are non-potable wells located in the cantonment area and used to irrigate golf courses. Five of the seven irrigation wells are at the Officers Club golf course, approximately three miles south of the WWTP. The remaining two non-potable irrigation wells are approximately five miles southeast of the WWTP at the Stryker Golf Course.

b. Surface runoff at the WWTP and WTP flows towards the Little River located with ½ mile of the SWMU. Groundwater at the WWTP locally flows to the north, toward the Little River. No residences, schools, playgrounds, churches, or hospitals exist within 1,500 feet of the SWMUs or AOC. No sensitive ecological areas, including wetlands, endangered species, or wildlife management areas, were found at or in the vicinity of the WWTP or WTP but are located within 1/2 mile of the SWMU 50 site.

c. Analytical results from soil samples collected from well boring offsets and soil borings from within the sludge drying beds, in February 2005, did not indicate the presence of excessive levels of most target constituents, with many of those compounds detected at levels below North Carolina soil standards. North Carolina soil standards are based on North Carolina Soil-to-Groundwater Concentrations per the NCDENR Federal Remediation Branch Target Screening Guidelines, cited herein. The most significant exceedances of the North Carolina soil standard were for mercury and silver, which occurred in five surface samples, each collected from the SWMU 50 sludge beds. These contaminants do not appear to have migrated down to the harder material making up the Cape Fear Formation where the deeper samples were collected, as evidenced by a lack of any detection from those intervals. Mercury and silver may have remained in the WWTP sludge originating from sources including thermometers, hospital waste and/or photo processing. A single chromium exceedance from the deeper interval seems to be an anomaly of its natural occurrence, as chromium was detected in every soil sample collected at the site.

d. Of the five pesticides detected in three soil samples from the SWMU 50 sludge beds, only dieldrin exceeded the North Carolina soil standard in one sample. Extractable Petroleum Hydrocarbons (EPH) was detected in three surface samples from the sludge beds, and Volatile Petroleum Hydrocarbons (VPH) was detected in one sample. All detections of VPH and EPH were below the listed North Carolina soil standards, if established. A detection of EPH C11-C22 aromatics did not have an established North Carolina Soil-to-Groundwater concentration, but was below a listed NCDENR Underground Storage Tank Section cleanup guideline. However, VPH C9-C12 aliphatics have no established soil standard.

e. An exceedance of Semi-Volatile Organic Compounds (SVOCs) occurred in only one soil sample at the SWMU 50 sludge beds. Benzo (a) pyrene slightly exceeded its North Carolina soil standard in one

surface sample. One or more Volatile Organic Compound (VOCs) was detected at low levels (most were estimated below the laboratory reporting limit) in most samples from the well borings and the sludge-bed borings, but none exceeded the North Carolina soil standards. No Polychlorinated Biphenyl (PCBs) was detected in any of the soil samples. No VPH, EPH or SVOC was detected in any soil samples at well borings.

f. Soil exceedances are isolated to the SWMU 50 sludge drying beds and do not appear to be widespread at the site or migrating into the groundwater. No contaminants were detected above North Carolina soil standards at the AOC A well at the WTP. Analytical results from groundwater samples indicated detections of total chromium slightly above the North Carolina 2L standard in some of the wells, however, the associated filtered samples from those same wells indicated the chromium level was well below the 2L standard. The elevated chromium levels in the unfiltered samples are associated with turbidity and are on the order of magnitude normally found in ground water at Fort Bragg, as representative of background and are not considered site related. Arsenic, silver, mercury, selenium, and lead were also detected in one or more groundwater samples but were below their respective North Carolina 2L standards and require NFA in this selected remedy.

g. The SVOC bis (2-ethylhexyl)phthalate was detected (J flagged values in all cases) in some of the ground water samples above the North Carolina 2L standard, however this is a common plasticizer and is thought to be a sampling or lab artifact. It is not considered to be a site-related contaminant.

h. No VOCs, VPHs, EPHs, PCBs or pesticides were detected above the North Carolina 2L standard at the WWTP site. No contaminants were detected in the samples from the AOC A well at the WTP.

i. Metals and traces of organics (SVOCs, a pesticide, VPH and EPH) were measured in soil just below the sludge at SWMU 50. Deeper soil samples at the sludge beds are not impacted. The Selected Remedy recommends that the uppermost soils beneath the sludge beds be excavated to a depth of two or three feet below ground surface. Confirmation samples should be obtained to document that contaminated soils have been removed. Then, the excavation should be backfilled with clean fill material.

