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Action Memorandum
for
Interim Response Action
Operable Unit No. 19
Site 84/Building 45 Area

Marine Corps Base
Camp Lejeune, North Carolina

Prepared For

Department of the Navy
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Naval Facilities Engineering Command

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Chemicals of Concern
CY	cubic yards
DDD	Dichlorodiphenyldichloroethane
DoN	Department of Navy
DRO	Diesel Range Organics
EE/CA	Engineering Evaluation/Cost Analysis
FFA	Federal Facilities Agreement
FS	Feasibility Study
GRO	Gasoline Range Organics
IR	Installation Restoration
J	Analyte was positively identified, value is estimated
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
LUCIP	Land Use Control Implementation Plan
MCB	Marine Corps Base
mg/kg	milligrams per kilogram
NC DENR	North Carolina Department of Environmental and Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTCRA	Non-time Critical Removal Action
OU	Operable Unit
O&M	Operation and Maintenance
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
ppm	parts per million
PRG	Preliminary Remediation Goal

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

RAB	Restoration Advisory Board
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
TSCA	Toxic Substances Control Act
TPH	Total Petroleum Hydrocarbons
µg/kg	micrograms per kilogram
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

ACTION MEMORANDUM
INTERIM RESPONSE ACTION
OPERABLE UNIT 19
SITE 84 - BUILDING 45 AREA
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

I. PURPOSE

This Action Memorandum documents approval of the interim response action described herein for Operable Unit (OU) 19, Site 84 - Former Building 45 Area, which is located near the center of the northern border of Marine Corps Base (MCB), Camp Lejeune.

This Action Memorandum, which serves as the decision document for the interim response action, has been completed in accordance with the program requirements defined by: the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); the Superfund Amendments and Reauthorization Act of 1986 (SARA); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP); and the United States Environmental Protection Agency's (USEPA) Superfund Removal Procedures - Action Memorandum Guidance dated December 1990 (USEPA, 1990). This Action Memorandum follows the guidelines published in the Navy/Marine Corps Installation Restoration (IR) Manual, dated June 2001 (DoN, 2001).

The Department of the Navy (DoN) has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out removal actions when a release or threatened release is on, or the sole source is from, a military installation. The IR Program was initiated to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at military installations.

The primary focus of this interim response action for Site 84 is the excavation and disposal of soil exceeding low occupancy land use remedial goals for polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs; specifically polyaromatic hydrocarbons [PAHs]), and total petroleum hydrocarbons (TPHs). Lagoon sediment also will be solidified and removed. Pesticide contaminated soil above the screening criteria was located around the former Building 45 foundation and was removed during the Non-Time Critical Removal Action (NTCRA) completed in October 2002. In addition, fencing will be installed along the entire site perimeter to protect potential recreational

trespassers. Also, land use controls to limit future land use to industrial use and intrusive activity controls will be established.

An Engineering Evaluation/Cost Analysis (EE/CA) has been submitted in October 2002 to evaluate potential technologies and remedial alternatives that may be implemented to address residual contamination and to provide public comment on these alternatives.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Camp Lejeune Description

MCB, Camp Lejeune is located on the coastal plain of North Carolina in Onslow County. The facility encompasses approximately 236 square miles and is bisected by the New River (Figure 1). The New River flows southeast and forms a large estuary before entering the Atlantic Ocean. The southeastern border of MCB, Camp Lejeune is the Atlantic Ocean shoreline. The western and northeastern boundaries of the facility are U.S. Route 17 and State Route 24 (Highway 24), respectively. The City of Jacksonville, North Carolina borders MCB, Camp Lejeune to the north.

2. Site Description

Site 84, part of the MCB Camp Lejeune Military Reservation, is located just south of Highway 24 on the main side of MCB Camp Lejeune, one mile west of the main gate entrance (Figure 1). The site is partially fenced to prevent vehicular access from Highway 24. The northern edge of the study area borders Highway 24 and the northwest edge is bordered by Northeast Creek. The site extends to the south and west to encompass the former Building 45, and a small, possibly man-made lagoon. Toward the creek, the site is mostly wooded or wetlands and is covered by thick vegetation. An access road runs through the site and terminates at Northeast Creek. Features of Site 84 are shown on Figure 2.

Building 45 is a former electric substation, where transformers reportedly containing PCBs were used and possibly stored. A transformer was discovered in the wooded area, east of the substation.

Additional transformers, potentially containing PCB transformer oil, were discovered and have been removed from the lagoon. Maintenance personnel at Building 45 have indicated that additional transformers may still be buried in areas near the lagoon; however, it was reported that public works had performed minor excavations in the area and did not discover any additional transformers.

In approximately 1965, Camp Lejeune converted Building 45 to a maintenance facility for large machinery and it was used for this purpose until the early 1990s. Reportedly, the lagoon was used to contain discharges from Building 45. A 12-inch diameter concrete pipe from Building 45 discharged into the southeastern end of the lagoon. Conversations with Base personnel indicate that the pipe is connected to the former oil/water separator located outside of Building 45. However, it is believed that prior to the installation of the oil/water separator, the pipe was connected directly to the building floor drains. The aboveground portions of Building 45 were demolished in 1999, and the area was secured with a 6-foot high chain link fence. A NTCRA was completed in October 2002 in which the foundation of Building 45 and surrounding contaminated soils were removed.

A railroad right-of-way borders Site 84 to the north, running parallel to Highway 24. Due to changing transportation needs, the railroad is no longer used, and the Base plans to transfer a portion of the railroad right-of-way (from Route 17 to Route 24) to the City of Jacksonville for development of a pedestrian/bicycle trail. A portion of this trail will be developed along the northern border of Site 84. Therefore, fencing is necessary along the northern border of the site to prevent recreational trespassers from accessing the site. Figure 2 shows the right of way designated for the rails-to-trails path. Additional sampling will take place during the remedial action phase at the northern portion of Site 84 between existing sampling locations with detected contaminants above screening criteria and the railroad tracks. This will further delineate the limits of site-related soil contamination near the future rails-to-trails path.

3. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant

Table 1 summarizes the analytical results from the Remedial Investigation (RI) and other investigations at Site 84. PCBs, SVOCs, and pesticides were detected in surface soil samples above screening criteria. PCBs, SVOCs, and TPH were detected in subsurface soil samples above screening criteria. PCBs above screening criteria were detected in sediment samples from the lagoon. The

highest contaminant concentrations occurred in the surface soil and sediment. PCBs appear to be the compounds most directly linked to past disposal practices or poor housekeeping. Compounds were retained as contaminants of concern only when they exceeded the remediation goal for the desired future land use.

4. National Priority List Status

MCB, Camp Lejeune was placed on the CERCLA National Priorities List (NPL) on October 4, 1989. Subsequent to this listing, the USEPA, Region IV; the North Carolina Department of Environment and Natural Resources (NC DENR); and the United States DoN entered into a Federal Facilities Agreement (FFA) for MCB, Camp Lejeune. The Fiscal Year 2003 Site Management Plan for MCB, Camp Lejeune, the primary document referenced in the FFA, identified 42 sites, including Site 84, that require Remedial Investigation/Feasibility Study (RI/FS) activities.

5. Maps, Pictures, and Other Graphic Representations

Attachment A contains figures that depict the site location and the overall scope of the proposed removal action. These figures are referenced throughout the text.

B. Other Actions

1. Previous Investigations

Investigations that have taken place at Site 84 have been reported in the following documents:

- Pre-Remedial Investigation Screening Study, 1998
- Draft Engineering Evaluation/Cost Analysis, 1998
- Draft Action Memorandum, Site 84 - The Building 45 Area, 1999
- Concrete Chip and Surface Water Sampling, Building 45, 1999
- Final Remedial Investigation, Operable Unit No. 19, Site 84/Building 45 Area, 2002
- Draft Engineering Evaluation/Cost Analysis, Operable Unit No. 19, Site 84, 2002

The pertinent findings from these investigations are summarized in Section II D of this document.

2. Previous Removal Actions

Remedial actions conducted to date at Site 84 have included the Building 45 NTCRA (October 2002), removal and closure of two leaking underground storage tanks (USTs) in October 1992, and the subsequent installation and operation of an air sparging and soil vapor extraction (SVE) system near the former Building 45. The Building 45 NTCRA removed the Building 45 foundation and surrounding contaminated soil. The removal area of the Building 45 NTCRA is shown on Figure 3. During the excavation, confirmatory sampling was performed to ensure that contaminated soil within the designated excavation limits was removed. The samples were first field screened using immunoassay test kits,, then laboratory tested for PCB, polynuclear aromatic hydrocarbons (PAHs), pesticides and TPH.

The air sparging/SVE system was implemented for the remediation of petroleum-contaminated soil and groundwater associated with the USTs. The system is maintained and managed under the UST Program. Contaminated soil removal associated with the former USTs and the Building 45 NTCRA are addressed by other removal actions and are therefore excluded from this Action Memorandum.

3. Future Actions

Future actions proposed for Site 84 include the evaluation (via the Final EE/CA) and implementation of interim response actions to address residual soil contamination at Site 84, as described in this Action Memorandum. In addition, Land Use Control Implementation Plans (LUCIPs) for the site will be imposed for future land management purposes. Also, soil sampling will be conducted at the northern border of Site 84 and the proposed rails-to-trails project to evaluate the absence of contamination on the trail.

C. State and Local Authorities' Roles

The USEPA and NC DENR have been involved in planning and reviewing site investigation reports, the EE/CA, and this Action Memorandum. At the local level, the general public is also involved via the Restoration Advisory Board (RAB) and publicly available site information. Comments on this

Action Memorandum have been solicited from the USEPA, NC DENR, and Marine Corps Base, Camp Lejeune. These comments, and responses to the comments, have been included into this Final document. Involvement by all parties in the planning process will continue throughout the interim response action implementation period through meetings and correspondence. Response to public notice is anticipated throughout the Site 84 interim response action implementation period.

D. Quantities and Types of Substances Present

Several investigations have been completed to date at Site 84 and have confirmed the presence of PCBs, SVOCs, pesticides, and TPH above screening criteria in soil and sediment. A summary description of the results from previous site investigations at Site 84 follows. Figure 4 illustrates the sample locations utilized during the various investigations.

