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PRELIMINARY DRAFT

PHASE I SWMU CONFIRMATORY SAMPLING REPORT

TEXT - VOLUME I OF II

MCB CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0371

JANUARY 29, 1998

Prepared for:

DEPARTMENT OF THE NAVY
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LIST OF ACRONYMS AND ABBREVIATIONS

AOCs	area of concerns
AST	above ground storage tank
Baker	Baker Environmental, Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy Program
CLP	Contract Laboratory Program
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
CTO	Contract Task Order
DEM	Division of Environmental Management
DoN	Department of the Navy
ER-L	Effects-Range Low
ER-M	Effefcts-Range Medium
ft/d	feet per day
ft_3/d	square feet per day
FMF	Fleet Marine Force
FMFLANT	Fleet Marine Force Atlantic
FSAP	Field Sampling and Analysis Plan
FWS	Fish and Wildlife Services
gpd	gallons per day
gpm	gallons per minute
GSRA	Greater Sandy Run Area
HSWA	Hazardous and Solid Waste Amendments of 1984
HQW	high quality waters
IAS	Initial Assessment Study
IR	Installation Restoration
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MAGTF	Marine Air Ground Task Force
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MEK	methyl ethyl ketone
MS/MSD	Matrix Spike/Matrix Spike Duplicates
MSL	mean sea level

LIST OF ACRONYMS
(Continued)

NCDENR	
NC DEHNR	North Carolina Department of Environment, ~~Health~~ and Natural Resources
NCWQS	North Carolina Water Quality Standard
NFA	no further action
NSW	nutrient sensitive waters
NWI	National Wetland inventory
OD	outside diameter
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PID	photoionization detection
POL	petroleum, oil, and lubricant
RBCs	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
	State of NC surface water classification
SA	estuarine water suited for commercial shell fishing and all other tidal saltwater uses
SC	salt waters protected for secondary recreation, fishing, aquatic life including propagation and survival
SI	Site Investigation
SOPs	Standard Operating Procedures
SVOA	semivolatile organic analysis
SVOCs	semivolatile organic compounds
SWMU	solid waste management unit
TSD	treatment, storage, and disposal
µg/kg	micrograms per kilogram
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound

EXECUTIVE SUMMARY

This document presents the Phase I Solid Waste Management Unit (SWMU) Confirmatory Sampling Report prepared for 62 SWMUs at Marine Corps Base (MCB), Camp Lejeune, North Carolina. This document has been prepared by Baker Environmental, Inc. (Baker) under Contract Task Order (CTO) 0371 of the Department of the Navy's (DoN's) Comprehensive Long-Term Environmental Action Navy (CLEAN) Program. The purpose of the Phase I Confirmatory Sampling Investigation was to collect a specific set of samples from each of the 62 SWMUs to determine whether of not additional investigation and/or cleanup action is warranted at each SWMU. The scope of work performed for the Confirmatory Sampling Investigation was analogous to a Site Investigation (SI) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Phase I of the Confirmatory Sampling Investigation consisted of collecting soil, surface water, and/or sediment samples at 62 SWMUs. A Phase II Confirmatory Sampling Investigation will be conducted for the SWMUs recommended for further action in this Phase I Report. The Phase II investigation will focus on a groundwater investigation. Additional soil, surface water, or sediment sampling may also be included in the Phase II investigation. The results of the Phase II investigation will be presented under separate cover.

Regulatory History

MCB, Camp Lejeune was issued a Resource Conservation and Recovery Act (RCRA) Part B Permit to operate a hazardous waste container storage facility in September 1984 for the long-term hazardous material/hazardous waste container storage facility (Buildings TP-451 and TP-463). This permit was issued before the enactment of the Hazardous and Solid Waste Amendments of 1984 (HSWA), which under Section 3004(u) empowers the United States Environmental Protection Agency (USEPA) to order corrective action at treatment, storage, and disposal (TSD) facilities. This section of the HSWA requires corrective action to be taken for all releases of hazardous waste or hazardous constituents from any SWMU. Need to include reference to new permit ~~waste~~ effective 10Jan97. included requirements for corrective action.

The USEPA Region IV and the North Carolina Department of Natural Resources (NC DENR) conducted an initial RCRA Facility Assessment (RFA) for MCB, Camp Lejeune in January 1989. Their report covered 76 sites, of which seven were determined to require RFA sampling visits, 23 to require a RCRA Facility Investigation (RFI) and 46 to require no further action (NFA). MCB, Camp Lejeune took the initial RFA and expanded it to include units such as landfills, surface impoundments, waste piles, tanks, container storage, septic tanks, drain fields, waste water treatment units, and storm water conveyances. The Base's efforts included the preliminary review of site records and a visual site inspection on potential SWMUs. More than 3,500 sites/units were identified during a preliminary review of MCB records. Visual site inspections were conducted on nearly 500 of these sites/units. The findings from this investigation are presented in the document entitled, "RCRA Facility Assessment Report for Marine Corps Base, Camp Lejeune, North Carolina" referred to as the 1996 RFA Report. The 1996 RFA Report categorized each of the potential SWMUs and areas of concern (AOCs) into four groups:

- Units having a release potential;
- Units addressed under the Installation Restoration (IR) Program in accordance with CERCLA;

- Units addressed under the IR Underground Storage Tank (UST) Program in accordance with NC DENR requirements; and

- Units having a release potential under RCRA corrective action; therefore requiring confirmatory sampling.

The 1996 RFA Report identified 41 IR sites, 112 UST sites, and 56 SWMU sites that required confirmatory sampling or corrective measures. Based on the findings in the 1996 RFA Report, the Base contracted Baker Environmental, Inc. (Baker) to conduct confirmatory sampling at 62 SWMUs (this total includes seven previous IR sites removed from the list that require further action under the Base's IR Program).

56+7=63 => where did 62 come from
if removed from IR list why do they need action under IR & why are they now SWMUs?

Location and Setting

MCB, Camp Lejeune is located within the Coastal Plain Physiographic Province. It is located in Onslow County, North Carolina, approximately 45 miles south of New Bern and 47 miles north of Wilmington. The facility covers approximately 236 square miles. This includes the recent acquisition of approximately 64 square miles west of the facility within the Greater Sandy Run Area (GSRA) of the county. The military reservation is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean.

The eastern border of MCB, Camp Lejeune is the Atlantic shoreline. The western and northwestern boundaries are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville, North Carolina, borders MCB, Camp Lejeune to the north.

The GSRA is located in the southeast portion of Onslow County, North Carolina, near the Pender-Onslow County border. The GSRA is approximately 31 miles northeast of Wilmington, North Carolina; 15 miles south of Jacksonville, North Carolina; and 5 miles northwest of the Atlantic Ocean. The GSRA is located south and west of MCB, Camp Lejeune, sharing a common boundary along Route 17 between Dixon and Verona. None of the 62 SWMUs covered by this report are located in the GSRA.

Confirmatory Sampling Investigation Overview

move

The field program for the phase 1 Confirmatory Sampling Investigation was conducted in September 1997. The purpose of the investigation was to determine if operations conducted at the SWMUs had potentially impacted the environment. The Confirmatory Sampling Investigation is being completed in two phases. The first phase is complete and consisted of a soil investigation at the SWMUs, and a surface water and/or sediment investigation at two SWMUs where surface water or sediment could have been impacted. The findings from this phase will determine the data and sampling objectives for the second phase.

phase 1 which is the focus of this report,

The analytical program for the Confirmatory Sampling Investigation focused on the suspected contaminants of concern identified for each of the SWMUs during the RFA, past and present activities conducted at the SWMUs, and discussions with NC DENR, MCB, Camp Lejeune and the DoN. Table ES-1 summarizes the analytical program (including the number of samples and analyses) for each of the 62 SWMUs included within the investigation. As shown on the table, the number of samples collected from each SWMU ranged from 2 to 15(with the exception of SWMU 336 where

no samples were able to be collected). The majority of samples collected from the SWMUs were analyzed for volatile organic analysis (VOAs), semivolatile organic analysis (SVOAs) and RCRA metals. A few of the samples were also analyzed for pesticides, herbicides, or polychlorinated biphenyls (PCBs).

Results and Recommendations

The analytical results from each SWMU were compared to a specific set of screening criteria to determine if any additional investigations should be conducted at the SWMU. The screening criteria included:

- USEPA Region III Industrial Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure), Target Concentrations (soil)
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water), Target Concentrations (soil)
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of surface water within 250 feet), Target Concentrations (soil)
- North Carolina Water Quality Standards (surface water)
- Camp Lejeune Reference Station Results for Webb Creek (surface water)
- USEPA Region IV Sediment Effects, Effects-Range Low (ER-L) Screening Values (sediment)
- USEPA Region IV Sediment Effects, Effects-Range Medium (ER-M) Screening Values (sediment)

The sample results from each SWMU was compared to three or more of the previously mentioned criteria. The screening criteria selected for each SWMU depended on the type(s) of media sampled and the proximity of the SWMU to a surface water body. Typically, if contaminant concentrations exceeded the comparison criteria, further investigation activities were recommended for that individual SWMU.

how large? how is this different from expected why (or why not) is this a problem.

Common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene and phthalate esters were observed in a large number of samples collected during the investigation. In most cases, the concentrations observed in the samples were below the comparison criteria for the SWMU. Only at a few SWMUs did one (or more) of these compounds exceed criteria. If the compound was detected at a concentration exceeding comparison criteria, the exceedence was noted and was evaluated as to its relevance given the SWMUs operation and waste stream. For instance, if toluene was detected at levels exceeding comparison criteria at an oil/water separator, it is likely that the contamination is the result of operations at the SWMU because the unit is expected to handle

petroleum-based waste. However, if acetone is detected in the vicinity of a concrete coal storage pad at levels exceeding comparison criteria, it would be reasoned that the presence of acetone was not SWMU-related since the compound is not used in the operations conducted at the unit. In cases where non-SWMU related compounds were the only compounds that exceeded the comparison criteria, additional investigation activities were not proposed.

sounds worse than it is.

Mercury contamination was prevalent at most of the SWMUs at very low levels of contamination (typically less than 1 milligrams per kilogram [mg/kg]). Because the North Carolina Risk Analysis Framework, Category S-3:G-1 Target Concentration for mercury is 0.0154 mg/kg, any detection of mercury in soil resulted in an exceedence of these criteria. Upon evaluation of the analytical data for the SWMUs, it was observed that mercury was detected in most SWMUs at relatively equal concentrations. As depicted in Section 1.0, the SWMUs are located throughout MCB, Camp Lejeune and all SWMUs do not handle the same type of waste. Therefore, it is suspected that the levels of mercury detected in the samples may be indicative of background conditions and not the result of SWMU related contamination. Typically, the concentrations detected in the soil samples were less than 1 mg/kg. Baker did not recommend additional investigation activities at SWMUs where only mercury exceeded the comparison criteria. Any supplemental investigation is recommended to include the analysis of metals to confirm the detections of mercury.

sound like article counts to me

Of the 62 SWMUs, it was recommended that 38 SWMUs require no further action, one SMWU requires institutional controls, and 23 SWMUs require additional investigation. The activities suggested for these SWMUs range from a single boring to confirm analytical results, to multiple borings and/or temporary groundwater monitoring wells to further ~~delineate~~/define contamination. A summary of the results obtained for each SWMU and the recommendations is presented on Table ES-2. The types of facilities (and number of each facility) requiring further investigation are as follows:

not determining extent at this time

- Oil/Water Separators (11 of 28)
- Above Ground Storage Tanks (4 of 14)
- Pest Control Shop (1 of 1)
- Historic Dump Site (1 of 1)
- Solid Waste Dumpster (1 of 5)
- Underground Storage Tank (1 of 3)
- Unidentified Container (1 of 1)
- Areas of Documented Releases (2 of 3)
- Wastewater Treatment Plant (1 of 1)

The 23 SWMUs requiring additional investigation include:

- SWMU 43
- SWMU 46
- SWMU 89
- SWMU 254
- SMWU 255
- SWMU 256
- SWMU 261
- SWMU 264
- SWMU 272
- SWMU 285
- SWMU 291
- SWMU 293
- SWMU 295
- SMWU 297