1.3 NATURE OF CURRENT PROPERTY USE. SMWU 50 is located in an area occupied by the Fort Bragg WTP, located across Manchester Road from Pope Air Force Base. The land use at SWMU 50 and surrounding area is industrial with no current plans to change the land use. In the heavily forested areas west of SWMU 50 (designated as open space and transition) are wetlands and habitat for the endangered red-cockaded woodpecker. No schools, playgrounds, churches, or hospitals are located within 1,500 feet of the site.

1.4 PROPERTY OWNERSHIP. The site is currently owned and operated by the United States Department of Defense/Department of the Army. The Real Estate contact is Ms. Dewanna Kennedy of Real Property Management (910) 396-4139. Mr. Edward Schwacke is the contact for the Installation Restoration Program and can be reached at (910) 432-8470.

2.0 JUSTIFICATION AND PURPOSE OF CORRECTIVE ACTION. The EPA has provided risk based corrective action guidance that specifies the major components to be considered in selecting a corrective action. These include the following threshold criteria: (1) protect human health and the environment and the management of wastes; (2) attain media cleanup standards set by the implementing agency (e.g., NCDENR); (3) control the source of the releases so as to reduce or eliminate, to the extent practicable, further releases that might pose a threat to human health and the environment; (4) comply with any applicable standards for management of wastes; and (5) other factors. Corrective action alternatives meeting the threshold criteria are then balanced against the following: (1) long-term reliability and effectiveness; (2) reduction of toxicity, mobility, or volume of wastes; (3) short-term effectiveness; (4) implementability; and (5) cost.

2.1 LOCATION AND MISSION OF FORT BRAGG. The U.S. Army Military Reservation at Fort Bragg was established in 1918 as the major logistic, training, and mobilization deployment center for the XVIII Airborne Corps and 82d Airborne Division, which is part of the U.S. Army's mobile infantry, assault, and armored forces. It is also home to the Army's largest support command (1st COSCOM) and the Special Operations Command. Fort Bragg occupies about 161,500 acres in southeastern North Carolina. Approximately 92,000 acres are designated for field maneuvers, exercises, firing ranges, impact areas, and parachute drop zones. The cantonment area, in the eastern part of Fort Bragg, occupies 11,000 acres and includes about 4,800 buildings. Most military maintenance and production facilities, supply facilities, operation and training facilities, various community facilities, and family and troop housing are in the cantonment area. Pope Air Force Base borders Fort Bragg north of the cantonment area.

2.2 SITE INFORMATION. Solid Waste Management Unit 50 is located in an area occupied by the Fort Bragg WTP. The land use at SWMU 50 and surrounding area is industrial with no current plans to change the land use. In the heavily forested areas 1/2 mile west of SWMU 50 (designated as open space and transition) are wetlands and habitat for the endangered red-cockaded woodpecker. No schools, playgrounds, churches, or hospitals are located within 1,500 feet of the site.

3.0 SURFACE WATER AND TOPOGRAPHY.

a. An east-west trending ridge divides Fort Bragg into two drainage sub-basins. The northern sub-basin drains into the Little River; the southern sub-basin drains into tributaries of Cross Creek

and Rockfish Creek. Little River, Cross Creek, and Rockfish Creek are tributaries of the Cape Fear River, which is east of Fort Bragg.

b. Surface runoff at SWMU 50 drains into the Little River downstream from the intake into the Fort Bragg Drinking Water Plant.

c. Surface water run-off is not used as a source of drinking water on the Fort Bragg installation. During times of drought, water impoundments are used to supplement the source of Fort Bragg drinking water, the Little River. Several impoundments are present at Fort Bragg and include Young Lake and McFayden Pond in the northern portion of the cantonment area, Lake Arthur in the northwestern corner of the installation, McKellars Pond beyond the western edge of the cantonment area, and Smith Lake and Texas Pond in the southeastern part of the cantonment area. There is no impoundment adjacent to the SWMU 50 site.