Surface Soil

PCBs

Over the course of three site investigations, a total of 95 surface soil samples were analyzed at a fixed based laboratory for PCBs. Aroclor-1260 was detected in 68 of 95 samples, at concentrations ranging from 18 J to 200,000 micrograms per kilogram (µg/kg). The highest detection of Aroclor-1260 was detected in surface soil sample SB27, located approximately in the center of the study area. Other PCB isomers were detected in surface soil samples, but in far fewer samples and generally at lower concentrations. Aroclor-1248 was detected in 4 of 95 samples, ranging from 56 µg/kg to 160,000 µg/kg and Aroclor-1254 was detected in only one sample at 51,000 µg/kg.

Field analyses using immunoassay test kits to detect PCBs was conducted on an additional 60 surface soil samples. The majority of the immunoassay results were between 1 part per million (ppm) and 10 ppm, representing a general area of low level contamination northwest of the Building 45 foundation. This area includes the former aboveground storage tank (AST) S-781, and extends toward, and includes a portion of the wetland area to the north of the site (in the vicinity of DP-71). A steep bank leading up to railroad tracks is located immediately north of DP-71 and is believed to be preventing migration of surface contaminants into this portion of the site. Two surface soil samples located near

the center of the site (DP-32 and DP-64) had PCB results greater than 50 ppm. Several areas had sample concentrations between 10 ppm and 50 ppm.

PCB contamination is widespread throughout site surface soil, though the concentrations vary. The PCB distribution pattern in the soil around former Building 45 suggests that drain pipes leading from the transformer room could be a source of PCB contamination. PCB contamination in soil at the site is generally less than one foot deep. PCBs are not very soluble in water nor are they very mobile in the environment. Thus, it is expected that shallow soil would exhibit the highest concentrations. The relatively widespread distribution of PCBs in the surface soil could be related to the mobilization of contaminated soil particles through wind, vehicle traffic, and soil erosion. The NTCRA has removed PCB contaminated surface soil in the vicinity of the former Building 45 foundation.

Volatile Organic Compounds

Twenty-six surface soil samples were analyzed for volatile organic compounds (VOCs). Only acetone, 2-butanone, ethylbenzene, and xylenes were positively detected. No detected VOCs in surface soil exceeded screening criteria.

Semi-Volatile Organic Compounds

Twenty-six samples were analyzed for SVOCs. A total of 21 SVOCs were detected in the surface soil samples. Nine SVOCs exceeded the screening criteria. The screening criteria was exceeded for a class of SVOCs known as polynuclear aromatic hydrocarbons (PAHs), which include the following compounds (ranges of detection in parentheses):

- Benzo(a)anthracene (520 μg/kg to 190,000 μg/kg)
- Benzo(a)pyrene (470 μg/kg to 150,000 μg/kg)
- Benzo(b)fluoranthene (540 μg/kg to 170,000 μg/kg)
- Benzo(k)fluoranthene (340 J μg/kg to 120,000 μg/kg)
- Carbazole (130 J μg/kg to 38,000 J μg/kg)
- Chrysene (560 μg/kg to 180,000 μg/kg)
- Dibenz(a,h)anthracene (70 J μg/kg to 17,000 J μg/kg)

- Indeno(1,2,3-cd)pyrene (250 J µg/kg to 59,000 µg/kg)
- Phenanthrene (910 J µg/kg to 180,000 µg/kg)

PAH detections are fuel related and the sources are likely the former AST northwest of Building 45 and/or activities associated with the former maintenance operations. The NTCRA has removed the PAH contaminated surface soil in the vicinity of the former Building 45 foundation, except for the area in the vicinity of the former AST.

Pesticides

Twenty-five samples were collected at Site 84 and analyzed for pesticides. Six of 14 pesticides analyzed were detected above the screening criteria including (ranges of detections in parentheses):

- 4,4'-DDD (3.2 J µg/kg to 3,000 µg/kg)
- Dieldrin (3.5 J µg/kg to 320 µg/kg)
- Heptachlor (1.5 J µg/kg to 22,000 µg/kg)
- Heptachlor epoxide (4.2 J µg/kg to 4,500 µg/kg)
- alpha-Chlordane (2 J µg/kg to 48,000 J µg/kg)
- gamma-Chlordane (3.9 µg/kg to 58,000 µg/kg)

Pesticides above the screening criteria in surface soils were present in the vicinity of the former Building 45 and have been removed through the NTCRA. Based on the results of the RI, pesticide concentrations above the criteria are not encountered outside of the former Building 45 area.

Inorganics

A total of 26 surface soil samples were analyzed for inorganics with 22 constituents detected in surface soil samples. No detected inorganics exceeded screening criteria.

Total Petroleum Hydrocarbons (TPH)

TPH was analyzed in 11 surface soil samples collected during the RI. TPH diesel-range organics (TPH-DRO) were detected in each of the 11 samples with concentrations ranging from 7 J milligrams per kilogram (mg/kg) to 470 mg/kg. The highest detection of TPH was located adjacent to the former Building 45 foundation (sample DP46-00), where TPH-DRO was detected at 470 mg/kg. Other surface soil detections of TPH-DRO ranged from 130 mg/kg to 340 mg/kg. TPH gasoline-range organics (TPH-GRO) were detected in one sample at 0.88 mg/kg. The NTCRA has removed the TPH contaminated surface soil in the vicinity of the former Building 45 foundation, except for the area in the vicinity of the former AST.

Subsurface Soil

PCBs

A total of 39 subsurface soil samples were analyzed for PCBs by a fixed based laboratory. Multiple Aroclor isomers were detected above the Toxic Substance Control Act (TSCA) high occupancy land use screening criteria (1,000 µg/kg) in 13 of these samples. Aroclor-1248 was detected at 47,000 µg/kg in sample DP47-01. Aroclor-1245 was detected in sample DP46-02 at 5,000 µg/kg. Aroclor-1260 was detected in the other 11 samples, ranging in concentration from 13 J µg/kg to 45,000 µg/kg, with the highest detected concentration in sample DP18-02.

Five subsurface soil samples were screened for PCBs using an immunoassay field test kit. One of the samples, DP18-02 (3-5 ft.) exhibited a concentration greater than or equal to 50 ppm. This sample point is located adjacent to the former AST S-781. Three samples exhibited PCB concentrations between 10 ppm and 50 ppm. The PCB concentration of the fifth sample (DP-28-01) was less than 1 ppm (the lowest detection limit of the field test kit).

After the NTCRA, only four subsurface soil sampling locations with detections above the TSCA level for high-occupancy land use (1,000 µg/kg) remain. These locations, located west of Building 45 within approximately 200 feet of the building, include: Aroclor-1260 detected at 8,900 µg/kg, 2,500 µg/kg and 1,100 µg/kg at DP-65, DP-63 and DP-15, respectively. The highest remaining Aroclor-

1260 concentration is 45,000 µg/kg at DP-18. These exceedances range from 1 to 7 feet below ground surface (bgs).

Volatile Organic Compounds

Twenty-four subsurface soil samples were analyzed for VOCs. There were ten VOCs detected in the subsurface soil samples, none of which exceeded screening criteria.

Semi-Volatile Organic Compounds

Thirty-three samples were collected and analyzed for SVOCs. A total of twenty-two SVOCs were detected, five of which exceeded screening criteria. The screening criteria was exceeded for PAHs, which include (ranges of detections in parentheses):

- Benzo(a)anthracene (640 µg/kg to 3,000 µg/kg)
- Benzo(a)pyrene (590 µg/kg to 2,600 µg/kg)
- Benzo(b)fluoranthene (68 J µg/kg to 2,800 µg/kg)
- Dibenz(a,h)anthracene (98 J µg/kg to 430 J µg/kg)
- Indeno(1,2,3-cd)pyrene (340 J µg/kg to 1,200 µg/kg)

The NTCRA has removed PAH contaminated subsurface soil in the vicinity of the former Building 45 foundation, except for the area in the vicinity of the former AST.

Pesticides

Eleven pesticides were detected in subsurface soil samples. Four of 14 pesticides analyzed were detected above the screening criteria in three samples, including (ranges of detections in parentheses):

- Heptachlor (1.6 J µg/kg to 6,900 µg/kg)
- Heptachlor epoxide (63 J µg/kg and 200 J µg/kg)
- alpha-Chlordane (3.3 µg/kg to 14,000 J µg/kg)
- gamma-Chlordane (3.3 µg/kg to 18,000 µg/kg)

The NTCRA has removed pesticide contaminated subsurface soil in the vicinity of the former Building 45 foundation. Based on the results of the RI, pesticide concentrations above the criteria are not encountered outside of the former Building 45 area.

Inorganics

Thirty-three subsurface soil samples were analyzed for inorganics. A total of twenty-two metals were detected, each at concentrations below the screening criteria.

Total Petroleum Hydrocarbons

Eight subsurface soil samples were analyzed for TPH-DRO and TPH-GRO. TPH-DRO was detected in all eight samples, at concentrations ranging from 15,000 μg/kg to 5,550,000 μg/kg. TPH-GRO was detected at 580,000 μg/kg in sample DP15-03 and at 220 μg/kg in sample DP46-02.

After the NTCRA, TPH-DRO and TPH-GRO only exceeds the North Carolina UST Program regulations at DP-15. At this location (near former AST), the concentration of TPH-DRO is 5,500,000 μg/kg and the concentration of TPH-GRO is 580,000 μg/kg. This contamination is at a depth of 5-7 feet bgs. The TPH contamination is found in the vicinity of the former AST and it is likely from the fuel-related storage at that tank.

Test Pits

Two soil samples were collected from each of the three test pits located along the length of the drainage pipe leading from Building 45 to the lagoon in July 2001. The purpose of this sampling effort was to determine if the drainage pipe leading from Building 45 to the lagoon had leaked. These samples were analyzed for PCBs and percent solids. Aroclor-1260 was the only detected PCB isomer and was detected in all six samples, at concentrations ranging from 56 μg/kg to 990 μg/kg. These are all below the TSCA screening criteria for PCB contamination for high-occupancy land use (1,000 μg/kg). The detections of Aroclor-1260 in all six samples is evidence that the pipe has potentially leaked.