- SWMU 299
- SWMU 300
- SWMU 303
- SWMU 306
- SWMU 311
- SWMU 315
- SWMU 317
- SWMU 318
- SWMU 319

TABLES

TABLE ES-1

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
2	SWMU 2 1700 Pond A	11	SVOAs - 8270 RCRA Metals
5	SWMU 5 575 Rack	7	VOAs - 8240 SVOAs - 8270 RCRA Metals
43	SWMU 43 Pest Control Shop (IR Site No. 11)	13	VOAs - 8240 SVOAs - 8270 Pesticides - 8080 Herbicides - 8150 RCRA Metals
46	SWMU 46 Montford Point Dump Site (IR Site No. 15)	9	SVOAs - 8270 RCRA Metals
53	SWMU 53 Coal Storage Area (IR Site No. 26)	15	SVOAs - 8270 RCRA Metals
89	SWMU 89 SLCH785 Basin	6	VOAs - 8240 SVOAs - 8270 RCRA Metals
253	SWMU 253 1205 Above Ground Storage Tank	2	VOAs - 8020 SVOAs - 8270 RCRA Metals
254	SWMU 254 1408 Dumpster	4	VOAs - 8240 SVOAs - 8270 RCRA Metals
255	SWMU 255 1502 Oil/Water Separator No. 1	11	VOAs - 8240 SVOAs - 8270 RCRA Metals
256	SWMU 256 1700 Oil/Water Separator No. 1	8	VOAs - 8240 SVOAs - 8270
257	SWMU 257 1700 Oil/Water Separator No. 2	9	VOAs - 8240 SVOAs - 8270
258	SWMU 258 S1745 Oil/Water Separator	12	VOAs - 8240 SVOAs - 8270 RCRA Metals
260	SWMU 260 1780 Oil/Water Separator No. 1	6	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
261	SWMU 261 1780 Underground Storage Tank No. 1	7	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals

TABLE ES-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
262	SWMU 262 1780 Underground Storage Tank No. 2	5	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
264	SWMU 264 2611 Container	3	VOAs - 8240 SVOAs - 8270 Pesticides - 8080 RCRA Metals
265	SWMU 265 2615 Oil/Water Separator	8	VOAs - 8240 SVOAs - 8270
268	SWMU 268 522 Dumpster	2	VOAs - 8240 SVOAs - 8270 RCRA Metals
269	SWMU 269 816 Oil/Water Separator	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
272	SWMU 272 AS137 Oil/Water Separator	8	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
273	SWMU 273 BA128/BA105 Dumpster	5	VOAs - 8240 SVOAs - 8270 RCRA Metals
275	SWMU 275 BB48 Dumpster	3	VOAs - 8240 SVOAs - 8270 PCBs - 8080 RCRA Metals
276	SWMU 276 BB49 Dumpster	3	VOAs - 8240 SVOAs 8270 PCB - 8080 RCRA Metals
277	SWMU 277 FC120 Oil/Water Separator	6	VOAs - 8240 SVOAs - 8270 RCRA Metals
279	SWMU 279 FC200 Oil/Water Separator	6	VOAs - 8240 SVOAs - 8270 RCRA Metals
280	SWMU 280 FC285 Above Ground Storage Tank	2	VOAs - 8240 SVOAs - 8270 RCRA Metals

TABLE ES-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
283	SWMU 283 FC279 Release	5	VOAs - 8020/8240 SVOAs - 8270 Pesticides/PCBs - 8080 RCRA Metals
284	SWMU 284 S947 Container	3	VOAs - 8240 SVOAs - 8270 RCRA Metals
285	SWMU 285 S947 Oil/Water Separator	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
286	SWMU 286 S947 Pile	0	Included with SWMU 284
291	SWMU 291 034 Ditch	8	VOAs - 8240/8020 SVOAs - 8270 Pesticides/PCBs - 8080 RCRA Metals
292	SWMU 292 1106/1107 Above Ground Storage Tank	0	Included with SWMU 293
293	SWMU 293 1106/1107 Oil/Water Separator	7	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
294	SWMU 294 1203 Oil/Water Separator	15	VOAs - 8020 SVOAs - 8270 RCRA Metals
295	SWMU 295 1601 Above Ground Storage Tank	7	VOAs - 8020 SVOAs - 8270 RCRA Metals
296	SWMU 296 1700 Basin B	0	Included with SWMU 53
297	SWMU 297 1780 Oil/Water Separator No. 2	0	Included with SWMU 261
298	SWMU 298 1780 Oil/Water Separator No. 3	4	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
299	SWMU 299 AS114 Above Ground Storage Tank	5	VOAs - 8020 SVOAs - 8270 RCRA Metals
300	SWMU 300 AS118 Above Ground Storage Tank	6	VOAs - 8020 SVOAs - 8270 RCRA Metals

TABLE ES-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
301	SWMU 301 AS4115 Above Ground Storage Tank	6	VOAs - 8020 SVOAs - 8270 RCRA Metals
302	SWMU 302 AS563 Above Ground Storage Tank	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
303	SWMU 303 AS515 Above Ground Storage Tank	10	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
304	SWMU 304 BA103 Oil/Water Separator	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
305	SWMU 305 BB224 Pile	7	VOAs - 8020 SVOAs - 8270 Pesticides/PCBs - 8080 RCRA Metals
306	SWMU 306 FC230 Oil/Water Separator	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
307	SWMU 307 G649 Wash Rack	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
308	SWMU 308 GP109 Oil/Water Separator	10	VOAs - 8020 SVOAs - 8270 RCRA Metals
309	SWMU 309 NH118 Underground Storage Tank	8	VOAs - 8020 SVOAs - 8270 RCRA Metals
310	SWMU 310 PT33 Pond Oil/Water Separator	14	VOAs - 8240 SVOAs - 8270 Pesticide/PCB - 8080 RCRA Metals
311	SWMU 311 S1619 Oil/Water Separator	7	VOAs - 8020 SVOAs - 8270 RCRA Metals
312	SWMU 312 Oil Water Separator S-1735 (S-1698)	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
313	SWMU 313 S1753 Oil/Water Separator	8	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals

TABLE ES-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
314	SWMU 314 SM187 Oil/Water Separator	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
315	SWMU 315 SM269 Oil/Water Separator Near Building M200	8	VOAs - 8020 SVOAs - 8270 RCRA Metals
316	SWMU 316 TC773 Oil/Water Separator	8	VOAs - 8020 SVOAs - 8270 RCRA Metals
317	SWMU 317 TT2453 Release	2	VOAs - 8020/8240 SVOA - 8270 RCRA Metals
318	SWMU 318 AS515 Oil/Water Separator	5	VOAs - 8020 SVOAs - 8270 RCRA Metals
319	SWMU 319 Camp Geiger Wastewater Treatment Plant	12	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
336	SWMU 336 AS4106 Paint Stripper	(Not able to be sampled)	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
337	SWMU 337 AS518 Paint Stripper	2	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
339	SWMU 339 AS4146 Sand Blasting Area	3	VOAs - 8240 SVOAs - 8270 RCRA Metals

Notes:

[a] SWMU = solid waste management unit
[b] VOA = volatile organic analysis
SVOA = semivolatile organic analysis
PCBs = polychlorinated biphenyls
RCRA = Resource Conservation and Recovery Act

TABLE ES-2

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 2 1700 Pond A	Concrete neutralization/settling pond associated with the Steam Plant. Receives runoff from coal pile	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 5 575 Rack	Wash water collection structure and oil/water separator associated with vehicle wash racks	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 43 Pest Control Shop (IR Site No. 11)	Oil/water separator associated with wash area for pesticide-carrying vehicles	One SVOC--benzo(a)pyrene, two pesticides--4,4'-DDT and chlordane, and these metals--arsenic, chromium, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance additional soil borings and install temporary monitoring wells. Analyze soil and groundwater samples for SVOAs, pesticides and metals.
SWMU 46 Montford Point Dump Site (IR Site No. 15)	Potential sewage treatment plant sludge disposal area	Four metals--arsenic, cadmium, lead, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. In the vicinity of boring SWMU46-IS02, advance one soil boring and install a temporary monitoring well. Analyze soil and groundwater samples for metals.
SWMU 53 Coal Storage Area (IR Site No. 26)	Concrete coal storage area associated with the Steam Plant	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 89 SLCH785 Basin	Oil/water separator associated with a vehicle wash rack	Eleven VOCs, 10 SVOCs, and four metals detected. Four organic compounds detected at concentrations exceeding criteria.	Further investigation recommended. Install a minimum of three temporary monitoring wells with soil and groundwater sampling. Analyze samples for VOAs and SVOAs. Re-sample existing monitoring wells if practicable.
SWMU 253 1205 Above Ground Storage Tank	Former location of a 500-gallon used oil AST	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 254 1408 Dumpster	Solid waste dumpster that at one point reportedly contained paint cans and a 1-gallon container of Citrakleen	The SVOCs benzo(a)anthracene, benzo(a)pyrene, benzo(a)fluoranthene, and dibenzo(ah)anthracene, and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of four soil borings and install a minimum of two temporary monitoring wells. Analyze soil and groundwater samples for SVOAs and RCRA metals.
SWMU 255 1502 Oil/Water Separator No. 1	Oil/water separator and grit chamber associated with vehicle maintenance facility	The SVOC pentachlorophenol and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Collect soil samples from just above the water table and install monitoring wells. Analyze soil samples for SVOAs.

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 256 1700 Oil/Water Separator No. 1	Oil/water separator associated with an AST at the Steam Plant	Sixteen SVOCs detected. Benzo(a)anthracene detected at concentration exceeding criteria.	Further investigation recommended. Advance one soil boring in the vicinity of boring SWMU256-IS02 and collect a surface and subsurface soil sample. Analyze samples for SVOAs.
SWMU 257 1700 Oil/Water Separator No. 2	Oil/water separator associated with an AST at the Steam Plant	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 258 S1745 Oil/Water Separator	Oil/water separator and grit chamber associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 260 1780 Oil/Water Separator No. 1	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 261 1780 Underground Storage Tank No. 1	550-gallon UST. Stores oil, grease and water associated with an oil/water separator (SWMU 297)	For SWMUs 261 and 297, 13 VOCs, four SVOCs, and six metals detected. One VOC-- chloroethane, and four metals--cadmium, chromium, lead, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Collect additional soil samples. Analyze samples for VOAs and metals.