3.1 SITE GEOLOGY.

a. Geologic units in the Fort Bragg area, from oldest to youngest, consist of the Carolina Slate Belt rocks, which comprise the basement rock, the Cape Fear Formation, and the Middendorf Formation. Carolina Slate Belt rocks, which underlie the younger sedimentary rocks, are of Precambrian and Cambrian age and are composed of metavolcanic, metasedimentary, and igneous rock (United States Geological Survey (USGS) 1996. The elevation of the top of basement rock ranges from 180 feet above sea level at Southern Pines (USGS 1996), near the western edge of the military reservation, to 110 feet below sea level near the confluence of the Cape Fear River and Rockfish Creek (USGS 1996). The Cape Fear and Middendorf Formations overlie the basement rock and saprolite. These formations are part of the generally southeastward dipping and thickening wedge of sediments that constitutes the Atlantic Coastal Plain deposits. These formations generally are considered to be representative of an upper delta-plain environment (USGS 1996).

b. The soils within the Fort Bragg cantonment area are the result of weathering of the unconsolidated sandy sediments of the Coastal Plain. The soils range from moderately to excessively well drained. Soils in upland areas are sandy, acidic, low in organic matter, and have low fertility. The upland soils have brittle, loamy or clayey subsoils associated with Blaney, Gilead, and Lakeland soil types. Soils in low-lying areas typically have a heavier texture (containing more organic and clayey material) than upland soils. Soils in low-lying areas are poorly drained, resulting in swampy areas along streams. Johnston loam typically is found in low-lying areas of Fort Bragg (USGS 1996). Because many of these soils have similar properties, transition zones between the soil types are not always apparent.

3.2 HYDREOLOGY AND PUBLIC WATER SUPPLIES.

a. Fort Bragg currently draws an average of 8.5 million gallons of water each day from the waters of the Little River. Fort Bragg also has the option to purchase up to 3 million gallons per day from the City of Fayetteville to meet emergency needs. Fort Bragg operates five public water systems that are permitted for operation by the state of North Carolina. The primary water treatment plant has a 16 million gallon per day capacity. The water treatment plant treats and supplies drinking water to the entire cantonment area, Simmons Army Airfield, the Central Vehicle Wash Facility, and all of Pope Air Force Base.

b. Water supplies for the City of Fayetteville, which is southeast of Fort Bragg, are obtained from the Cape Fear River and impoundments along the Cross Creek and Little Cross Creek, which drain the southeastern part of Fort Bragg. The water supply for the Town of Spring Lake, adjacent and northeast of Fort Bragg, is purchased from the City of Fayetteville and Harnett County.

c. An east-to-west trending ridge divides Fort Bragg into two drainage sub basins. The northern sub basin drains into Little River; the southern sub basin drains into tributaries of Cross Creek and Rockfish Creek. Beaver Creek flows into Cumberland Creek, a tributary of the Cape Fear River, which is east of Fort Bragg. Streams located on the military reservation generally are low gradient and, in many areas, have poorly defined channels, which grade into swampy areas. Streambeds consist of unconsolidated materials, typically silt or clay.

d. The Fort Bragg area is underlain by three freshwater aquifers: the saprolite-basement, Cape Fear, and Middendorf aquifers. The saprolite-basement rock aquifer is below the Cape Fear Formation, and its depth ranges from 140 feet below land surface (BLS) in low-lying parts of the cantonment area to 300 feet or more BLS in the central and western parts of Fort Bragg. The saprolite-basement aquifer is generally assumed to yield little water, and no supply wells in this area are known to solely tap this aquifer. The Cape Fear aquifer is composed of the Cape Fear Formation, which is primarily clay interbedded with silt and silty sand under confined conditions. The uppermost 5 to 10 feet of the Cape Fear Formation in the Fort Bragg area forms the Cape Fear confining unit. This confining unit restricts vertical movement of water between the overlying sediments and the silty-sand units of the Cape Fear aquifer. Several wells on the Fort Bragg reservation are screened in this aquifer. East of Fort Bragg, the Cape Fear aquifer is used for public and industrial water supplies (USGS 1996).