Sediments

In October 1995, seven sediment samples were collected at Site 84 and analyzed for PCBs. Three of the samples were collected from Northeast Creek and four of the samples were collected from the on-site lagoon. PCBs were not detected in the sediment samples collected from Northeast Creek; however, each of the four samples collected from the lagoon exhibited PCBs above the TSCA high occupancy land use level of 1,000 μg/kg. Sediment sample SD05 contained PCB compounds Aroclor-1248 at 2,800 μg/kg and Aroclor-1260 at 20,000 μg/kg. Aroclor-1260 was also detected in samples SD06, SD07, and SD08 at concentrations of 8,100 μg/kg, 17,000 μg/kg, and 3,700 μg/kg, respectively.

During the March 1998 sampling event, three additional sediment samples were collected from the lagoon. Aroclor-1260 was detected at concentrations of 40,000 μg/kg, 5,900 μg/kg, and 4,300 μg/kg in these samples. These concentrations are above the TSCA high-occupancy guideline of 1,000 μg/kg.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Human Health Risk Summary

Potential receptors evaluated for Site 84 include current adolescent and adult recreational users, current Base personnel, future industrial/commercial workers, future adult and child residents, and future construction workers. Two distinct exposure scenarios were evaluated. The first exposure scenario includes the soil around the perimeter of Building 45 foundation that has been removed as part of the Building 45 NTCRA. The second exposure scenario excludes the soil that has been excavated for the Building 45 NTCRA. As the Building 45 NTCRA has been completed, this study is concerned with the second exposure scenario, which excludes the soil removed during the Building 45 NTCRA (i.e., site conditions after the removal action).

Soil contamination that remains after the Building 45 NTCRA does not contribute significantly to unacceptable carcinogenic risks or to unacceptable noncarcinogenic adverse health effects for the current receptors or for potential future industrial/commercial or construction workers. For the potential future adult and child resident, unacceptable carcinogenic risks are related to exposure to

PCBs in surface soil and lagoon sediment. Therefore, further actions are recommended to address the contaminated soil and lagoon sediment at Site 84.

Based on the preliminary risk screening summarized above, an interim response action is required to address potential human health risk and minimize migration of contaminants from site soil. Removal of the soil as well as subsequent clean up of residual soil contamination and lagoon sediment assures that the site will not adversely impact the environment or Base personnel.

B. Proposed Land Use

The proposed land use for Site 84 is low-occupancy, as defined under the TSCA. Low-occupancy areas are defined as areas where an unprotected individual would be present for less than 335 hours/year, or less than 6.7 hours/week on average. Examples of low-occupancy areas include an electrical substation or a non-office warehouse facility.

C. Remediation Goals

The most conservative soil remediation goal for PCBs for low-occupancy land use of 10 ppm was selected for Site 84. This remediation goal is for low-occupancy land use without additional controls based on USEPA guidance (USEPA, 1990). TSCA regulations call for a 25 ppm soil remediation goal for PCBs in low-occupancy areas with no additional engineering or land use controls. This range of values is also consistent with USEPA guidance, which calls for a 10 to 25 ppm cleanup goal for non-residential or industrial land use (USEPA, 1990). The selected remediation goal for PCBs for low-occupancy land use with fencing is 50 ppm, based on TSCA requirements that specify a cleanup level of 50 ppm for a low-occupancy area when the site is secured with fencing and signs. In accordance with TSCA, a PCB remediation goal of 100 ppm is selected for low-occupancy land use under a capping alternative.

Soil remediation goals of 10 ppm for TPH-GRO and 40 ppm for TPH-DRO were selected as stipulated by the North Carolina UST Program. These remediation goals are expected to also address the PAHs. In summary, the soil remedial goals for low-occupancy land use selected for Site 84 are:

- PCBs 10 ppm (USEPA industrial land use recommendation)

- TPH (GRO) 10 ppm
- TPH (DRO) 40 ppm

IV. ENDANGERMENT DETERMINATION

Based upon the concentrations, the frequency of detection, and the risk characterization results, the soil and lagoon sediment at Site 84 warrant further action to mitigate or abate potential adverse impacts to human health and the environment. Exposure to hazardous substances, if not addressed by implementing the proposed response actions discussed in this Action Memorandum, may endanger public health, welfare, and the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Action Description

The proposed interim response action is recommended for low-occupancy future land uses such as a non-office warehouse, equipment storage facility, or an electrical substation. The interim response actions for Site 84 include:

1. Excavation and removal of PCB, pesticide, SVOC, and TPH contaminated soil.
2. Off-site disposal of excavated contaminated soil in the Base landfill or TSCA permitted facility, as appropriate.
3. Solidification, removal, and off-site disposal of lagoon sediments.
4. Regrading and revegetation to establish pre-excavation conditions.
5. Fencing along entire site perimeter to protect potential recreational trespassers.
6. Establishment of land use controls to limit future land use to industrial use, and to restrict intrusive activities.

The primary component of the proposed action at Site 84 includes excavation of soil and lagoon sediments that contain contaminant concentrations in excess of remediation goals for low-occupancy land use. Remediation goals for the proposed action include North Carolina UST cleanup goals for

TPH (10 ppm GRO and 40 ppm DRO), and USEPA cleanup goals for PCBs for industrial areas (10 ppm) (see Table 2). The excavation area for this option can be seen in Figure 5 and the total volume for site-wide excavation is approximately 3,650 cubic yards (CY).

Confirmatory sampling will take place to ensure that all contaminants exceeding remediation goals have been excavated. Samples will be analyzed for PCBs, PAHs, and TPH. Excavated soils would be separated into TSCA-regulated and non-TSCA-regulated soils. TSCA-regulated soils (PCBs greater than 50 ppm) will be handled separately and would be transported to a TSCA-permitted chemical waste landfill meeting the requirements of 40 Code of Federal Regulations (CFR) 761.75 for proper off-site disposal. The remaining (non-TSCA-regulated) excavated soils will be transported to the Base landfill for proper disposal.

Following the excavation operation, the site would be restored by placing clean backfill (assumed to be from an on-Base borrow area) to bring the site back to it's original grade. All disturbed areas would be revegetated with native grasses and plant species to control erosion. Access roads or other infrastructure that are disturbed or destroyed in the excavation process would be restored to pre-excavation conditions.

Under the proposed response action, permanent land use controls will be required because contaminants exceeding high-occupancy and recreational remediation goals would remain on the site. In addition, certain types of intrusive activities at the site (e.g., excavation, installation of wells, or construction, other than for monitoring or future remediation purposes) will be restricted. The entire site perimeter would be fenced to prevent recreational trespassers from accessing the site. This will be necessary since contaminants above recreational remedial goals would remain on site.

2. Contribution to Remedial Performance

This interim response action includes the removal of PCB, PAHs, and TPH contaminated soil with contaminant concentrations exceeding the established low occupancy clean-up goals (see Table 2). The removal action will be protective of human health for future low occupancy land uses by eliminating the direct-contact risk presented by the soil and sediment. This conclusion is based upon the 2002 EE/CA.

The interim response action also provides institutional controls that reduce potential risks to human health and the environment. In designating the site for land use controls, the exposure pathways for receptors for other than low-occupancy land use are controlled. Therefore, low-occupancy receptors are appropriately protected because contamination exceeding low-occupancy criteria will be removed. Potential high-occupancy receptors are protected because land use restrictions limit future land use to only low-occupancy uses such as a storage facility, non-office warehouse, or electrical substation. As soil contaminated below the selected cleanup levels may remain on site, excavation restrictions will be implemented at the site to prevent possible exposure to contaminated soil during intrusive activities. Also, the perimeter of the site will be fenced to protect potential recreational trespassers. The location of the fence and areas for the removal of the contaminated soil are shown in Figure 5.

Extent of Remediation Accomplished With the Interim Response Action:

This interim response action will significantly reduce direct contact exposures by removal of the contaminated surface soil, subsurface soil, and sediment. Residual contamination in soil will be at concentrations less than the North Carolina UST cleanup goals for TPH (10 ppm GRO and 40 ppm DRO), USEPA cleanup goals for PCBs for industrial areas (10 ppm). As noted, the PAHs are expected to be addressed using the TPH criteria. This removal action also includes fencing of the entire site perimeter to restrict access for recreational trespassers, which is necessary since contaminants above recreational remedial goals would remain on site. Institutional controls will limit future land use and excavation.

3. Description of Alternative Technologies

The selected response action includes excavation and off-site disposal, fencing, and land use controls to limit future land use to low-occupancy. One additional alternative technology was considered for this interim response action as described below.

Capping

A capping option (i.e., soil cover) for Site 84 would consist of placing compacted soil fill, with topsoil and vegetation on top of the compacted fill. The soil cover would reduce the potential for direct exposure to the contaminated soil and would minimize the potential for contaminant migration via

surface water runoff and erosion. However, as contaminants do remain in the soil, permanent erosion controls are required as well as aquifer use, land use and excavation restrictions. All soil exceeding cleanup criteria would be capped with a soil cover. Wooded and wetlands areas would need to be cleared and grubbed before capping. This option was not selected due to long-term maintenance considerations and more extensive land use restrictions associated with protection of the cap.

Table 3 provides a summary of the response action alternatives considered for Site 84. The land use restrictions, cleanup levels and total cost are provided for each alternative. A detailed budgetary cost estimate for the selected response action (Excavation and Landfill Disposal for Low-Occupancy Land Use) is provided in Attachment B.

4. Applicable or Relevant and Appropriate Requirements

The 1990 NCP requires that removal actions attain applicable or relevant and appropriate federal and state requirements (ARARs) with limited exception, to the extent practicable. Four factors are applied to determine whether the attainment of ARARs is practicable in a particular removal situation: (1) the exigencies of the situation; (2) the scope of the removal action to be taken; (3) the effect of ARAR attainment on the statutory limits for removal action duration and cost; and (4) the criteria listed under SARA Section 121(d) providing conditions under which ARARs may be waived. The criteria listed under SARA Section 121(d)(4) for which ARARs may be waived include the following:

- Interim remedy waiver
- Greater risk to health and the environment
- Technical impracticability
- Inconsistent application of State requirements

The removal action set forth in this memorandum will comply with all applicable, relevant, and appropriate environmental and health requirements, to the extent practicable, considering the proposed future industrial land use for Site 84.