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 262 1780 Underground Storage Tank No. 2	550-gallon UST. Stores oil, grease and water associated with an oil/water separator (SWMU 298)	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 264 2611 Container	Once tar-stained area that was subsequently covered with wood chips. Wood chips and tar no longer present	One SVOC--pentachloro-phenol, one pesticide--chlordane, and one metal--arsenic detected at concentrations exceeding criteria.	Further investigation recommended. Advance soil borings and install a minimum of one temporary monitoring well. Analyze soil and groundwater samples for SVOAs, pesticides and metals.
SWMU 265 2615 Oil/Water Separator	Oil/water separator associated with No. 6 fuel oil loading area	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 268 522 Dumpster	Solid waste dumpster	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 269 816 Oil/Water Separator	Former location of a oil/water separator and vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 272 AS137 Oil/Water Separator	Recently replaced oil/water separator	Two VOCs -- methylene chloride and 1,4 dichlorobenzene, three SVOCs--2-chlorophenol, naphthalene, and pentachlorophenol, and two metals--arsenic and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of three soil borings and install a minimum of two temporary monitoring wells. Re-sample the existing monitoring well located southwest of the separator. Analyze soil and groundwater samples for VOAs, SVOAs and metals.
SWMU 273 BA128/BA105 Dumpster	Former solid waste dumpster location. Reportedly had a one-time release of petroleum or oil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 275 BB48 Dumpster	Solid waste dumpster which at one time reportedly showed evidenced of a spill	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 276 BB49 Dumpster	Solid waste dumpster which at one time reportedly showed evidenced of a POL spill	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 277 FC120 Oil/Water Separator	Oil/water separator associated with a wash rack and adjacent to IR Site No. 1	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 279 FC200 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 280 FC285 Above Ground Storage Tank	Former location of a used oil AST	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 283 FC279 Release	Small area adjacent to a materials storage area with distressed vegetation	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 284 S947 Container	Former location of roll-off box which contained POL-contaminated soil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 285 S947 Oil/Water Separator	Oil/water separator associated with a storm water containment system	One VOC -- methylene chloride, two SVOCs--benzo(a)pyrene and benzo(a)anthracene, and one metal--arsenic detected at concentrations exceeding criteria.	Further investigation recommended. Advance several soil borings and install temporary monitoring wells. Re-sample the existing monitoring well located southwest of the separator. Analyze soil samples for SVOAs and metals, and groundwater samples for SVOAs.
SWMU 286 S947 Pile	Recently regraded and paved area in which POL-contaminated soils were once stored	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 291 034 Ditch	Storm water drainage ditch and scour area that historically received runoff from an oil/water separator and wash rack	For soil, arsenic and chromium detected above screening criteria. For surface water, tetrachloroethene detected above screening criteria. For sediment, acenaphthene, 4-4'-DDE, cadmium and chromium detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring in the vicinity of boring 291SWMU-IS01 to confirm the presence/concentration of arsenic and chromium. Collect one surface and subsurface sample from this boring. Analyze soil samples for metals. Collect additional surface water and sediment samples from the ditch to confirm/define VOC, SVOC, pesticide and metals contamination. Analyze surface water and sediment samples for VOAs, SVOAs, pesticides and metals.
SWMU 292 1106/1107 Above Ground Storage Tank	500-gallon AST that stores waste oil and antifreeze	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 293 1106/1107 Oil/Water Separator	Oil/water separator contains oil filters, waste oil, antifreeze, and possibly solvents	Lead and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring to confirm the presence/concentration of lead. Analyze soil samples for metals.
SWMU 294 1203 Oil/Water Separator	Oil/water separator and grit chamber associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 295 1601 Above Ground Storage Tank	AST in an area of known TCE groundwater contamination	The SVOC naphthalene detected at concentration exceeding criteria.	Further investigation recommended. Advance a minimum of three soil borings and install a minimum of two temporary monitoring wells. Collect groundwater samples from temporary wells and existing well 78GW09-1. Analyze samples for SVOAs.
SWMU 296 1700 Basin B	Collection basin that receives runoff from coal pile	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 297 1780 Oil/Water Separator No. 2	Oil/water separator associated with SWMU 261. Contains oil, grease and water	For SWMUs 261 and 297, 13 VOCs, four SVOCs, and six metals detected. One VOC-- chloroethane, and four metals--cadmium, chromium, lead, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Collect additional soil samples. Analyze samples for VOAs and metals.
SWMU 298 1780 Oil/Water Separator No. 3	Oil/water separator associated with SWMU 262. Contains oil, grease and water	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 299 AS114 Above Ground Storage Tank	Used oil AST. Significant staining noted on tank exterior	Five VOCs, 22 SVOCs, and six metals detected. Six organic compounds and five metals detected at concentrations exceeding criteria.	Further investigation recommended. Install a minimum of three temporary monitoring wells with soil and groundwater sampling. Analyze samples for VOAs and SVOAs, and metals. Implement engineering/institutional controls to mitigate/eliminate overfills.
SWMU 300 AS118 Above Ground Storage Tank	Used motor oil AST	The SVOC benzo(a)pyrene, and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of two soil borings and install a minimum of two temporary monitoring wells. Analyze soil and groundwater samples for SVOAs and metals.
SWMU 301 AS4115 Above Ground Storage Tank	Two ASTs that contain POLs	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 302 AS563 Above Ground Storage Tank	AST that contains used engine, hydraulic and transmission oil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 303 AS515 Above Ground Storage Tank	Two ASTs that are labeled as "Hydraulic Fluid, Engine and Transmission Oils Only, No Solvents or Other Chemicals"	The SVOC benzo(a)anthracene, and the metals arsenic and chromium detected at concentrations exceeding criteria.	Further investigation recommended. Advance soil borings to confirm the presence/concentrations of the detected constituents. Analyze soil samples for SVOAs, and metals.

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 304 BA103 Oil/Water Separator	Oil/water separator connected to a drain field	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 305 BB224 Pile	Former location of soil pile which reportedly contained grease and contaminated soil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 306 FC230 Oil/Water Separator	Oil/water separator associated with vehicle wash area	Silver and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring to confirm the presence/concentration of silver. Analyze the soil samples for metals.
SWMU 307 G649 Wash Rack	Oil/water separator and vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 308 GP109 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 309 NH118 Underground Storage Tank	Waste oil UST and AST	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 310 PT33 Pond Oil/Water Separator	Several earthen impoundments used for dewatering of cooking grease	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 311 S1619 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	Six VOCs, 11 SVOCs, and five metals detected. The VOC chlorobenzene and four metals detected at concentrations exceeding criteria. Site soils may be influenced by runoff from Michael Road.	Further investigation recommended. Install three temporary monitoring wells with soil and groundwater sampling. Collect surface soil/sediment samples in swale. Analyze samples for VOAs, SVOAs, and metals.
SWMU 312 Oil Water Separator S-1735 (S-1698)	Oil/water separator that receives steam condensate from the Steam Plant (Building 1700)	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 313 S1753 Oil/Water Separator	Oil/water separator associated with a vehicle and equipment wash area	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 314 SM187 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 315 SM269 Oil/Water Separator Near Building M200	Oil/water separator associated with a vehicle wash rack. Unit may have been used for disposal of waste oil	Two VOCs, 11 SVOCs, and seven metals detected. The SVOC pentachlorophenol and two metals detected at concentrations exceeding criteria.	Further investigation recommended. Install three temporary monitoring wells with soil and groundwater sampling. Analyze samples for SVOAs and metals.

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 316 TC773 Oil/Water Separator	Oil/water separator and vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 317 TT2453 Release	Area near a used antifreeze AST where a release had reportedly occurred	Lead and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of four soil borings and a minimum of two temporary monitoring wells with soil and groundwater sampling. Analyze samples for metals.
SWMU 318 AS515 Oil/Water Separator	Oil/water separator and grit chamber associated with a helicopter wash pad	Seven organic compounds and five metals detected at concentrations exceeding criteria.	Further investigation recommended. Install temporary monitoring wells with soil and groundwater sampling. Also, collect additional soil samples from the ditch receiving runoff from the SWMU. Analyze samples for VOAs, SVOAs, and metals.
SWMU 319 Camp Geiger Wastewater Treatment Plant	An AST at the Camp Geiger Wastewater Treatment Plant	Two VOCs, 12 SVOCs, and four metals detected. The SVOC benzo(a)anthracene and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring in the vicinity of boring SWMU319-IS01 and collect one surface and subsurface soil sample. Analyze samples for SVOAs.
SWMU 336 AS4106 Paint Stripper	Two paint stripping vats.	The floor drains located on either side of the vats contained no sediments. No samples were collected from this SWMU.	No further action

TABLE ES-2 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 337 AS518 Paint Stripper	Two paint stripping vats in an organic stripping room	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 339 AS4146 Sand Blasting Area	Covered sand blasting area	For soil, no SWMU-related constituents detected above any screening criteria. For sediment, seven VOCs, six SVOCs, and six metals detected. Four SVOCs and four metals detected at concentrations exceeding criteria.	No further investigative action. Implement controls to reduce the potential for migration of contaminated sand and grit into the storm water system.

Notes:

AST = aboveground storage tank
IR = Installation Restoration
POL = Petroleum, Oil and Lubricants
SVOA = semivolatile organic analysis
SVOC = semivolatile organic compounds
SWMU = Solid Waste Management Unit
UST = underground storage tank
VOA = volatile organic analysis
VOC = volatile organic compound

1.0 INTRODUCTION

This document presents the Phase I Solid Waste Management Unit (SWMU) Confirmatory Sampling Report prepared for 62 SWMUs at Marine Corps Base (MCB) Camp Lejeune, North Carolina. This document has been prepared by Baker Environmental, Inc. (Baker) under Contract Task Order (CTO) 0371 of the Department of the Navy's (DoN's) Comprehensive Long-Term Environmental Action Navy (CLEAN) Program. The purpose of the Phase I Confirmatory Sampling Investigation was to collect a specific set of samples from each of the 62 SWMUs to determine whether of not additional investigation and/or cleanup action is warranted at each SWMU. The scope of work performed for the Confirmatory Sampling Investigation was analogous to a Site Investigation (SI) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Phase I of the Confirmatory Sampling Investigation consisted of collecting soil, surface water, and/or sediment samples at 62 SWMUs. A Phase II Confirmatory Sampling Investigation will be conducted for the SWMUs recommended for further action in this Phase I Report. The Phase II investigation will focus on a groundwater investigation. Additional soil, surface water, or sediment sampling may also be included in the Phase II investigation. The results of the Phase II investigation will be presented under separate cover.

Section 1.1 provides a brief summary of the regulatory history of MCB, Camp Lejeune as it pertains to the Resource Conservation and Recovery Act (RCRA). Section 1.2 describes the organization of this report and discussions included in each of the sections.

1.1 Regulatory History

MCB, Camp Lejeune was issued a RCRA Part B Permit to operate a hazardous waste container storage facility in September 1984 for the long-term hazardous material/hazardous waste container storage facility (Buildings TP-451 and TP-463). This permit was issued before the enactment of the Hazardous and Solid Waste Amendments of 1984 (HSWA), which under Section 3004(u) empowers the United States Environmental Protection Agency (USEPA) to order corrective action at treatment, storage, and disposal (TSD) facilities. This section of the HSWA requires corrective action to be taken for all releases of hazardous waste or hazardous constituents from any SWMU (EnSafe, 1996).

The USEPA Region IV and the North Carolina Department of Environment and Natural Resources (NC DENR) conducted an initial RCRA Facility Assessment (RFA) for MCB, Camp Lejeune in January 1989. Their report covered 76 sites, of which seven were determined to require RFA sampling visits, 23 to require an RCRA Facility Investigation (RFI) and 46 to require no further action (NFA). MCB, Camp Lejeune has taken the initial RFA and has expanded it to include units such as landfills, surface impoundments, waste piles, tanks, container storage, septic tanks, drain fields, waste water treatment units, and storm water conveyances. The Base's efforts included a preliminary review of data and a visual site inspection on potential SWMUs. More than 3,500 sites/units were identified during a preliminary review of MCB records. Visual site inspections were conducted on nearly 500 of these sites/units. The findings from this investigation are presented in the document entitled, "RCRA Facility Assessment Report for Marine Corps Base, Camp Lejeune, North Carolina" (EnSafe, 1996) referred to as the 1996 RFA Report. The 1996 RFA Report categorized each of the potential SWMUs and areas of concern (AOCs) into four groups:

- Units having a release potential;
- Units addressed under the Installation Restoration (IR) Program in accordance with CERCLA;
- Units addressed under the IR Underground Storage Tank (UST) Program in accordance with NC DENR requirements; and
- Units having a release potential under RCRA corrective action; therefore requiring confirmatory sampling.

The 1996 RFA Report identified 41 IR sites, 112 UST sites, and 56 SWMU sites that required confirmatory sampling or corrective measures. Based on the findings in the 1996 RFA Report, the Base contracted Baker Environmental, Inc. (Baker) to conduct confirmatory sampling at 62 SWMUs (this total includes seven previous IR sites removed from the list that require further action under the Base's IR Program). Figure 1-1 provides a location plan that depicts MCB, Camp Lejeune and an index for locations of Figures 1-2 through 1-6. Figures 1-2 through 1-6 depict the locations of the 62 SWMUs investigated as part of this project.

A SWMU is defined by the NC DENR as: "Any discernible unit which has been used for the treatment, storage, or disposal of solid waste at any time, irrespective of whether the unit is or ever was intended for management of solid waste. RCRA regulated hazardous waste management units are also solid waste management units." A SWMU may include any landfill, surface impoundment, waste pile, land treatment unit, incinerator, injection well, tank, container storage area, septic tank, drain field, waste water treatment unit, elementary neutralization unit, transfer station, or recycling unit (EnSafe, 1996).

A RCRA corrective action can have five stages:

- RCRA Facility Assessment;
- Interim Measure;
- RCRA Facility Investigation;
- Corrective Measures Study; and
- Corrective Measures Implementation.