e. The Middendorf aquifer primarily consists of coarse- to fine-grained silty or clayey sands with interbedded light-gray to tan clays. The interbedded and discontinuous clay layers in this aquifer support local perched water zones. Perched water zones in the Fort Bragg area

generally are within 20 feet of land surface, and groundwater in these perched zones is under unconfined conditions and referred to as the "surficial aquifer." The saturated thickness of the water table within a perched water zone is typically only a few feet. Many of the perched water zones dry out during the growing season and are not a reliable source of water supply.

f. Groundwater in the lower part of the Middendorf aquifer is commonly under confined or semi confined conditions, as determined by interbedded clay layers, whereas groundwater in the upper part of the Middendorf aquifer is under unconfined conditions. The potentiometric surface of the aquifer is as much as 80 feet BLS in upland areas of the military reservation and near land surface along perennial streams (discharge areas for the Middendorf aquifer).

g. The sandy soils, which cover most of Fort Bragg and the Sand Hills hydrologic area, are leached beds of the Middendorf Formation. These sands are highly permeable and allow rapid infiltration of precipitation, which is the primary source of groundwater recharge.

3.3 POTENTIAL RECEPTORS AND SENSITIVE AREAS.

a. Surface runoff at SWMU 50 appears to generally flow south into the Little River. There are no family housing areas within 500 to 750 feet of SWMU 50.

b. In the heavily forested areas west of SWMU 50 (designated as open space and transition) are wetlands and habitat for the endangered red-cockaded woodpecker. No schools, playgrounds, churches, or hospitals were noted within 1,500 ft of the site.

4.0 EVALUATION OF CORRECTIVE ACTION TECHNOLOGIES. A no-action with groundwater monitoring alternative and one category of corrective action technologies were identified for the soil at SWMU 50. The technology was evaluated using the screening criteria of effectiveness, implementability, and cost. The no-action alternative provides a baseline against which other technologies can be compared. Under the no-action alternative, no further action would be taken to mitigate risks posed by soil contamination. Groundwater monitoring would be performed to document contaminant concentrations with monitored natural attenuation. This alternative has the lowest associated cost. The acceptability of the no-action alternative is judged in relation to the assessment of known site risks and by comparison with other corrective action technologies. The no-action alternative is not considered viable because it provides no reliable or effective method for protecting human health from soil contamination; therefore, the no-action alternative has been eliminated from further evaluation.

a. Final Remedial Action (Soil Removal) to remove the contaminated soils which would protect human health based on the

criteria of long-term reliability and effectiveness; reduction of toxicity, mobility, or volume of wastes; short term effectiveness, implementability; and cost. The soil removal would reduce soil levels beneath the Sludge Drying Beds to acceptable standards and eliminate future impacts to groundwater. Soil removal has been retained for future consideration.

b. Groundwater monitoring would not be required under the selected remedy based on the investigative findings of the 2005 report. Further long-term monitoring of groundwater will not be required at the SWMU 50 site.

5.0 SELECTED CORRECTIVE REMEDIAL ACTION. The Selected Corrective Remedial Action for the SWMU 50 site is a Final Remedial Action of Soil Removal to a depth of 2-3 feet BLS for a total cost of $250,000. This selected remedy is not planned until 2007 or when the drying beds are no longer in use.

6.0 CONCLUSION. As long as SWMU 50 soil removal action removes all elevated concentrations of silver and mercury, risks to human health and the environment will be alleviated. The Cost-To-Complete for the FRA is $250,000.00. Once the Final Soil Removal Report is completed, Fort Bragg will request a No Further Action determination. The DD will be made available for public review on the Fort Bragg website http://www.bragg.army.mil/envbr/restoration.htm.