ARARs are divided into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are particular to individual contaminants. Location-specific ARARs

depend upon the location of the contamination and potential restrictions on activities conducted in these areas (i.e., wetlands, floodplains, etc.). Action-specific ARARs govern the remedial action and are usually technology- or Base-specific directions or limitations that control actions taken at CERCLA sites. In addition to ARARs, USEPA may, as appropriate, identify other Federal or State advisories, criteria, or guidance to be considered for specific releases.

The following ARARs may be applicable to the removal action at Site 84 and were considered in the selection of the response action for this site:

- Chemical-specific ARARs:
  - Cleanup levels for PCBs under the Toxic Substances Control Act (TSCA)
  - Disposal and storage requirements for PCBs under TSCA
  - USEPA guidance on PCB cleanup levels
  - USEPA Region IX Residential and Industrial PRGs
  - North Carolina UST Program guidelines for TPH
  - North Carolina Groundwater Standards

- Location-specific ARARs:
  - North Carolina Coastal Management
  - Fish and Wildlife Coordination Act
  - Federal and North Carolina Endangered Species Acts
  - Executive Order 11990 on Protection of Wetlands
  - Executive Order 11988 on Floodplain Management

- Action-specific ARARs:
  - NC Sedimentation Control Rules
  - NC Hazardous Waste Management Rules
  - NC Solid Waste Management Rules
  - NC Air Pollution Control Requirements

5. Project Schedule

Completion of the removal action is anticipated within nine months of the approved and signed Action Memorandum. The construction efforts associated with the removal action for Site 84 will begin following the completion and acceptance of this Action Memorandum. The anticipated schedule will follow the general outline below:

- Final Action Memorandum — October 2002
- Complete Removal Actions — May 2003

B. Estimated Costs

The estimated costs for the proposed response action are listed below. A detailed cost estimate spreadsheet for the proposed response action is presented in Attachment B. There are no operation and maintenance costs (O&M) associated with the proposed response action.

- Capital Cost: $ 605,700
- Professional Services Costs $ 214,900
- Present Worth of Annual O&M Cost: $ 0
- Total Project Cost: $ 820,600

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If no action is taken or the action is significantly delayed, future site receptors may be at risk. However, no current receptors are at risk from soil and sediment contaminated at Site 84. Therefore, the interim response action is not time critical, however should be completed due to localized areas of contamination that exceed the low occupancy remedial goals.

VII. OUTSTANDING POLICY ISSUES

As noted, herein, both Federal (USEPA) and state (NC DENR) agencies are currently involved in environmental planning for Site 84 at MCB, Camp Lejeune. The general public is also involved via the RAB, the announcement of available site related information, and the published request for public comment. A Public Meeting was held on June 18, 2002 and presented the proposed interim response action at this site. All of the agency and public comments received in relation to this Action Memorandum will be taken into consideration prior to the start of remedial action at Site 84.

VIII. ENFORCEMENT

The DoN can and will perform the approved response action for Site 84 promptly and properly.

IX. RECOMMENDATION

This decision document presents the recommended interim response action for Site 84 - Building 45 Area. This removal action was developed in accordance with CERCLA as amended, and is consistent with the NCP.

Approval by:

D M Mize

Major General D.M. Mize
Commanding General
Marine Corps Base, Camp Lejeune

20 NOV 2002

Date

X. REFERENCES

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Baker, 1998b. "Pre-Remedial Investigation Screening Study Sites 12, 68, 75, 76, 84, 85 and 87. Marine Corps Base, Camp Lejeune, North Carolina", Baker Environmental, Inc., November 1998.

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USEPA, 1990. "Superfund Removal Procedures, Action Memorandum Guidance". EPA/540/P-90/004. December 1990.

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ATTACHMENT A

TABLES AND FIGURES

TABLE 1
PREVIOUS INVESTIGATION RESULTS FOR SITE 84
OPERABLE UNIT NO. 19, SITE 84 / BUILDING 45 AREA
ACTION MEMORANDUM, CTO 0139
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria[1]	Range of Positive Detections	Maximum Location	Detection Frequency
Surface Soil	Volatiles	2-Butanone	7,300,000 N	4.8 J - 9 J	IR84-MW20-00	2/26
		Acetone	1,600,000 N	40 J - 40 J	84-MW15-00	1/26
		Ethylbenzene	230,000 S	330 J - 330 J	IR84-DP82-00	1/26
		Xylenes (total)	210,000 S	8.7 J - 120 J	IR84-DP82-00	2/26
	Semivolatiles	2-Methylnaphthalene	1,600,000 N[2]	120 J - 92,000	IR84-DP84-00	3/26
		Acenaphthene	3,700,000 N	140 J - 20,000 J	IR84-DP46-00	8/26
		Anthracene	22,000,000 N	210 J - 56,000	IR84-DP46-00	8/26
		Benzo(a)anthracene	620 C	520 - 190,000	IR84-DP46-00	8/26
		Benzo(a)pyrene	62 C	470 - 150,000	IR84-DP46-00	7/26
		Benzo(b)fluoranthene	620 C	540 - 170,000	IR84-DP46-00	7/26
		Benzo(ghi)perylene	6,720,000 N[3]	74 J - 55,000	IR84-DP46-00	9/26
		Benzo(k)fluoranthene	6,200 C	340 J - 120,000	IR84-DP46-00	7/26
		Carbazole	24,000 C	130 J - 38,000 J	IR84-DP46-00	7/26
		Chrysene	62,000 C	560 - 180,000	IR84-DP46-00	8/26
		Dibenz(a,h)anthracene	62 C	70 J - 17,000 J	IR84-DP46-00	7/26
		Dibenzofuran	290,000 N	84 J - 8,900 J	IR84-DP46-00	7/26
		Fluoranthene	2,300,000 N	1,200 - 300,000	IR84-DP46-00	8/26
		Fluorene	2,600,000 N	130 J - 19,000 J	IR84-DP46-00	9/26
		Hexachlorocyclopentadiene	420,000 C	410 J - 410 J	IR84-DP47-00	1/26
		Indeno(1,2,3-cd)pyrene	620 N	250 J - 59,000	IR84-DP46-00	7/26
		Naphthalene	56,000 N	140 J - 7,500 J	IR84-DP46-00	5/26
		Phenanthrene	59,600 N	910 J - 180,000	IR84-DP46-00	9/26
		Pyrene	2,300,000 [3]	760 - 250,000	IR84-DP46-00	8/26
		bis(2-Ethylhexyl) phthalate	35,000 N	140 J - 620	IR84-MW20-00D	2/26
	Pesticides/PCBs	4,4'-DDD	2,400 C	3.2 J - 3,000 J	IR84-DP47-00	7/24
		4,4'-DDE	1,700 C	3.1 - 58	IR84-DP49-00	7/24
		4,4'-DDT	1,700 C	1.9 - 190	IR84-DP49-00	7/24
		Dieldrin	30 C	3.5 J - 320	IR84-DP49-00	8/24
		Endosulfan sulfate	370,000 N[4]	2.1 J - 54 J	IR84-MW20-00	6/25
		Endrin	18,000 N	6.9 J - 6.9 J	IR84-MW20-00	1/24
		Endrin aldehyde	18,000 N[5]	4.5 J - 74 J	IR84-MW20-00	8/25
		Endrin ketone	18,000 N[5]	1.7 J - 26 J	IR84-DP81-00	5/25
		Heptachlor	110 C	1.5 J - 22,000	IR84-DP47-00	8/24
		Heptachlor epoxide	53 C	4.2 J - 4,500 J	IR84-DP47-00	6/24
		Methoxychlor	310,000 N	1.9 J - 98 J	IR84-MW20-00	7/25
		Aroclor-1248	1,000 C[6]	56 - 160,000	IR84-DP47-00	4/95
		Aroclor-1254	1,000 C[6]	51,000 - 51,000	IR84-DP53-00	1/95
		Aroclor-1260	1,000 C[6]	18 J - 200,000	IR84-SB27-01	68/95
		PCB-Ensys Test Kit Results	1,000 C[6]	1,000 - >50,000	IR84-DP32, IR84-DP64	33/60
		alpha-BHC	90 C	21 - 21	IR84-DP82-00	1/24
		alpha-Chlordane	1,600 C[7]	2 J - 48,000 J	IR84-DP47-00	10/24
		gamma-Chlordane	1,600 C[7]	3.9 - 58,000	IR84-DP47-00	10/24

TABLE 1 (continued)
PREVIOUS INVESTIGATION RESULTS FOR SITE 84
OPERABLE UNIT NO. 19, SITE 84 / BUILDING 45 AREA
ACTION MEMORANDUM, CTO 0139
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [1]	Range of Positive Detections	Maximum Location	Detection Frequency
Surface Soil (Continued)	Total Petroleum Hydrocarbons	TPH (as Diesel)	10,000 [8]	7,000 J - 470,000	IR84-DP46-00	11/11
		TPH (as Gasoline)	40,000 [8]	880 - 880	IR84-DP46-00	1/11
	Metals	Aluminum	76,000 N	1,270 - 8,940	IR84-MW20-00	26/26
		Antimony	31 N	0.66 J - 3.3 J	IR84-DP49-00	13/26
		Arsenic	26.2 C [3]	0.33 J - 9.1	IR84-DP49-00	24/26
		Barium	5,400 N	3 J - 65.7	IR84-DP49-00	23/26
		Beryllium	150 N	0.06 J - 0.075 J	IR84-DP46-00	5/26
		Cadmium	37 N	0.067 J - 0.57	IR84-DP53-00	14/26
		Calcium	NE	109 J - 100,000 J	IR84-DP50-00	26/26
		Chromium	210 N	1.7 - 20.2	IR84-DP49-00	26/26
		Cobalt	4,700 N	0.18 J - 0.76 J	IR84-DP49-00	23/26
		Copper	2,900 N	0.35 J - 146	IR84-DP49-00	26/26
		Iron	23,000 N	684 - 5,000	IR84-MW20-00	26/26
		Lead	400 N [9]	1.8 - 97.3	IR84-DP49-00	26/26
		Magnesium	NE	47.3 J - 1,480	IR84-DP49-00	26/26
		Manganese	1,800 N	2.7 - 32.8	IR84-DP49-00	26/26
		Mercury	23,000 N	0.01 J - 0.2	IR84-DP74-00	18/26
		Nickel	1,600 N	0.46 J - 2.9 J	IR84-DP49-00	26/26
		Potassium	NE	70.2 J - 258 J	IR84-DP76-00	17/26
		Selenium	390 N	0.53 J - 0.61	IR84-DP74-00	2/26
		Sodium	NE	165 J - 235 J	IR84-DP50-00	3/26
		Thallium	5.5 [2]	0.6 J - 0.6 J	IR84-DP45-00	1/26
		Vanadium	550 N	2.3 J - 11.2	IR84-MW20-00	26/26
		Zinc	23,000 N	1.3 J - 154 J	IR84-DP49-00	26/26
Subsurface Soil	Volatiles	1,2-Dichloroethene (total)	63,000 N	91 J - 91 J	IR84-DP82-04	1/24
		2-Butanone	7,300,000 N	3.8 J - 3.8 J	IR84-MW21-04	1/24
		Acetone	1,600,000 N	14 J - 18 J	IR84-MW21-04	2/24
		Benzene	670 C	120 J - 160 J	84-MW15-04	2/24
		Chloroform	240 C	0.98 J - 2.3 J	IR84-SB05-01	3/24
		Ethylbenzene	230,000 N	0.89 J - 1,300	IR84-DP75-05	5/24
		Methylene chloride	8,900 C	1.3 J - 1.3 J	IR84-DP78-03	1/24
		Styrene	1,700,000 N	2.1 J - 2.1 J	IR84-MW23-01	1/24
		Toluene	520,000 N	75 J - 75 J	IR84-DP75-05	1/24
		Xylenes (total)	210,000 N	4.1 J - 3,100	IR84-DP75-05	4/24