A RFA is conducted in response to a real or suspected release. The RFA may consist of three parts: preliminary review, a visual site inspection, and a sampling visit. Results of the RFA determine if a release has or is occurring. An interim measure can be conducted as a response to a release of hazardous constituents which is imminently endangering human health or the environment. The RFI involves the process of characterizing the nature and extent of a release (confirmed by the RFA). The Corrective Measure Study (CMS) is the process of evaluating and selecting technologies to address released hazardous constituents. A Corrective Measures Implementation (CMI) is the implementation of the selected remedy.

should address where this study fits
ie completes the RFA stage
through sampling to determine if
a release has or is occurring

1.2 Report Organization

In addition to Section 1.0, the following sections are presented in this Confirmatory Sampling Report:

- Section 2.0 - MCB, Camp Lejeune Background
- Section 3.0 - Confirmatory Sampling Investigation Overview
- Section 4.0 - SWMU-Specific Information and Investigation Results
- Section 5.0 - Conclusions and Recommendations

Section 2.0 summarizes relevant background information pertaining to MCB, Camp Lejeune. This includes information such as location, setting, mission, topography, hydrology, geology, hydrogeology, demographics, climatology, water supply, ecology, wetlands, threatened and endangered species. Section 3.0 describes the analytical program and field sampling activities conducted during the Confirmatory Sampling Investigation. Section 4.0 provides information specific to the SWMUs such as background information, number of samples and depths, the analytical program selected for the SWMU, results of the sample analysis, evaluation of the analytical results and recommendations for the SWMU. Information about the geology for each SWMU has been included as part of Section 2.0. The information will not be part of Section 4.0 to reduce redundancy. Section 5.0 will provide project-wide recommendations stipulating which SWMUs require no further action, additional groundwater and/or soil sampling and which SWMUs require an RFI.

References for each of the sections will be included as the last subsection. With the exception of Section 4.0, all tables and figures will be provided following the text for each section. In Section 4.0, the tables and figures for each SWMU will follow the text in the subsection which discusses the SWMU.

1.3 References

Environmental and Safety Designs, Inc. (EnSafe). 1996. RCRA Facility Assessment Report for Marine Corps Base Camp Lejeune, North Carolina. Final. Prepared for the Naval Facilities Engineering Command, Atlantic Division, Norfolk, Virginia. July 25, 1996.

FIGURES

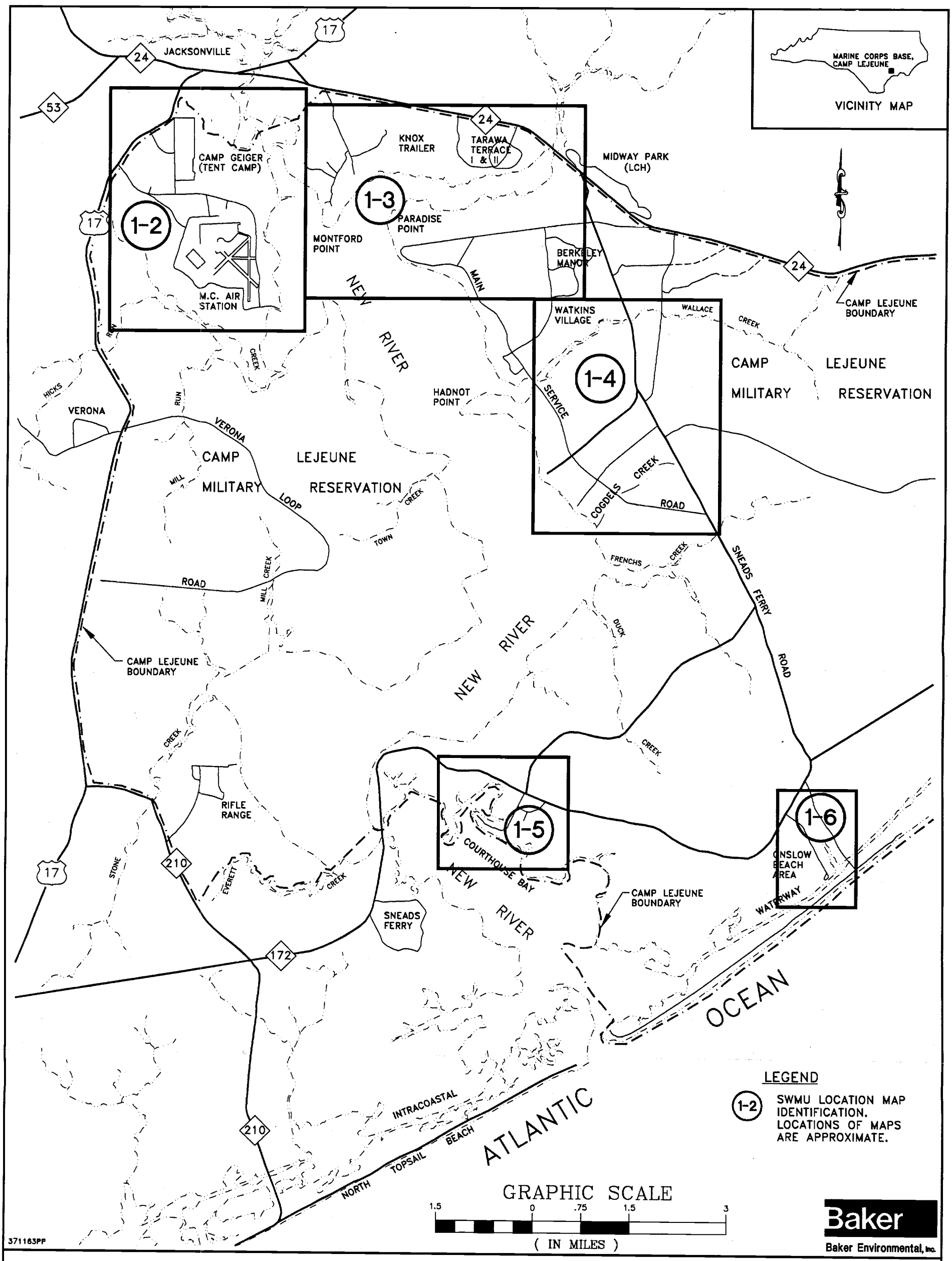


FIGURE 1-1
MCB CAMP LEJEUNE LOCATION/INDEX MAP
CONFIRMATORY SAMPLING REPORT
CTO - 0371

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

00175FF01Z

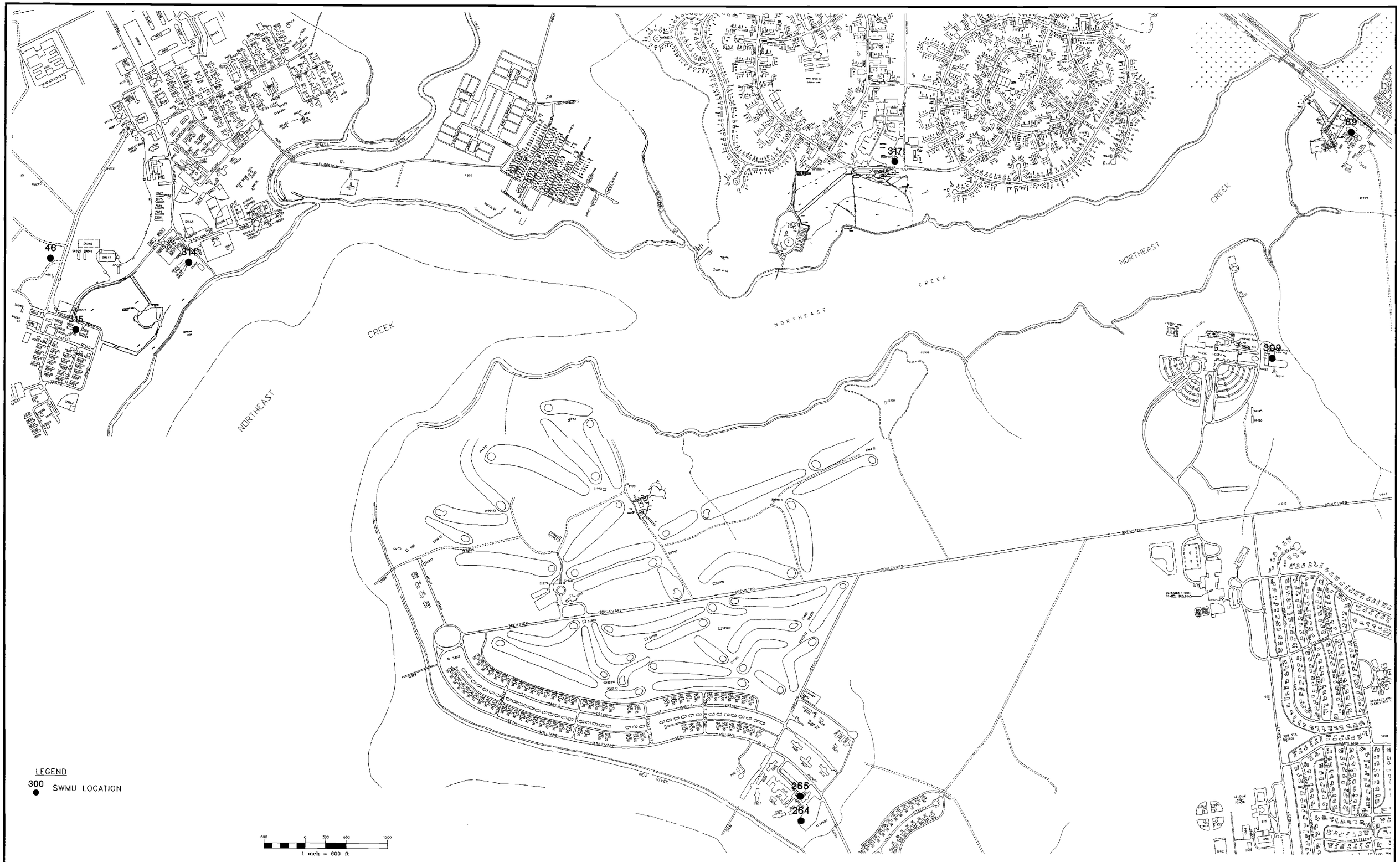
LEGEND

300 ● SWMU LOCATION

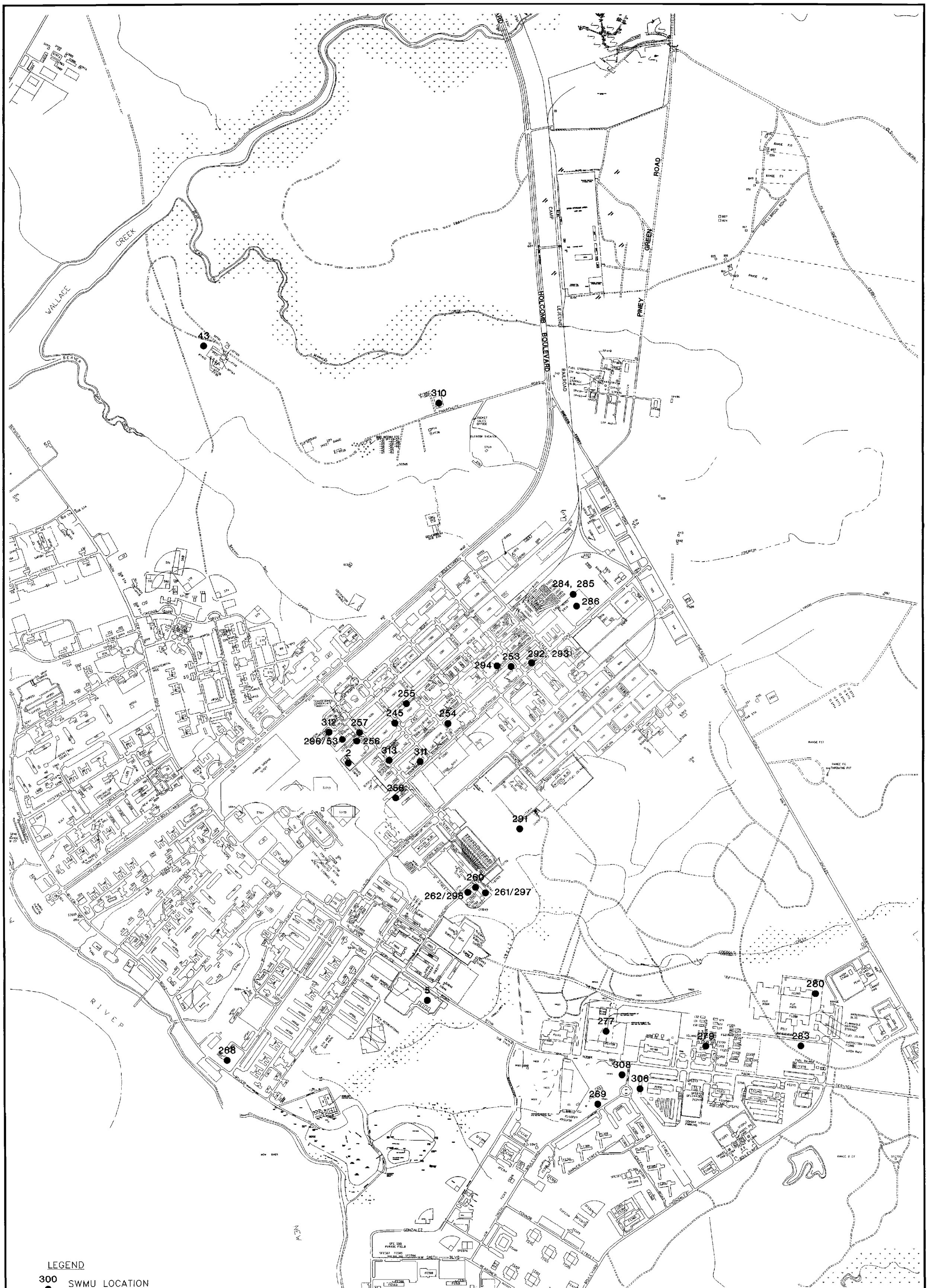
1 inch = 1 ft

LEGEND	DRAWN REL REVIEWED JSC SO# 62470-371 CADD# 371_1-2	NORTH		MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA BAKER ENVIRONMENTAL, Inc Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	CAMP GEIGER/MCAS AREA SWMU LOCATION MAP SCALE 1 = 500 DATE 1/29/98	FIGURE No 1-2