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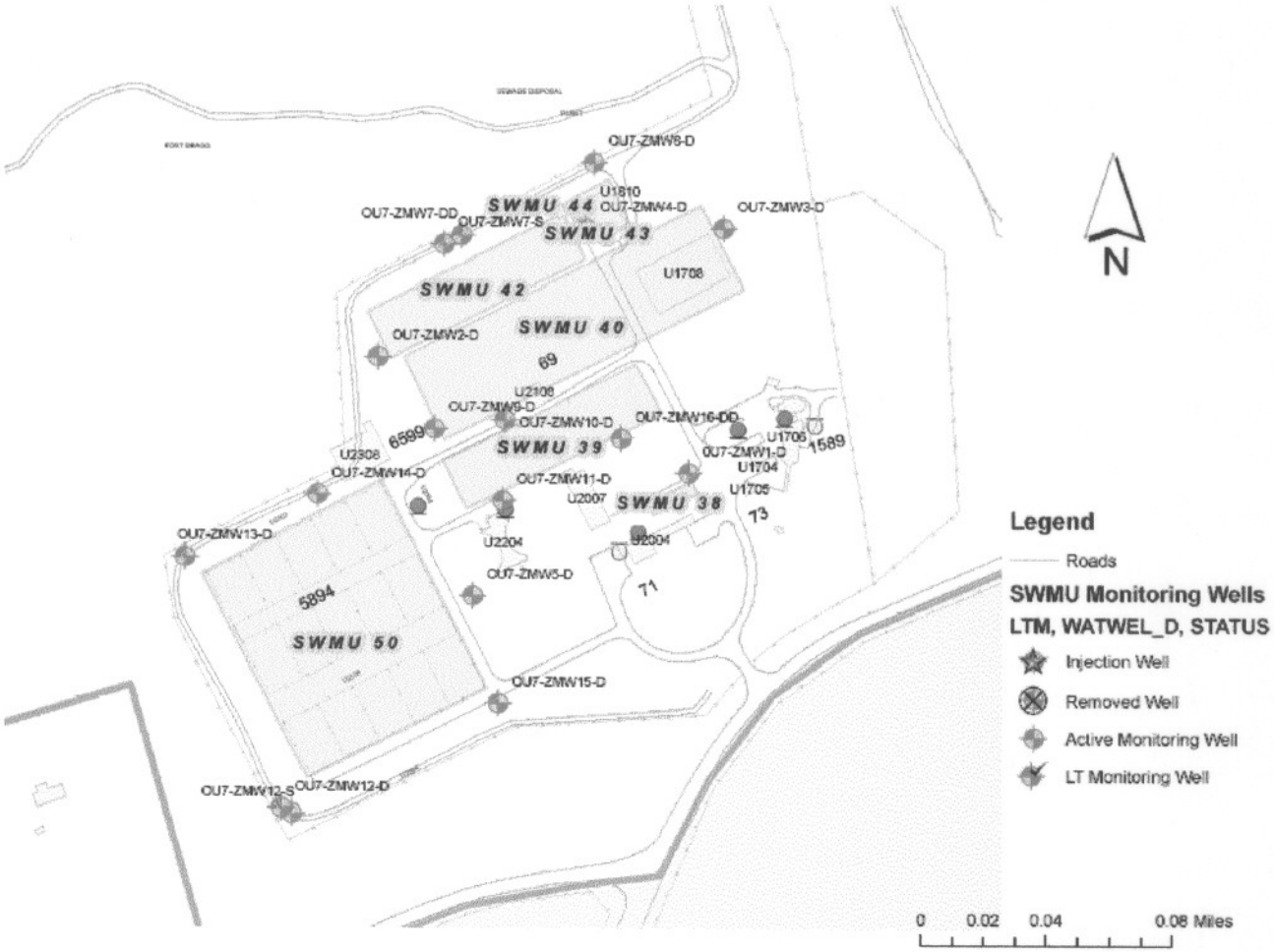
ACRONYMS

AMSL	above mean sea level
AOC	Area of Concern
BGS	below ground surface
BLS	below land surface
BMP	Base Master Plan
CMS	Corrective Measures Study
COC	constituent of concern
COPC	constituent of potential concern
CY	calendar year
DOD	U.S. Department of Defense
EPA	U.S. Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
HQ	hazard quotient
ILCR	incremental lifetime cancer risk
IMAC	interim maximum acceptable concentration
IRP	Installation Restoration Program
LTM	Long-term Monitoring
MCL	maximum contaminant level
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NFA	No Further Action
O&M	operations and maintenance
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
PWBC	Public Works Business Center
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
Redox	oxidation-reduction potential
RFI	RCRA facility investigation
RGO	remedial goal option
SCM	site conceptual model
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VOC	volatile organic compound
VPH	Volatile Petroleum Hydrocarbons

Figure 1, Site Map



SWMU 50 Site Map