TABLE 1 (continued)
PREVIOUS INVESTIGATION RESULTS FOR SITE 84
OPERABLE UNIT NO. 19, SITE 84 / BUILDING 45 AREA
ACTION MEMORANDUM, CTO 0139
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [1]	Range of Positive Detections	Maximum Location	Detection Frequency
Subsurface Soil (Continued)	Semivolatiles	2-Methylnaphthalene	1,600,000 N [2]	1,000 - 27,000	84-MW15-04	3/33
		Acenaphthene	3,700,000 N	61 J - 950 J	IR84-DP15-03	4/33
		Anthracene	22,000,000 N	190 J - 830 J	IR84-DP46-02	3/33
		Benzo(a)anthracene	620 C	640 - 3,000	IR84-DP46-02	3/33
		Benzo(a)pyrene	62 C	590 - 2,600	IR84-DP46-02	3/33
		Benzo(b)fluoranthene	620 C	68 J - 2,800	IR84-DP46-02	5/33
		Benzo(ghi)perylene	6,720,000 C [3]	65 J - 1,200	IR84-DP46-02	5/33
		Benzo(k)fluoranthene	6,200 C	280 J - 1,700	IR84-DP46-02	3/33
		Carbazole	24,000 N	110 J - 480 J	IR84-DP46-02	3/33
		Chrysene	62,000 C	57 J - 3,100	IR84-DP46-02	5/33
		Dibenz(a,h)anthracene	62 C	98 J - 430 J	IR84-DP46-02	3/33
		Dibenzofuran	290,000 N	160 J - 1,300 J	IR84-DP15-03	3/33
		Fluoranthene	2,300,000 N	74 J - 4,800	IR84-DP46-02	5/33
		Fluorene	2,600,000 N	61 J - 1,500 J	IR84-DP15-03	5/33
		Hexachlorocyclopentadiene	420,000 N	94 J - 94 J	IR84-DP47-01	1/33
		Indeno(1,2,3-cd)pyrene	620 C	340 J - 1,200	IR84-DP46-02	3/33
		Naphthalene	56,000 N	55 J - 8,500	84-MW15-04	4/33
		Phenanthrene	59,600 N [3]	150 J - 3,400 J	84-MW15-04,IR84-DP15-03	6/33
		Phthalic anhydride	100,000 N	120 NJ - 170 NJ	IR84-SB04-02	2/2
		Pyrene	2,300,000 N	69 J - 4,100	IR84-DP46-02	5/33
		bis(2-Chloroethoxy)methane	NE	54 - 54	IR84-DP81-04	1/33
		bis(2-Ethylhexyl) phthalate	35,000 N	91 J - 1,800	IR84-MW22-02	7/33
	Pesticides/PCBs	4,4'-DDD	2,400 C	1.7 J - 46 J	IR84-DP45-03	7/33
		4,4'-DDE	1,700 C	2 J - 16	IR84-DP52-01	5/33
		4,4'-DDT	1,700 C	2.5 - 120 J	IR84-DP52-01	5/33
		alpha-Chlordane	1,600 C [7]	3.3 J - 14,000 J	IR84-DP47-01	8/33
		beta-BHC	320 C	1.7 J - 1.7 J	84-MW17-07	1/33
		Dieldrin	30 C	1.8 - 2.4	IR84-SB01-02	3/33
		Endrin aldehyde	18,000 N [5]	10 J - 10 J	IR84-DP15-03	1/33
		gamma-Chlordane	1,600 N [7]	3.3 J - 18,000	IR84-DP47-01	8/33
		Heptachlor epoxide	53 C	63 J - 200 J	IR84-DP46-02	2/33
		Heptachlor	110 C	1.6 J - 6,900	IR84-DP47-01	7/33
		Methoxychlor	310,000 N	2.9 J - 24 J	IR84-DP15-03	3/33
		Aroclor-1248	1,000 N [6]	47,000 - 47,000	IR84-DP47-01	1/39
		Aroclor-1254	1,000 N [6]	5,000 - 5,000	IR84-DP46-02	1/39
		Aroclor-1260	1,000 N [6]	13 J - 45,000	IR84-DP18-02	11/39
		PCB-Ensys Test Kit Results	1,000 N [6]	1,000 - > 50,000	IR84-DP18-02	4/5
	Total Petroleum Hydrocarbons	TPH (as Diesel)	10,000 [8]	7,000 J - 470,000	IR84-DP46-00	11/11
		TPH (as Gasoline)	40,000 [8]	880 - 880	IR84-DP46-00	1/11

TABLE 1 (continued)
PREVIOUS INVESTIGATION RESULTS FOR SITE 84
OPERABLE UNIT NO. 19, SITE 84 / BUILDING 45 AREA
ACTION MEMORANDUM, CTO 0139
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [1]	Range of Positive Detections	Maximum Location	Detection Frequency
Subsurface Soil (Continued)	Metals	Aluminum	76,000 N	589 - 7,210	IR84-DP77-03	33/33
		Antimony	31 N	0.6 J - 1.3 B	IR84-DP15-03	8/33
		Arsenic	26.2 C [3]	0.33 J - 2	IR84-DP15-03,IR84-DP79-02D	29/33
		Barium	5,400 N	0.92 J - 24.3	IR84-DP49-01	21/33
		Beryllium	150 N	0.051 J - 0.13 B	IR84-DP15-03	5/33
		Cadmium	37 N	0.05 J - 0.18 J	IR84-DP49-01	7/33
		Calcium	NE	71.4 J - 66,800 J	IR84-SB03-02	33/33
		Chromium	210 N	1.2 - 9.9	IR84-DP45-03	33/33
		Cobalt	4,700 N	0.16 J - 0.69 J	IR84-DP52-01	27/33
		Copper	2,900 N	0.34 J - 25.5	IR84-DP50-01	29/33
		Iron	23,000 N	155 - 6,140	IR84-DP15-03	33/33
		Lead	400 N [9]	0.87 - 52.7	IR84-DP49-01	33/33
		Magnesium	NE	16.4 J - 943	IR84-SB03-02	33/33
		Manganese	1,800 N	0.48 J - 50.5	IR84-SB03-02	33/33
		Mercury	23,000 N	0.0092 J - 0.055 J	IR84-DP46-02	23/33
		Nickel	1,600 N	0.42 J - 3.5 J	IR84-DP50-01	32/33
		Potassium	NE	21.3 J - 195 J	IR84-DP77-03	27/33
		Selenium	390 N	0.39 J - 0.73	IR84-SB03-02	8/33
		Sodium	NE	89.7 J - 89.7 J	IR84-SB03-02	1/33
		Thallium	5.5 [2]	0.64 J - 0.9 J	IR84-SB03-02	5/33
		Vanadium	550 N	1.1 J - 11.4	IR84-DP79-02D	33/33
		Zinc	23,000 N	1.4 J - 42.6 J	IR84-DP49-01	29/33
Test Pits	PCBs	PCBs	NA	-- - --	--	0/6
Sediment	Semivolatiles	2-Methylnaphthalene	1,600,000 N [3]	10,000 - 10,000	IR84-SD07-98B	1/1
		Naphthalene	56,000 N	2,000 - 2,000	IR84-SD07-98B	1/1
		Phenanthrene	59,600 N [3]	2,500 - 2,500	IR84-SD07-98B	1/1
		bis(2-Ethylhexyl) phthalate	35,000 C	2,400 J - 2,400 J	IR84-SD07-98B	1/1
	PCBs	Aroclor-1248	1,000 C [6]	2,800 - 2,800	84-SD05-01	1/7
		Aroclor-1260	1,000 C [6]	3,700 - 40,000	IR84-SD01-98B	7/7
	Total Petroleum Hydrocarbons	Diesel Range Organics	40,000 [8]	3,500 - 14,000	IR84-SD01-98BD	4/4

NA - Not Applicable NE - Not Established

Notes:

(1) Screening Criteria: Region IX Residential PRGs for soil and sediment, NCWQS for groundwater, and USEPA Region 4 Fresh Surface Water Screening values for surface water, unless otherwise
(2) USEPA Region III Residential RBC
(3) North Carolina Soil-to-Groundwater Concentration
(4) Screening value for endosulfan used as a surrogate
(5) Screening value for endrin used as a surrogate
(6) Residential Cleanup Goal under TSCA for PCBs
(7) Screening value for chlordane used as a surrogate
(8) TPH Cleanup goal for low boiling point fuels (gasolene range) under North Carolina UST Regulations
(9) EPA action level for lead

TABLE 2
INAL SOIL COC AND REMEDIATION GOALS (LOW-OCCUPANCY LAND USI
OPERABLE UNIT NO. 19, SITE 84 / BUILDING 45 AREA
ACTION MEMORANDUM, CTO 0139
MCB, CAMP LEJEUNE, NORTH CAROLINA