00175 FF BIX



REVISIONS		NORTH		MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA	Baker Baker Environmental, Inc.	TARRAWA TERRACE/MONTFORD POINT AREA SWMU LOCATION MAP	FIGURE No. 1-3
	DRAWN REL REVIEWED JSC S.O.# 62470-371 CADD# 371_1-3			BAKER ENVIRONMENTAL, Inc. Coraopolis, Pennsylvania		SCALE 1"= 600' DATE 1/29/98	

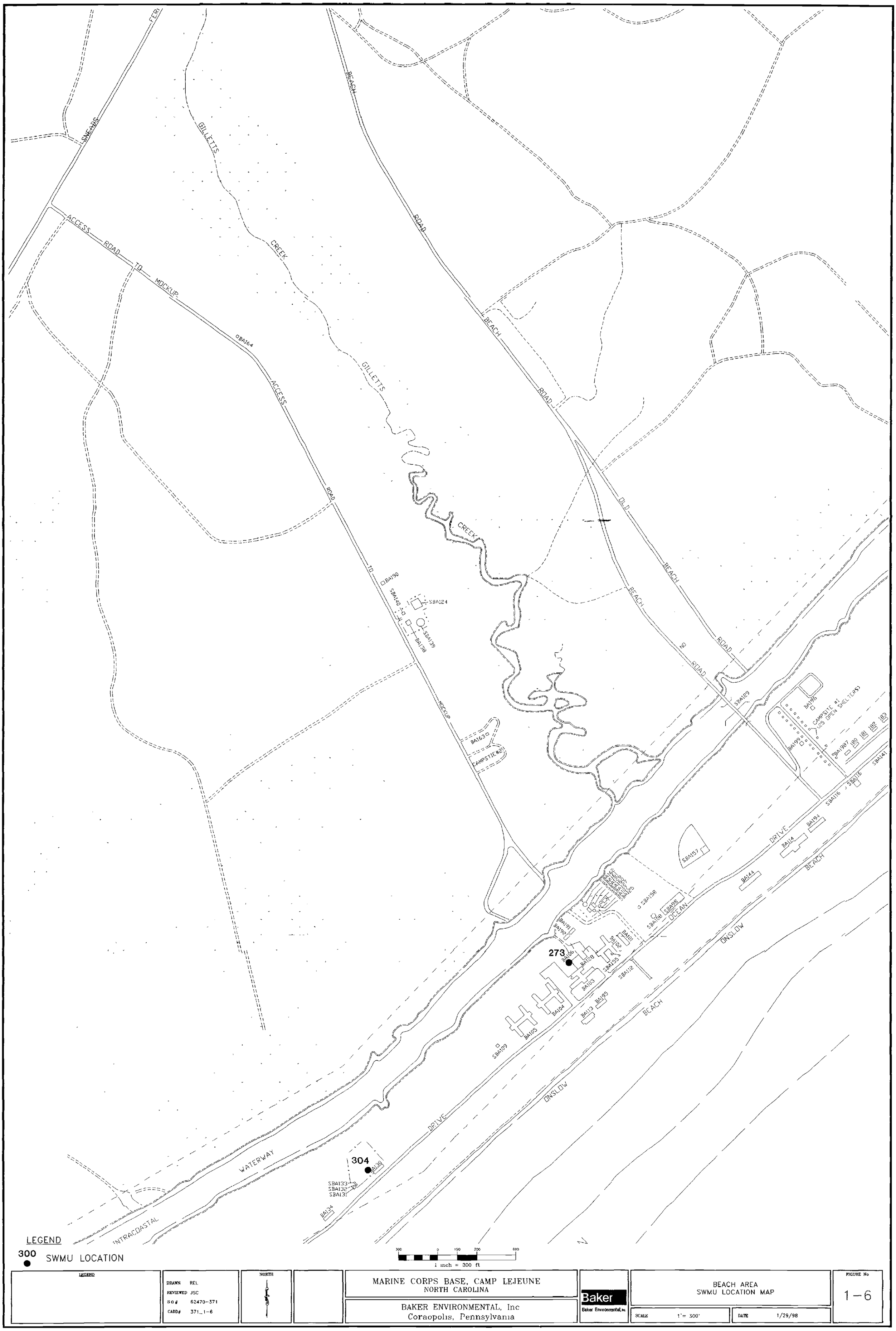


LEGEND

300 ● SWMU LOCATION

LEGEND	DRAWN REL REVIEWED JSC SO # 62470-371 CADD# 371_1-4	NORTH		MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA BAKER ENVIRONMENTAL, Inc Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	HADNOT POINT AREA SWMU LOCATION MAP SCALE 1 = 600 DATE 1/29/98	FIGURE No 1-4

REVISIONS		NORTH		MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA	Baker Baker Environmental, Inc.	COURTHOUSE BAY AREA SWMU LOCATION MAP	FIGURE No 1-5
	DRAWN REL REVIEWED JSC S.O.# 62470-371 CADD# 371_1-5			BAKER ENVIRONMENTAL, Inc. Coraopolis, Pennsylvania		SCALE 1" = 200' DATE 1/29/98	



LEGEND

300 ● SWMU LOCATION

LEGEND	DRAWN REL REVIEWED JSC SO # 62470-371 CADD# 371_1-6	NORTH		MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA BAKER ENVIRONMENTAL, Inc Coraopolis, Pennsylvania	Baker Baker Environmental, Inc	BEACH AREA SWMU LOCATION MAP SCALE 1"= 300' DATE 1/29/98	FIGURE No 1-6

2.0 MCB, CAMP LEJEUNE BACKGROUND

This section presents a discussion of the history and physical characteristics of MCB, Camp Lejeune. The discussion details the setting, history and mission of MCB, Camp Lejeune, the topography and surface features, hydrology, geology, hydrogeology, land usage, climatology, water supply, ecology, wetlands, and threatened and endangered species. This information was obtained from the available literature about MCB, Camp Lejeune and the Confirmatory Sampling field activities.

2.1 MCB, Camp Lejeune Location, Setting and Mission

This section provides an overview of the location, history and mission associated with MCB, Camp Lejeune, North Carolina (which also includes Marine Corps Air Station [MCAS] New River).

2.1.1 Location and Setting

MCB, Camp Lejeune is located within the Coastal Plain Physiographic Province. It is located in Onslow County, North Carolina, approximately 45 miles south of New Bern and 47 miles north of Wilmington. The facility covers approximately 236 square miles. This includes the recent acquisition of approximately 64 square miles west of the facility within the Greater Sandy Run Area (GSRA) of the county. The military reservation is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean.

The eastern border of MCB, Camp Lejeune is the Atlantic shoreline. The western and northwestern boundaries are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville, North Carolina, borders MCB, Camp Lejeune to the north. The location of MCB, Camp Lejeune is depicted in Figure 1-1.

The GSRA is located in the southeast portion of Onslow County, North Carolina, near the Pender-Onslow County border. The GSRA is approximately 31 miles northeast of Wilmington, North Carolina; 15 miles south of Jacksonville, North Carolina; and 5 miles northwest of the Atlantic Ocean. The GSRA is located south and west of MCB, Camp Lejeune, sharing a common boundary along Route 17 between Dixon and Verona.

The following overview of the Base was taken from the document "Master Plan, Camp Lejeune Complex, North Carolina." The Complex consists of 12 identifiable developed areas. Of the developed areas, Hadnot Point comprises the most concentrated area of development. This area includes the organizational offices for the Host Activity and for the Headquarters, 26th Marine Amphibious Unit, as well as the Headquarters and regimental areas for the 2nd Marine Division, Marine Expeditionary Force, 6th Marine Expeditionary Brigade, 22nd Marine Expeditionary Unit, 24th Marine Amphibious Unit, the Central Exchange & Commissary and the Naval Dental Clinic Headquarters. Directly north of Hadnot Point are the family housing areas concentrated throughout the wooded areas of the central Complex and along the shores of the New River. Also located in this north central area are major personnel support land uses, including the newly-constructed Naval Hospital, school sites, recreational areas, as well as additional family housing areas (quarters developments, Midway Park and Tarawa Terrace I and II).

MCAS New River and Camp Geiger are considered as a single urban area possessing two separate missions and supported by two unrelated groups of personnel. MCAS New River encompasses 2,772 acres and is located in the northwestern section of the Base and lies approximately five miles

south of Jacksonville. The MCAS includes air support activities, troop housing and personnel support facilities, all of which immediately surround the aircraft operations and maintenance areas.

Camp Geiger, located directly north of MCAS New River, contains a mixture of troop housing, personnel support and training uses. Currently, the area is utilized by a number of groups which have no direct relationship to one another. The majority of the land surrounding this area is comprised of buffer zones and unbuildable marshland.

MCB, Camp Lejeune contains five other areas of concentrated development, all of which are much smaller in size and population than either Hadnot Point, MCAS New River, or the Camp Geiger area. The oldest of these is the Montford Point area, which is bounded by the New River to the south and west and by Route 24 on the north. New development in Montford Point has been limited, with most of the facilities for troop housing, maintenance, supply and personnel support having been converted from their intended uses. A majority of the MCB training schools requiring classroom instruction are located here and use surrounding undeveloped areas for training operations when required. The French Creek area located directly south of Hadnot Point is occupied by the 2nd Force Service Support Group (2nd FSSG). Its activities are directed toward providing combat service and technical support as required by Headquarters, II Marine Expeditionary Force. Expansion of the French Creek Complex is constrained by the Ordnance Storage Depot explosives safety arc on the south and by the regimental area of Hadnot Point. Onslow Beach, located along the Onslow Bay, east of the New River Inlet, presents assets for amphibious training as well as recreational use. Courthouse Bay is located on one of a series of small bays which are formed by the New River. This area is used for maintenance, storage and training associated with amphibious vehicles and heavy engineering equipment. The Engineering School, also located here, conducts training activities in the large open area located to the southeast of the Courthouse Bay. Another concentrated area of development is the Rifle Range. This area is located on the southwest side of the New River, is singular in purpose and has only a small number of assigned personnel. It was constructed in the early stages of Base development and is used solely for rifle qualification training. The small group of barracks, located at the Rifle Range, are used for two-week periods by troops assigned to range training.

2.1.2 History and Mission of Camp Lejeune

Construction of MCB, Camp Lejeune began in 1941 with the objective of developing the "World's Most Complete Amphibious Training Base." Construction of the Base started at Hadnot Point, where the major functions of the base are centered. Development at MCB, Camp Lejeune is primarily in five geographical locations under the jurisdiction of the Base Command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, and the Rifle Range Area.

The MCB organization functions as the host command to the two Fleet Marine Force Atlantic (FMFLANT) tenant activities -- Headquarters of the II Marine Expeditionary Division and the 2nd FSSG. The MCB host organization mission is to provide housing, training facilities, logistical support and certain administrative support for tenant units and for other units assigned to MCB, Camp Lejeune and to conduct specialized schools and other training maneuvers, as directed.

The mission of the 6th Marine Expeditionary Brigade is to provide the Command element for a brigade-size Marine Air Ground Task Force (MAGTF).

The mission of the 2nd Marine Division is to execute amphibious assault operations, and other operations as may be directed, which are supported by Marine aviation and force service support units.

With the aircraft wing, the Marine division provides combined arms for service with the Fleet in the seizure or defense of advanced naval bases and for the conduct of land operations essential to the prosecution of a naval campaign.

The mission of the 2nd FSSG is to command, administer and train assigned units in order to provide combat service and technical support as required by Headquarters FMFLANT and its subordinate command in accomplishment of the overall FMFLANT mission.

2.1.3 Summary of Hazardous Wastes Generated

MCB, Camp Lejeune generates various hazardous wastes which can generally be classified as waste batteries, waste oil filters, waste solvents, waste paint, discarded commercial chemical products, and others (EnSafe, 1996).

Waste batteries are made up of lithium, magnesium, mercury, nickel-cadmium, and electrolyte. Spent lithium batteries, if not deactivated, can be reactive. Magnesium and mercury batteries may be hazardous due to chromium and mercury contents. Nickel-cadmium batteries may be hazardous due to cadmium levels. Waste electrolyte can be generated when lead-acid batteries are drained, wet cell nickel-cadmium batteries are discarded, or when waste electrolyte is discarded. Electrolyte can be hazardous based on corrosivity properties and/or lead or cadmium contents (EnSafe, 1996).

Waste oil filters are routinely generated from vehicle and aircraft maintenance operations. In the past when terne-plated filters were used, they were classified as hazardous waste due to their lead content (EnSafe, 1996).

Solvents such as methyl ethyl ketone (MEK), toluene, xylene, and methylene chloride are used in vehicle, military hardware, and aircraft maintenance. These types of solvents exhibit a RCRA characteristic or are listed as a RCRA hazardous waste (EnSafe, 1996).

Several types of waste paint are generated at the Base: enamel, chemical-resistive coating, epoxy, and oil-based. These waste paints may exhibit a RCRA characteristic and/or contain a RCRA-listed hazardous waste (EnSafe, 1996).

The Bases' Naval Hospital is a major generator of discarded commercial chemical products. Generally, these products are discarded due to expired shelf life. These discarded products may be classified as hazardous waste (EnSafe, 1996).

2.2 Topography and Surface Features

The generally flat topography of MCB, Camp Lejeune is typical of the North Carolina Coastal Plain. Elevations on the Base vary from sea level to 72 feet above mean sea level (msl); however, the elevation of most of Camp Lejeune is between 20 and 40 feet msl.

Drainage at Camp Lejeune is generally toward the New River, except in areas near the coast which drain through the Intracoastal Waterway. In developed areas, natural drainage has been altered by asphalt cover, storm sewers, and drainage ditches. Approximately 70 percent of Camp Lejeune is in broad, flat interstream areas. Drainage is poor in these areas and the soils are often wet (WAR, 1983). The U.S. Army, Corps of Engineers has mapped the limits of 100-year floodplain at Camp Lejeune

at 7.0 feet above msl in the upper reaches of the New River increasing downstream to 11 feet above msl near the coastal area (WAR, 1983).

2.3 Surface Water Hydrology

The following summary of surface water hydrology was originally presented in the Initial Assessment Study (IAS) report (WAR, 1983). The dominant surface water body at MCB, Camp Lejeune is the New River. It receives drainage from most of the Base. The river is short, with a course of approximately 50 miles on the central Coastal Plain of North Carolina. Over most of its course, the New River is confined to a narrow channel entrenched in Eocene and Oligocene limestones. South of Jacksonville, the river widens as it flows across less resistant sands, clays, and marls. At MCB, Camp Lejeune, the New River flows in a southerly direction into the Atlantic Ocean through the New River Inlet. Several small coastal creeks that are not associated with the New River or its tributaries drain into the area of MCB, Camp Lejeune. The New River, the Intracoastal Waterway and the Atlantic Ocean converge at the New River Inlet.

Classifications for surface waters in North Carolina have been published under Title 15 of the North Carolina Administration Code. At MCB, Camp Lejeune, the New River falls into three classifications. The portion of the river that passes from the Atlantic Coast Line railroad trestle to Mumford Point is classified as SC NSW HQW. This classification is defined as salt waters protected for secondary recreation, fishing, aquatic life including propagation and survival (SC) that are nutrient sensitive (NSW) and of high quality (HQW). The portion of the river that resided between Mumford Point to a line extending across the river from Grey Point to a point of land approximately 2,200 yards downstream of the mouth of Duck Creek is classified as Class SC NSW. As previously described, these waters are similar to the waters upstream of Mumford Point, however they are not considered high quality waters. The remaining portion of the New River is classified as estuarine water suited for commercial shell fishing and all other tidal saltwater uses (SA).

2.4 Geology

MCB, Camp Lejeune is within the Tidewater region of the Atlantic Coastal Plain physiographic province. The sediments of the Atlantic Coastal Plain consist mostly of interbedded sands, silts, clays, calcareous clays, shell beds, sandstone and limestone. These sediments are layered in interfingering beds and lenses that gently dip and thicken to the southeast to a combined thickness of approximately 1,500 feet. They were deposited in marine or near-shore environments and range in age from early Cretaceous to Quaternary time. Regionally, the sediments comprise 10 aquifers and nine confining units which overlie igneous and metamorphic basement rocks of the pre-Cretaceous age. Seven of these aquifers and their associated confining units are present in the MCB, Camp Lejeune area (Cardinell, et al., 1993). Table 2-1 presents a generalized stratigraphic column for Jones and Onslow Counties, North Carolina. Hydrogeologic section location plan and hydrogeologic cross-sections of the MCB, Camp Lejeune area are presented on Figures 2-1 and 2-2, respectively.

As part of this investigation, a total of 56 soil borings were advanced continuously at the SWMUs. Typically, one boring was advanced per SWMU. Continuous borings were foregone at SWMUs within close proximity of other SWMUs at which borings were advanced continuously. The individual borings provided information regarding the lithologic conditions in the vicinity of the SWMU, and also allowed for estimation of depth to groundwater.

The lithology encountered during the investigation consisted primarily of fine sand with varying amounts of silt and clay. In areas, silty and/or clayey strata predominated. Fill materials were also encountered at specific SWMUs. Refer to the boring logs that are presented in Appendix A for information regarding the lithology encountered at the individual SWMUs. The lithologic conditions at MCB, Camp Lejeune are discussed in further detail and related to the hydrogeologic framework of the region in Section 2.5.

2.5 Hydrogeology

The following paragraphs discuss the hydrogeologic conditions at MCB, Camp Lejeune. The information presented within this section is from literature published by the United States Geological Survey (USGS) (Harned, et al., 1989 and Cardinell, et al., 1993). Additionally, information was collected from a technical memorandum prepared by Baker summarizing groundwater data and aquifer characteristics for MCB, Camp Lejeune (see Appendix B).

USGS studies at MCB, Camp Lejeune indicate that the area is underlain by sand and limestone aquifers separated by confining units of silt and clay. These aquifers include the surficial (water table), Castle Hayne, Beaufort, Peedee, Black Creek, and upper and lower Cape Fear. Less permeable clay and silt beds function as confining units or semi-confining units which separate the aquifers and impede the flow of groundwater between aquifers.

The surficial unit consists of interfingering beds of sand, clay, sandy clay and silt that contain some peat and shells of Quaternary and Miocene age. These sediments commonly extend to depths of 50 to 100 feet bgs. Thickness of the surficial aquifer in the MCB, Camp Lejeune area ranges from zero to 73 feet, and typically average 25 feet (Cardinell, et al., 1993). The aquifer is generally thickest in the interstream divide areas and may be absent where it is cut by the New River and its tributaries. The clay, sandy clay, and silt beds that occur in the surficial aquifer are thin and discontinuous throughout. A semi-confining unit is found in the surficial aquifer within some portions of MCB, Camp Lejeune.

Recharge to the surficial aquifer is by rainfall. The aquifer receives more recharge in the winter than in the summer when much of the water evaporates or is transpired by plants before it can reach the water table. Most of the surficial groundwater is discharged to local streams, but some water passes through the underlying semiconfining unit. Recharge for the surficial aquifer is based on an average rainfall of 52 inches per year and an average recharge of 30 percent, or an annual recharge of approximately 16 inches per year (Table 2-2). The remaining 70 percent of the rainfall is lost as surface runoff or evapotranspiration. Sixteen inches of recharge equates to 7,600,000 gallons per day (gpd) per square mile or approximately 114,000,000 gpd for all of MCB, Camp Lejeune (based on 150 square miles of recharge area). Water levels in the wells tapping the surficial aquifer vary seasonally. The water table is generally highest in the winter and spring, and lowest in the summer and early fall. The estimated lateral hydraulic conductivity for the surficial aquifer is 50 feet per day (ft/d) and is based on a general composition of fine sand mixed with some silt and clay (Cardinal, et al., 1993).

A study of data from aquifer tests (pump tests) done at MCB, Camp Lejeune was conducted by Baker in 1994 to evaluate aquifer characteristics and production capacities. The technical memorandum is provided in Appendix B. The information contained in this memorandum pertains primarily to the surficial aquifer. Average pumping rates were established between 0.5 to three gpm; transmissivity ranged from 7.1 to 7,100 square feet per day (ft^2/day); storativity ranged from 1.5×10^{3} to 7.5×10^{2}; and hydraulic conductivity was estimated to range from 0.5 to 1.4 ft/day.

Although the aquifer is classified as GA (i.e., existing or a potential source of drinking water supply for humans), it is not used as a potable water source at MCB, Camp Lejeune because of its low yielding production rates (typically less than three gpm).

The Castle Hayne confining unit is composed of silt, clay and sandy clay beds. These beds form a unit across MCB, Camp Lejeune that may be represented by one or more geological units such as the deposits at the bottom of the surficial aquifer, the uppermost beds of the River Bend Formation or the uppermost beds of the Castle Hayne Formation. Overall, the Castle Hayne confining unit may be characterized as a group of less permeable beds at the top of the Castle Hayne aquifer that have been eroded in places. The thickness of the confining unit ranges from zero to 26 feet thick, averaging nine feet thick where present. No discernible trend in the thickness of the confining unit exists although it is more than 20 feet thick only in the southern and southwestern parts of the Base. The vertical hydraulic conductivity of the Castle Hayne confining unit was estimated to range from 0.0014 to 0.41 ft/d. These values are comparable to those determined for silts and clays and therefore, this unit may only be partly effective at retarding the vertical movement of groundwater between the surficial and Castle Hayne aquifers (Cardinell, et al., 1993).

The principal water supply aquifer for MCB, Camp Lejeune is the Castle Hayne aquifer. This aquifer primarily resides within the River Bend Formation which consists of sand, cemented shells and limestone. The upper portion of the aquifer primarily consists of calcareous sands with some thin clay and silt beds. The sand becomes increasingly more limy with depth. The lower portion of the aquifer consists of partially unconsolidated limestone and sandy limestone interbedded with clay and sand. Also, buried paleostream channels containing various deposits exist within the aquifer. The top of the aquifer ranges from 10 feet above msl to 70 feet below msl and is irregular over most of the northern portion of MCB, Camp Lejeune. The aquifer is more regular in areas southeast of the New River, where it slopes southeastward. The Castle Hayne thickens to the east, from 160 feet in the Camp Geiger area to more than 400 feet at the eastern boundary of MCB, Camp Lejeune.

Estimated transmissivity, hydraulic conductivity and storage coefficient values for the Castle Hayne aquifer range from 6,100 to 183,300 gpd/ft, 14 to 91 ft/d and 2×10^{-4} to 1.9×10^{-3}, respectively. An aquifer pump test conducted by ESE (1988) in the Hadnot Point Industrial Area, using an existing water supply well (HP642), indicates an average transmissivity and storage coefficient of 9,600 gpd/ft and 8.8×10^{-4}, respectively (ESE, 1988). Table 2-3 summarizes the previously stated information.

Recharge of the Castle Hayne aquifer at MCB, Camp Lejeune is primarily received from the surficial aquifer. Natural discharge is to the New River and its major tributaries. The Castle Hayne aquifer provides roughly seven million gallons of water to MCB, Camp Lejeune. Groundwater pumping has not significantly affected natural head gradients in the aquifer.