Contaminant
Aroclor-1260[1]
Aroclor-1248[1]
Aroclor-1254[1]
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluroanthene
Dibenz(a,h)anthracene
Dieldrin[2]
alpha-Chlordane[2]
gamma-Chlordane[2]
Heptachlor[2]
Heptachlor epoxide[2]
Indeno(1,2,3-cd)pyrene
Phenanthrene
TPH (Diesel Range Organics)
TPH (Gasoline Range Organics)

Notes:

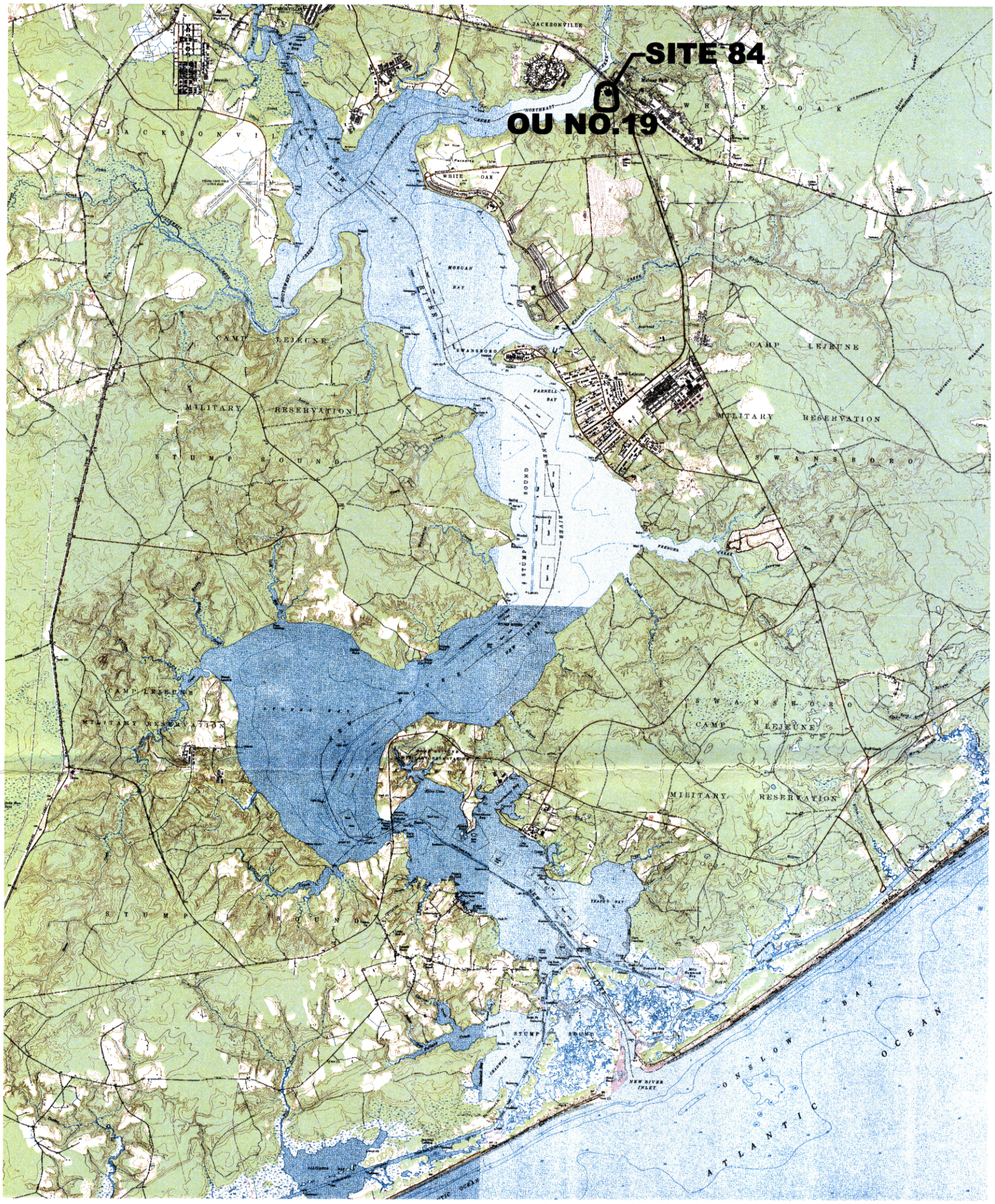
(1) EPA OSWER directive for industrial land use is 10 ppm. Low-occupancy remedial goals for PCBs under TSCA may be 25 ppm with no additional controls, 50 ppm if area is secured with fencing and 100 ppm if area is capped with a soil, concrete or asphalt cover

(2) The PRGs were used to estimate the approximate area and depth of the Non-TCRA for pesticides.

TABLE 3
SOIL RESPONSE ACTION ALTERNATIVE SUMMARY TABLE
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
ACTION MEMORANDUM - CTO 0139
MCB CAMP LEJEUNE, NORTH CAROLINA

Response Action Alternative	Description / Components	Appropriate Land Uses	Land Use Controls Needed	TPH Cleanup Level	PCB Cleanup Level	Usable Land Area	Remedial Action Alternative Cost
High-Occupancy Land Uses							
Excavation and Landfill Disposal ("No Access Restrictions")	Excavate all soils above cleanup levels; disposal of TSCA and non-TSCA waste in appropriate landfills; site restoration; wetland restoration	Housing, school, park, marina, office building	None	10 ppm - TPH(GRO) 40 ppm - TPH(DRO)	1 ppm	9.8 acres	$1,311,100
Excavation and Landfill Disposal ("Access Restrictions")	Excavate all soils above cleanup levels in open areas; fence wooded/wetland areas; disposal of TSCA and non-TSCA waste in appropriate landfills; site restoration	Housing, school, park, marina, office building	Partial access restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO)	1 ppm	8.5 acres	$1,012,700
Excavation and Capping ("No Access Restrictions")	Excavate all soils above 10 ppm PCBs; disposal of TSCA and non-TSCA waste in appropriate landfills; cap soils exceeding residential PRGs, TPH cleanup levels, or 1 ppm PCBs; site restoration; wetland restoration	Housing, school, park, marina, office building	Intrusive restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO) (capping)	10 ppm (excavation) 1 ppm (capping)	9.8 acres	$1,025,800
Excavation and Capping ("Access Restrictions")	Excavate all soils above 10 ppm PCBs in open areas; fence wooded/wetland areas; disposal of TSCA and non-TSCA waste in appropriate landfills; cap soils exceeding residential PRGs; TPH cleanup levels, and exceeding 1 ppm PCBs; site restoration	Housing, school, park, marina, office building	Intrusive restrictions, Partial access restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO) (capping)	10 ppm (excavation) 1 ppm (capping)	8.5 acres	$862,400
Low-Occupancy Land Uses							
Excavation and Landfill Disposal *	Excavate all soils above cleanup levels; disposal of TSCA and non-TSCA waste in appropriate landfills; site restoration; wetland restoration; site perimeter fencing	Non-office warehouse, equipment storage, electrical substation	Land use restrictions, Intrusive restrictions, Site access restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO)	10 ppm	9.8 acres	$820,600
Hot Spot Removal and Institutional Controls	Excavate all soils above cleanup levels; disposal of TSCA and non-TSCA waste in appropriate landfills; site restoration; site perimeter fencing	Non-office warehouse, equipment storage, electrical substation	Land use restrictions, Intrusive restrictions, Site access restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO)	25 ppm	9.8 acres	$786,000
Hot Spot Removal and Fencing	Excavate all soils above cleanup levels; disposal of TSCA and non-TSCA waste in appropriate landfills; site restoration; site perimeter fencing	Non-office warehouse, equipment storage, electrical substation	Land use restrictions, Intrusive restrictions, Site access restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO)	50 ppm	9.8 acres	$540,200
Hot Spot Removal and Capping	Excavate all soils above 100 ppm PCBs; disposal of TSCA and non-TSCA waste in appropriate landfills; cap soils exceeding industrial PRGs, TPH cleanup levels, or 25 ppm PCBs; site restoration; site perimeter fencing	Non-office warehouse, equipment storage, electrical substation	Land use restrictions, Intrusive restrictions, Site access restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO) (capping)	100 ppm (excavation) 25 ppm (capping)	9.8 acres	$517,800
Recreational Land Uses							
Excavation and Landfill Disposal ("No Access Restrictions")	Excavate all soils above cleanup levels; disposal of TSCA and non-TSCA waste in appropriate landfills; site restoration; wetland restoration	Marina, fishing, boating, community park	Land Use Restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO)	7.7 ppm	9.8 acres	$1,181,100
Excavation and Landfill Disposal ("Access Restrictions")	Excavate all soils above cleanup levels in open areas; fence wooded/wetland areas; disposal of TSCA and non-TSCA waste in appropriate landfills; site restoration	Marina, fishing, boating, community park	Land Use Restrictions, Partial access restrictions	10 ppm - TPH(GRO) 40 ppm - TPH(DRO)	7.7 ppm	8.5 acres	$996,900

* Selected Response Action for Site 84



8000 0 4000 8000

1 inch = 8000 ft.

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LEGEND

SOURCE: U.S.G.S. QUADRANGLES JACKSONVILLE SOUTH, CAMP LEJEUNE, SNEADS FERRY AND NEW RIVER INLET.

FIGURE 1
SITE LOCATION MAP
SITE 84 ACTION MEMORANDUM
CTO 0139

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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NORTHEAST CREEK

FLOW

500-YEAR FLOOD PLAIN

WETLANDS

LAGOON

PIPE OUTLET

PIPE

DRAINAGE INLET

DIRT ROAD

CP&L SUBSTATION

N.C. HWY 24

RAILROAD

DRAINAGE INLET

DRAINAGE INLET

PIPE OUTLET

PIPE OUTLET

GRAVEL ROAD

FORMER AST S781

FORMER BUILDING 45 FOUNDATION

780

FUTURE PEDESTRIAN/BICYCLE RECREATIONAL TRAIL 50-FOOT R.O.W.

2 EXISTING VEHICLE GATES AND FENCE

LCH216

LCH214

LCH116

LCH114

LCH112

LCH110

LCH115

LCH108

LCH106

LCH113

LCH111

LCH109

LCH107

LCH105

120 0 60 120

1 inch = 120 ft.