MCB, Camp Lejeune lies in an area where the upper part of the Castle Hayne aquifer contains freshwater. Saltwater is found in the bottom of the aquifer in the region and in the New River estuary; both are of concern in managing water withdrawals from the aquifer. Over pumping the deeper parts of the aquifer or in areas hydraulically connected to estuarine streams could cause saltwater intrusions. The aquifer underlying most of the area contains water having less than 120 milligrams per liter (mg/L) of chloride.

2.6 Land Use and Demographics

MCB, Camp Lejeune presently covers an area of approximately 236 square miles. Currently, the military population of MCB, Camp Lejeune is approximately 41,000 active duty personnel. The military dependent community is more than 32,000 civilian employees performing facilities management and support functions. The population of Onslow County has grown from 17,738 in 1940, before the formation of the Base, to its present population of 121,350.

During World War II, MCB, Camp Lejeune was used as a training area to prepare Marines for combat. This has been a continuing function of the facility during the Korean and Vietnam Conflicts and the recent Gulf War (i.e., Desert Storm). Toward the end of World War II, the Base was designated as home for the Second Marine Division. Since then, Fleet Marine Forces units also have been stationed here as tenant commands.

The existing land patterns in the various geographic areas within the MCB are listed, per geographic area, on Table 2-4. In addition, the number of acres comprising each land use category has been estimated and provided on the table.

2.7 Climatology

Although coastal North Carolina lacks distinct wet and dry seasons, there is some seasonal variation in average precipitation (see Table 2-2). July receives the most precipitation and rainfall amounts during summer are generally the greatest. Daily showers during the summer are common, and so are periods of one or two weeks without rain. Convective showers and thunderstorms contribute to the variability of precipitation during the summer months. October receives the least amount of precipitation, on average. Throughout the winter and spring months precipitation occurs primarily as migratory low pressure storms. MCB, Camp Lejeune's average yearly rainfall is approximately 52 inches. Table 2-2 presents a climatic summary of data collected during 35 years (January 1955 to December 1990) of observations at MCAS New River.

Coastal plain temperatures are moderated by the proximity of the Atlantic Ocean which effectively reduces the average daily temperature fluctuation. Lying 50 miles offshore at its nearest point, the Gulf Stream has little effect on coastal temperatures. The southern reach of the cold Labrador Current offsets any warming effect the Gulf Stream might otherwise provide.

MCB, Camp Lejeune experiences hot and humid summers, however ocean breezes frequently produce cooling effects. The winter months are mild, with occasional brief cold spells. Average daily temperatures range from 38°F to 58°F in January and 72°F to 86°F in July. The average relative humidity, between 75 and 85 percent, does not vary greatly from season to season.

Observations of sky conditions indicate yearly averages of approximately 112 clear, 105 partly cloudy, and 148 cloudy days. Measurable amounts of rainfall occur 120 days per year, on the average. Prevailing winds are generally from the south-southwest 10 months of the year. During the months of September and October, the winds blow from the north-northwest at an average speed of 6.9 miles per hour.

2.8 Water Supply

Potable water for MCB, Camp Lejeune is supplied entirely by groundwater. The Base does not have established groundwater preservation areas; however, because the Base controls more than 110,000 acres of land, and because much of this land has remained undeveloped, the undeveloped areas serve the function of groundwater preserves. Groundwater usage is roughly seven million gpd (Cardinell, et al., 1993). Groundwater is pumped from approximately 77 of 90 water supply wells located within the boundaries of MCB, Camp Lejeune. According to Base personnel, groundwater is treated at five plants located at Hadnot Point, Holcomb Boulevard, MCAS New River, Courthouse Bay and Onslow Beach having a total capacity of 15.8 million gpd.

All of the water supply wells use the Castle Hayne aquifer. The Castle Hayne aquifer is a highly permeable, semi-confined aquifer that can yield several hundred to 1,000 gallons per minute (gpm) in municipal and industrial wells in the MCB, Camp Lejeune area. The water supply wells at the Base average 162 feet in depth; eight inches in diameter (casing); and yield 174 gpm (Harned, et al., 1989). The water is typically a hard, calcium bicarbonate type. Information concerning the supply wells was gathered from the Wellhead Management Program Engineering Study 91-36 (Geophex, 1991), the Preliminary Draft Report Wellhead Monitoring Study 92-34 (Greenhorne and O'Mara, Inc., 1992), and interviews with Base personnel.

2.9 Ecological Characteristics

The Natural Resources and Environmental Affairs (NREA) Division of MCB, Camp Lejeune, the U.S. Fish and Wildlife Service, and the North Carolina Wildlife Resource Commission have entered into an agreement for the protection of endangered and threatened species that might inhabit MCB, Camp Lejeune. Habitats are maintained at MCB, Camp Lejeune for the preservation and protection of rare and endangered species through the Base's forest and wildlife management programs. Full protection is provided to such species, and critical habitat is designated in management plans to prevent or mitigate adverse effects of Base activities. Special emphasis is placed on habitat and sightings of alligators, osprey, bald eagles, cougars, dusky seaside sparrows, and red-cockaded woodpeckers (WAR, 1983).

Camp Lejeune covers approximately 153,000 acres, 84 percent of which is forested (USMC, 1987). Approximately 45 percent of this is pine forest, 22 percent is mixed pine/hardwood forest, and 17 percent is hardwood forest. Nine percent of the Base, a total of 3,587 acres, is wetland and includes pure pond pine stands, mixed pond pine/hardwood stands, marshes, pocosins, and wooded swamps. The Base also contains 80 miles of tidal streams, 21 miles of marine shoreline, and 12 freshwater ponds. Over half of the 153,000 acres located within the boundaries of MCB, Camp Lejeune are under forestry management. Timber producing areas are under even-aged management with the exception of those areas along streams and swamps. These areas are managed to provide both wildlife habitat and erosion control. Forest management provides wood production, increased wildlife populations, enhancement of natural beauty, soil protection, prevention of stream pollution, and protection of endangered species (WAR, 1983).

Because of the natural resources on the Base, forested areas are actively managed for timber. Game species are also managed for hunting, and ponds are maintained for fishing. Game species managed include wild turkey, white-tailed deer, black bear, grey and fox squirrels, bobwhite quail, eastern cottontail and marsh rabbits, racoons, and wood ducks.

Aquatic ecosystems on MCB, Camp Lejeune consist of small lakes, the New River estuary, numerous tributaries, creeks, and part of the Intracoastal Waterway. A wide variety of freshwater and saltwater fish species exist here. Freshwater ponds are under management to produce optimum yields and ensure continued harvest of desirable fish species (WAR, 1983). Freshwater fish in the streams and ponds include largemouth bass, redbreast sunfish, bluegill, chain pickerel, yellow perch, and catfish. Reptiles include alligators, turtles, and snakes, including venomous species. Both recreational and commercial fishing are practiced in the waterways of the New River and its tributaries (WAR, 1983).

Many natural communities are present in the coastal plain. Subcommunities and variations of these major community types are also present and alterations of natural communities have occurred in response to disturbance and intervention (i.e., forest cleared to become pasture). The natural communities found in the Camp Lejeune area are summarized as follows:

- Loblolly Pine Forest - a dominant forest type at Camp Lejeune. Pine forest often has a dense hardwood subcanopy and shrub understory because of clear-cutting and/or fire suppression. Dense shading results in a sparse ground layer of vegetation with little probability or rare species occurring (LeBlond et. al., 1994).

- Hardwood Forest - Found primarily in stream floodplains and on slopes and terraces next to stream valleys and estuarine features. Stream floodplain communities include cypress - gum swamp and coastal plain small stream swamp. Very few rare species are found in hardwood forests, but the communities themselves can be quite rare (LeBlond et. al., 1994).

- Loblolly Pine/Hardwoods Community - The predominant forest type at Camp Lejeune. Second growth forest that includes loblolly pine with a mix of hardwoods - oak, hickory, sweetgum, sour gum, red maple, and holly (oak is the predominant hardwood). These forests have a low probability for rare species because of the lack of herbaceous development and overall plant diversity (LeBlond et. al.,1994).

- Longleaf Pine Forest and Longleaf Pine/Hardwood Forests - Contain critical, fire maintained natural communities: Pine Savanna, Wet Pine Flatwoods, Mesic Pine Flatwoods, Pine/Scrub Oak Sanhill, and Zeric Sanhill Scrub. Some longleaf pine forests have developed in old fields and cut-over areas. The Federal endangered red-cockaded woodpecker (Picoides Borealis) is essentially restricted to opened, burned longleaf pine forests. The pine savannas and wet pine flatwood communities are particularly important habitats for several rare species (LeBlond et. al., 1994).

- Maritime Forest - Develop on the lee side of stable sands and dunes protected from the ocean. Live oak is an indicator species with pine, cedar, yaupon, holly, and laurel oak. Deciduous hardwoods may be present where forest is mature (USMC, 1987).

- Pond Pine Forest - These forests are primarily found in pocosins and are classified by Schafale and Wealkey (1990) as the Pond Pine Woodland natural community. Red bay, sweet bay, and loblolly bay are important components of this community. These forests frequently produce areas of high plant diversity and support several rare

species. The Federal endangered loosestrife (Lysimachia asperulifolia) is found in this community (LeBlond et. al., 1994).

- Freshwater Marsh - Occurs upstream from tidal marshes and downstream from non-tidal freshwater wetlands. Cattails, sedges, and rushes are present, On the coast of North Carolina, swamps are more common than marshes (USMC, 1987).

- Salt Marsh - These areas occur in saline tidal areas protected from tidal action by barrier beach features. The barrier islands fronting the Atlantic Ocean support Brackish Marsh, Upper Beach, Dune Grass, and Martitime Wet and Dry Grassland communities. Regularly flooded, tidally influenced areas dominated by salt-tolerant grasses. Saltwater cordgrass is a characteristic species. Tidal mud flats may be present during low tide. These dynamic communities are critical to such Federal endangered species as the piping plover (Charadrius Melodus) and the Federal threatened American loggerhead turtle (Caretta caretta) and the green turtle (Chelonia Mydas) (LeBlond et. al., 1994).

- Salt Shrub Thicket - High areas of salt marshes and beach areas behind dunes. Subjected to salt spray and periodic saltwater flooding. Dominated by salt resistant shrubs.

- Dunes/Beaches - Zones from the ocean shore to the maritime forest. Subjected to sand, salt, wind, and water.

- Ponds and Lakes - Low depressional areas where water table reaches the surface or where ground is impermeable. In ponds rooted plants can grow across the bottom, Fish populations managed in these ponds include redear, bluegill, largemouth bass, and channel catfish (USMC, 1987).

- Open Water - Marine and estuarine water and all underlying bottoms below the intertidal zone.

2.10 Wetlands

The NC DENR's Division of Environmental Management (DEM) has developed guidance concerning activities that may impact wetlands (NC DENR 1992). In addition, certain activities affecting wetlands also are regulated by the U.S. Corps of Engineers. The U.S. Fish and Wildlife Service has prepared National Wetland Inventory (NWI) maps for the Camp Lejeune, North Carolina area by stereoscopic analysis of high altitude aerial photographs (USDI, 1982).

Wetland ecosystems at MCB, Camp Lejeune can be categorized into five habitat types: (1) pond pine or pocosin; (2) sweet gum, water oak, cypress, and tupelo; (3) sweet bay, swamp black gum, and red maple; (4) tidal marshes; and, (5) coastal beaches. Pocosins provide excellent habitat for bear and deer because these areas are seldom disturbed by humans. The presence of pocosin-type habitat at MCB, Camp Lejeune is primarily responsible for the continued existence of black bear in the area. Many of the pocosins are overgrown with brush and pine species that would not be profitable to harvest (WAR, 1983).

Sweet gum, water oak, cypress, and tupelo habitat is found in the rich, moist bottomlands along streams and rivers. This habitat extends to the marine shorelines. Deer, bear, turkey, and waterfowl are commonly found in this type of habitat (WAR, 1983).

Sweet bay, swamp black gum, and red maple habitat exist in the floodplain areas of MCB, Camp Lejeune. Fauna including waterfowl, mink, otter, raccoon, deer, bear, and gray squirrel frequent this habitat (WAR, 1983).