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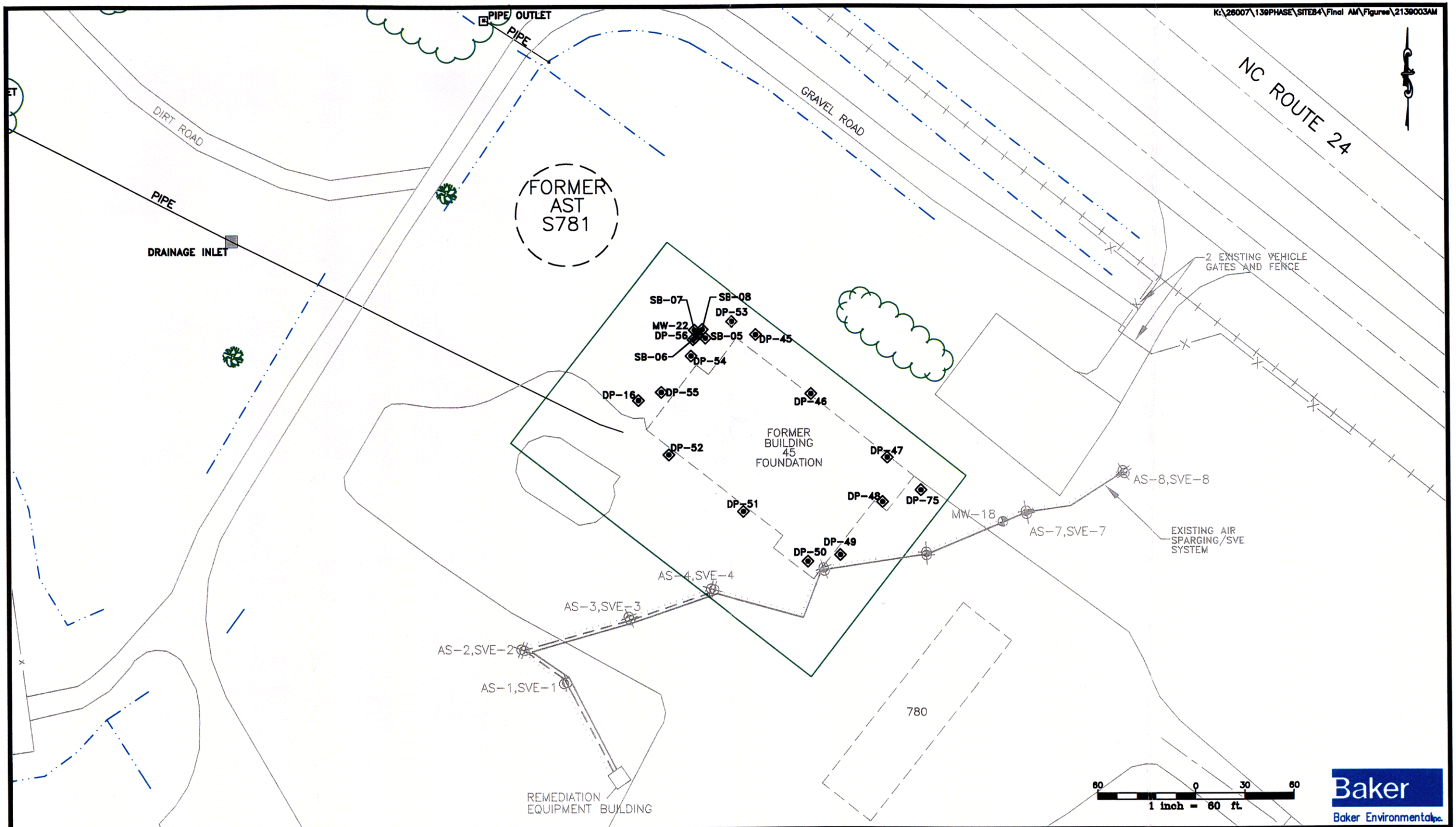
LEGEND

- FORMER BUILDING
- RAIL ROAD
- FENCE
- INTERMITTENT DRAINAGE SWALE
- APPROXIMATE WETLAND BOUNDARY
- TREE LINE
- TREE
- WETLANDS

FIGURE 2
SITE FEATURES MAP
SITE 84 ACTION MEMORANDUM
CTO 0139

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



LEGEND

- INTERMITTENT DRAINAGE SWALE
- TREE LINE
- FORMER BUILDING
- RAIL ROAD
- FENCE
- TREE
- NTCRA EXCAVATION AREA
- DIRCET PUSH SOIL BORING (2001)

FIGURE 3
SOIL EXCAVATION AREA, NTCRA
SITE 84 ACTION MEMORANDUM
CTO 0139
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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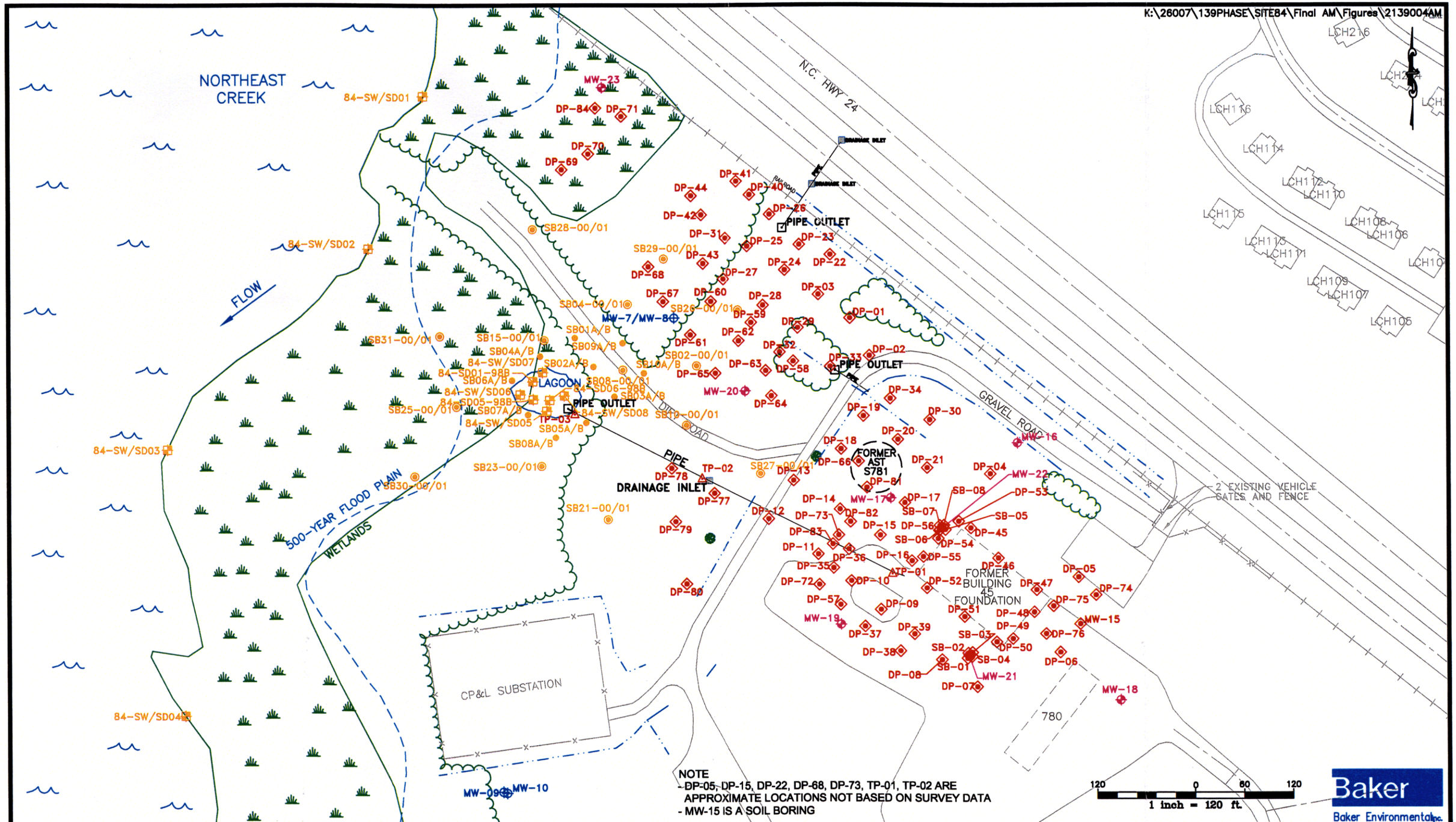

LEGEND

- INTERMITTENT DRAINAGE SWALE
- TREE LINE
- TREE
- WETLANDS
- FORMER BUILDING
- RAIL ROAD
- FENCE
- APPROXIMATE WETLAND BOUNDARY
- DIRECT PUSH SOIL BORING (2001)
- EXISTING MONITORING WELL (1992)
- TEST PIT (2001)
- NEW MONITORING WELL (2001)
- SOIL SAMPLING LOCATION (1998)
- SURFACE WATER/SEDIMENT SAMPLE STATION (1995/1998)
- SOIL SAMPLING LOCATION (1995)

FIGURE 4
SAMPLE LOCATIONS MAP
SITE 84 ACTION MEMORANDUM
CTO 0139

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

NOTES:
1. SOIL SAMPLES SHOWN IN RED EXCEED 10 ppm PCBs, TPH, AND/OR INDUSTRIAL CLEANUP GOALS AND SHALL BE EXCAVATED TO THE DEPTHS SHOWN.
2. EXCAVATE CONTAMINATED SOILS WITH PCBs GREATER THAN 50 ppm (SHOWN AS A GREEN HATCHED AREA) TO 2' DEPTH AND DISPOSE AT APPROVED TSCA LANDFILL.
3. REMAINING CONTAMINATED SOILS SHALL BE DISPOSED AT THE BASE LANDFILL.
4. LAGOON WATER SHALL BE PUMPED AND TRANSPORTED TO THE LOT 203 TREATMENT PLANT.
5. LAGOON SEDIMENTS SHALL BE SOLIDIFIED PRIOR TO EXCAVATION.
6. BACKFILL ALL EXCAVATIONS, LAGOON AREA, AND "HOLES" AND GRADE TO DRAIN.
7. REVEGETATE ALL DISTURBED AREAS.
8. DP-05, DP-15, DP-22, DP-68, DP-73, TP-01, TP-02 ARE APPROXIMATE LOCATIONS NOT BASED ON SURVEY DATA.
9. MW-15 IS A SOIL BORING.

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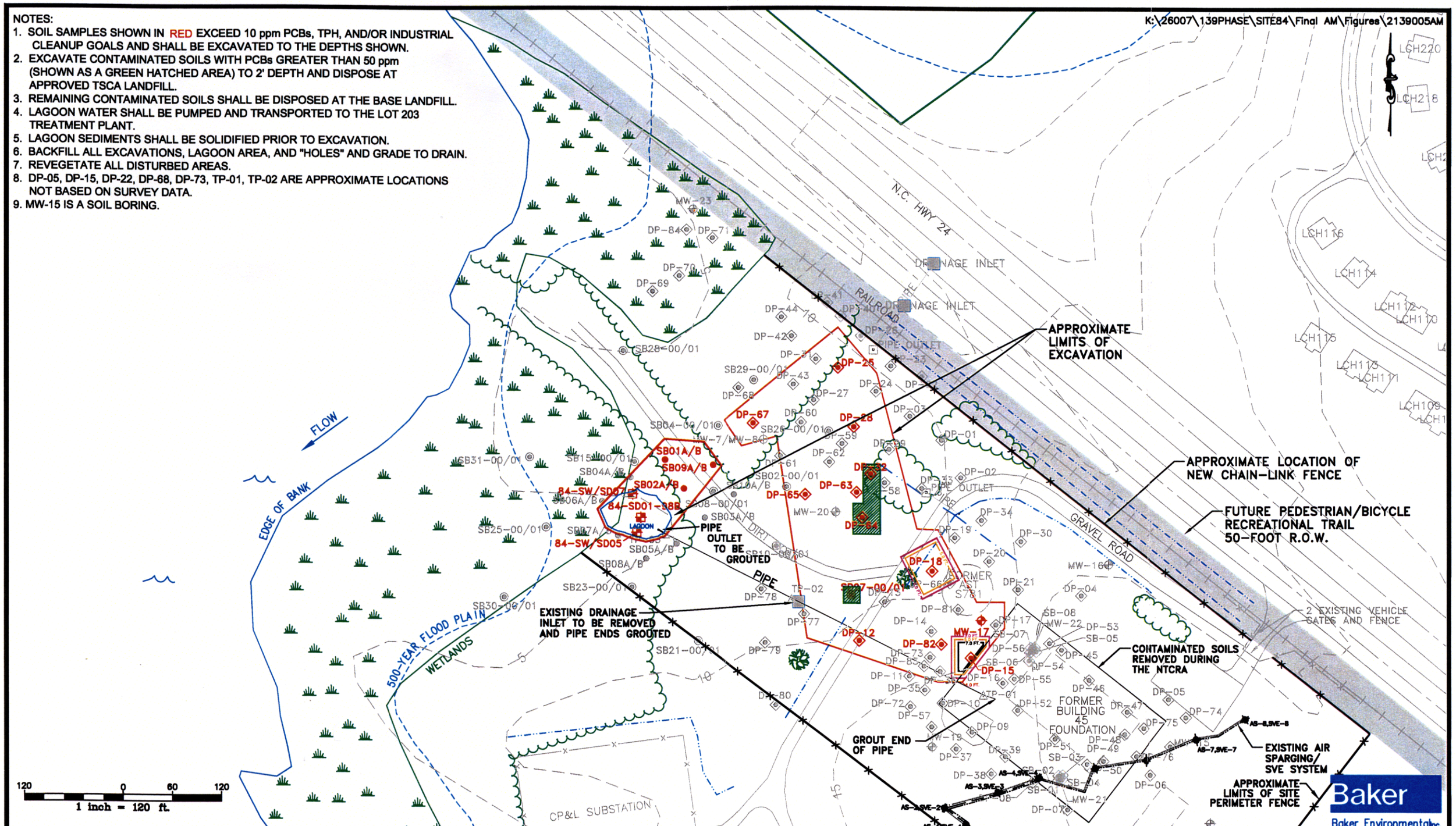

LEGEND

- INTERMITTENT DRAINAGE SWALE
- TREE LINE
- TREE
- WETLANDS
- FORMER BUILDING
- APPROXIMATE WETLAND BOUNDARY
- EXISTING FENCE
- RAIL ROAD
- PROPOSED FENCE
- DIRECT PUSH SOIL BORING (2001)
- EXISTING MONITORING WELL (1992)
- TEST PIT (2001)
- NEW MONITORING WELL (2001)
- SOIL SAMPLING LOCATION (1998)
- SOIL SAMPLING LOCATION (1995)
- SURFACE WATER/SEDIMENT SAMPLE (1995/1998)
- PCBs GREATER THAN 50 ppm
- EXCAVATE TO 1' DEPTH
- EXCAVATE TO 3' DEPTH
- EXCAVATE TO 5' DEPTH
- EXCAVATE TO 7' DEPTH
- NTCRA EXCAVATION AREA

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FIGURE 5
EXCAVATION AND LANDFILL DISPOSAL
LOW-OCCUPANCY LAND USE
SITE 84 ACTION MEMORANDUM
CTO 0139

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

ATTACHMENT B

COST ESTIMATES

TABLE B-1
EXCAVATION AND LANDFILL DISPOSAL (LOW-OCCUPANCY LAND USE)
BUDGETARY COST ESTIMATE (1)
OPERABLE UNIT No. 19, SITE 84/BUILDING 45 AREA
ACTION MEMORANDUM - CTO 0139
MCB, CAMP LEJEUNE, NORTH CAROLINA

Cost Item	Quantity	Units	Unit Cost	Total Cost	Assumptions (Basis of Cost Estimate)
DIRECT CAPITAL COSTS					
I. Site Preparation					
A. Mobilization/Demobilization	1	LS	$15,000	$15,000	Engineering Judgement
B. Contaminated Stormwater Management	1	LS	$5,000	$5,000	Includes collection, sampling, pumping, and transport to Lot 203 treatment plant
C. Grouting of Pipe and Inlet Removal / Disposal	1	LS	$1,000	$1,000	Engineering Estimate - grout 40 feet of 12-inch diameter pipe with concrete
D. Erosion Protection	1	LS	$5,000	$5,000	Engineering Estimate
E. Rails-to-Trails ROW Investigation	1	LS	$2,500	$2,500	Engineering Estimate
Subtotal				$28,500	
II. Excavation and Site Restoration					
A. Excavation of Contaminated Soil	3650	CY	$3.43	$12,517	Means Site Work 2002 (02315-400-1200) (02315-400-0020) Add 10% for Level D
B. Solidification of Lagoon Sediments	350	CY	$100.00	$35,000	Engineering Estimate (mix with flyash, lime, or cement)
C. Excavation of Sediments from Lagoon	700	CY	$11.56	$8,095	Means Site Work 2001 (02315-400-0550) (02315-400-0020) Add 10% for Level D
D. Confirmatory Sampling (2)	150	EA	$580	$87,000	Analysis for SVOCs, PCBs/Pesticides& TPH. Includes $50/sample for collection/handling. Assume 100 samples/acre.
E. Base Landfill Disposal (PCBs < 50 ppm)	6233	Ton	$5	$31,163	Transport to Base Landfill, distance of 4 miles each way (estimate)
F. Off-Site Landfill Disposal (PCBs > 50 ppm)	293	Ton	$112	$32,760	Vendor Quote: Disposal Fee plus local and state taxes - Model City, NY
G. Off-Site Landfill Transport. (PCBs > 50 ppm)	293	Ton	$110	$32,175	Vendor Quote (From Camp Lejeune to Model City, NY)
H. Analytical/Waste Profiles for Off-site Disposal	1	LS	$6,500	$6,500	4 samples (Base landfill) @ $500/ea plus 3 TCLP (TSCA landfill) @ $1500/ea
I. Decontamination Of Equipment	1	LS	$5,200	$5,200	Engineering Estimate Environmental Means 2001 (19-04-0626)
J. Backfill (bring site back to within 6 inches of original grade)	2800	CY	$16.30	$45,640	Means Site Work 2001 (02320-200-0540) (A12.1-724-1550), Assume source is on-Base borrow area, includes placement/compaction
K. Top Soil (6-inches)	1500	CY	$30.00	$45,000	Means Site Work 2001 (02315-200-7010) (02320-200-0540) (A12.1-724-1550)
L. Fine Grading/Stormwater Controls	2	AC	$2,800	$5,600	Means Site Work (02300-440-0100)
M. Revegetation	2	AC	$2,500	$5,000	Engineering Estimate
N. Fencing (8' chain-link fence)	2210	LF	$31	$68,510	Means Site Work 2001 (02820-528-0920)
Subtotal				$420,160	
Subtotal - Direct Capital Costs				$448,660	
Scope & Bid Contingency				$157,031	Total 35% contingency (20% scope and 15% bid contingency)
TOTAL - DIRECT CAPITAL COSTS				$605,691	
PROFESSIONAL SERVICES					
I. Design/Engineering Support	1	LS	$90,854	$90,854	Assume 15% of total direct capital cost
II. Construction Management	1	LS	$60,569	$60,569	Assume 10% of total direct capital cost
III. Project Management	1	LS	$48,455	$48,455	Assume 8% of total direct capital cost
IV. Institutional Controls	1	LS	$15,000	$15,000	Land use, intrusive, and site access restrictions
TOTAL - PROFESSIONAL SERVICES COSTS				**$214,878**	
ANNUAL OPERATION & MAINTENANCE COSTS					
TOTAL - ANNUAL O&M COSTS				**$0**	
TOTAL PROJECT COST SUMMARY					
DIRECT CAPITAL COSTS				$605,691	
PROFESSIONAL SERVICES COSTS				$214,878	
PRESENT WORTH OF ANNUAL O&M COSTS				$0	
TOTAL PROJECT COST				**$820,568**	

Notes:
(1) Estimated accuracy of cost estimate is -30% to +50%. Cost estimate is to be used primarily for comparison of costs relative to other response action alternatives.
(2) Confirmatory Sampling will be conducted on a 25' by 25' grid on the bottom of the excavation and at 25' spacing along the side walls (assume 100 samples/acre).