The tidal marsh at the mouth of the New River is one of the few remaining North Carolina coastal areas relatively free from filling or other manmade changes. This habitat, which consists of marsh and aquatic plants such as algae, cattails, saltgrass, cordgrass, bulrush, and spikerush, provides wildlife with food and cover. Migratory waterfowl, alligators, raccoons, and river otter exist in this habitat (WAR, 1983).

Coastal beaches along the Intracoastal Waterway and along the outer banks of MCB, Camp Lejeune are used for recreation and to house a small military command unit. Basic assault training maneuvers are also conducted along these beaches. Training regulations presently restrict activities that would impact ecologically sensitive coastal barrier dunes. The coastal beaches provides habitat for many shorebirds (WAR, 1983).

2.11 Threatened and Endangered Species

Certain species have been granted protection by the U.S. Fish and Wildlife Services (FWS) under the Federal Endangered Species Act (16 U.S.C. 1531-1543), and/or by the North Carolina Wildlife Resources Commission, under the North Carolina Endangered Species Act (G.S. 113-331 to 113-337). The protected species fall into one of the following status classifications: Federal or state endangered, threatened, or candidate species; state special concern; state significantly rare; or state watch list. While only the Federal or state threatened or endangered and state special concern species are protected from certain actions, the other classified species have the potential for protection in the future.

Surveys have been conducted to identify threatened or endangered species at Camp Lejeune and several programs are underway to manage and protect them. Table 2-5 lists protected species present at the base and their protected classifications. Of these species, the red-cockaded woodpecker, American alligator, and sea turtles are covered by specific protection programs.

The red-cockaded woodpecker is classified as state endangered. This species requires a specific habitat in mature, living longleaf or loblolly pine trees. The birds exist in family groups and young are raised cooperatively. At Camp Lejeune, 2,512 acres of habitat have been identified and marked for protection. Research on the bird at Camp Lejeune began in 1985 and information has been collected to determine home ranges, population size and composition, reproductive success, and habitat use. An annual roost survey is conducted and 36 colonies of birds have been located.

The American alligator is considered threatened in the northernmost part of its range, which includes North Carolina. The alligator is found in freshwater, estuarine, and saltwater wetlands in Camp Lejeune. Base wetlands are maintained and protected for the alligator. Signs have been erected where alligators are known to live. Annual surveys of Wallace, Southwest, French, Duck, Mill, and Stone Creeks have been conducted since 1977 to identify alligators and their habitats on base.

Two protected sea turtles, the Atlantic loggerhead and Atlantic green turtle, nest on Onslow Beach at Camp Lejeune and are both classified as threatened species. The green turtle was found nesting in 1980; the sighting was the first time the species was observed nesting north of Georgia. The turtle returned to nest in 1985. Turtle nests on the beach are surveyed and protected, turtles are tagged, and annual turtle status reports are issued.

Four bird species (black skimmer, piping plover, Bachman's sparrow, and peregrine falcon) have also been identified during surveys at Camp Lejeune. The piping plover and peregrine falcon are classified as threatened species. The black skimmer and Bachman's sparrow are classified as special concern (state). The black skimmer and piping plover are sea and shore birds respectively. Skimmers nest on low sandy islands and sand bars along the coast and piping plovers prefer beaches with broad open sandy flats above the high tide line. Skimmers feed above open water and piping plovers feed along the edge of incoming waves. Like the black skimmer and piping plover, Bachman's sparrows are very specific in their habitat requirements. They live in open stretches of pines with grasses and scattered shrubs for ground cover. Bachmaif s sparrows were observed at numerous locations throughout the southern portion of Camp Lejeune.

In addition to the protected species that breed or forage at Camp Lejeune, several protected whales migrate through the coastal waters off the base during the spring and fall. These include the Atlantic right whale, finback whale, sei whale, and sperm whale. Before artillery or bombing practice is conducted in the area, aerial surveys are made to assure that whales are not present in the impact areas.

A natural heritage resources survey was conducted at Camp Lejeune (LeBlond, 1991) to identify threatened or endangered plants and areas of significant natural interest. From this survey, the rough-leaf loosestrife was the only specie identified that is both Federal and state endangered. Also, several state endangered/threatened and Federal and state candidate species were found on the Base.

2.12 References

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TABLES

TABLE 2-1

GEOLOGIC AND HYDROGEOLOGIC UNITS IN THE COASTAL PLAIN OF NORTH CAROLINA MCB, CAMP LEJEUNE, NORTH CAROLINA CONFIRMATORY SAMPLING REPORT, CTO-0371

GEOLOGIC UNITS			HYDROGEOLOGIC UNITS
System	Series	Formation	Aquifer and Confining Unit
Quaternary	Holocene/Pleistocene	Undifferentiated	Surficial Aquifer
Tertiary	Pliocene	Yorktown Formation[1]	Yorktown Confining Unit
			Yorktown Aquifer
	Miocene	Eastover Formation[1]	Pungo River Confining Unit
		Pungo River Formation[1]	Pungo River Aquifer
		Belgrade Formation[2]	Castle Hayne Confining Unit
	Oligocene	River Bend Formation	Castle Hayne Aquifer
	Eocene	Castle Hayne Formation	Beaufort Confining Unit[3]
	Palocene	Beaufort Formation	Beaufort Aquifer
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee Confining Unit
			Peedee Aquifer
		Black Creek and Middendorf Formations	Black Creek Confining Unit
			Black Creek Aquifer
		Cape Fear Formation	Upper Cape Fear Confining Unit
			Upper Cape Fear Aquifer
			Lower Cape Fear Confining Unit
			Lower Cape Fear Aquifer
	Lower Cretaceous[1]	Unnamed Deposits[1]	Lower Cretaceous Confining Unit
			Lower Cretaceous Aquifer[1]
Pre-Cretaceous Basement Rocks		--	--

[1] Geologic and hydrologic units not present beneath Camp Lejeune.
[2] Constitutes part of the surficial aquifer and Castle Hayne confining unit in the study area.
[3] Estimated to be confined to deposits of Paleocene age in the study area.
Source: Cardinell, et al., 1993

Climatological ? TABLE 2-2

→ CLIMATIC DATA SUMMARY
MARINE CORPS AIR STATION, NEW RIVER
MCB, CAMP LEJEUNE, NORTH CAROLINA
CONFIRMATORY SAMPLING REPORT, CTO-0371

	Precipitation (Inches)			Relative Humidity (Percent)	Temperature (Fahrenheit)			Mean Number of Days With				
								Precipitation		Temperature		
	Maximum	Minimum	Average		Maximum	Minimum	Average	>=0.01"	>=0.5"	>=90F	>=75F	<=32F
January	7.5	1.4	4.0	79	54	34	44	11	2	0	1	16
February	9.1	.9	3.9	78	57	36	47	10	3	0	2	11
March	8	.8	3.9	80	64	43	54	10	3	*	5	5
April	8.8	.5	3.1	79	73	51	62	8	2	1	13	*
May	8.4	.6	4.0	83	80	60	70	10	3	2	25	0
June	11.8	2.2	5.2	84	86	67	77	10	4	7	29	0
July	14.3	4.0	7.7	86	89	72	80	14	5	13	31	0
August	12.6	1.7	6.2	89	88	71	80	12	4	11	31	0
September	12.8	.8	4.6	89	83	66	75	9	3	4	27	0
October	8.9	.6	2.9	86	75	54	65	7	2	*	17	*
November	6.7	.6	3.2	83	67	45	56	8	2	0	7	3
December	6.6	.4	3.7	81	58	37	48	9	2	0	2	12
Annual	65.9	38.2	52.4	83	73	53	63	118	35	39	189	48

Notes:

* = Mean no. of days less than 0.5 days
Source: Naval Oceanography Command Detachment, Asheville, North Carolina. Measurements obtained from January 1955 to December 1990.

TABLE 2-3

HYDRAULIC PROPERTY ESTIMATES OF THE CASTLE HAYNE AQUIFER AND CONFINING UNIT
MCB, CAMP LEJEUNE, NORTH CAROLINA
CONFIRMATORY SAMPLING REPORT, CTO-0371

Hydraulic Properties	USGS Phase I Study[1]	USGS Aquifer Test[2]	ESE, Inc. [3]	NC DENR Aquifer Test[4]	RASA Estimate[5]
Aquifer transmissivity (cubic foot per day per square foot times foot of aquifer thickness)	4,300 to 24,500 average 9,500	1,140 to 1,325	820 to 1,740 average 1,280	900	10,140 to 26,000
Aquifer hydraulic conductivity (foot per day)	14 to 82 average 35	20 to 60	--	18 to 91 average 54	45 to 80 average 65
Aquifer storage coefficient (dimensionless)	--	2.0×10^{-4} to 2.2×10^{-4}	5.0×10^{-4} to 1.0×10^{-3} average 8.0×10^{-4}	1.9×10^{-3}	--
Confining-unit vertical hydraulic conductivity (foot per day)	--	3.0×10^{-2} to 4.1×10^{-1}	1.4×10^{-3} to 5.1×10^{-2} average 3.5×10^{-3}	--	--

Notes:

(1) Analysis of specific capacity data from Harned and others (1989).
(2) Aquifer test at well HP-708.
(3) Aquifer test at Hadnot Point well HP-462 from Environmental Sciences and Engineering, Inc. (1988).
(4) Unpublished aquifer test data at well X24s2x, from NC DENR well records (1985).
(5) Transmissivities based on range of aquifer thickness and average hydraulic conductivity from Winner and Coble (1989).

Source: Cardinell, et al., 1993.

Land Use Summary?

TABLE 2-4

LAND UTILIZATION: DEVELOPED AREAS LAND USE[1]
MCB, CAMP LEJEUNE, NORTH CAROLINA
CONFIRMATORY SAMPLING REPORT, CTO-0371

Geographic Area	Oper.	Training (Instruc.)	Maint.	Supply/ Storage	Medical	Admin.	Family Housing	Troop Housing	CM	CO	Recreat.	Utility	Total
Hadnot Point	31 (2.9)	15 (1.4)	154 (14.3)	157 (14.4)	10 (0.9)	122 (11.3)	22 (2.0)	196 (18.1)	115 (10.7)	36 (3.3)	182 (16.9)	40 (3.7)	1,080 (100)
Paradise Point	1 (0)		3 (0.4)	1 (0)			343 (34)	19 (1.9)	31 (3.1)		610 (60.4)	2 (0.2)	1,010 (100)
Berkeley Manor/ Watkins Village							406 (80)		41 (8.1)	1 (0.2)	57 (11.2)	2 (0.5)	507 (100)
Midway Park		1 (0.4)		2 (0.7)		2 (0.7)	248 (92.2)		8 (3.0)	3 (1.1)	4 (1.5)	1 (0.4)	269 (100)
Tarawa Terrace I and II			3 (0.5)			1 (0.3)	428 (77.4)		55 (9.9)	11 (2.0)	47 (8.5)	8 (1.4)	553 (100)
Knox Trailer							57 (100)						57 (100)
French Creek	8 (1.4)	1 (0.2)	74 (12.7)	266 (45.6)	3 (0.5)	7 (1.2)		122 (20.9)	22 (3.8)	6 (1.0)	74 (12.7)		583 (100)
Courthouse Bay		**73 (28.6)**	**28 (10.9)**	**14 (5.5)**		**12 (4.7)**	**12 (4.7)**	**43 (16.9)**	**15 (5.9)**	**4 (1.6)**	**43 (16.9)**	**11 (4.3)**	**255 (100)**
Onslow Beach	6 (9.8)	1 (1.6)	3 (4.8)	2 (3.2)	1 (1.6)	2 (3.2)		2 (3.2)	12 (19.3)		25 (40.3)	8 (13.0)	62 (100)
Rifle Range		1 (1.3)	1 (1.3)	7 (8.8)	1 (1.3)	5 (6.3)	7 (8.8)	30 (37.5)	5 (6.3)	1 (1.3)	9 (11.3)	13 (16.3)	80 (100)
Camp Geiger	4 (1.9)	15 (6.9)	19 (8.8)	50 (23.1)		23 (10.6)		54 (25.0)	27 (12.5)	2 (1.0)	16 (7.4)	6 (2.8)	216 (100)
Montford Point	6 (2.6)	48 (20.5)	2 (0.9)	4 (1.7)	2 (0.9)	9 (3.9)		82 (35.2)	20 (8.6)	1 (0.4)	49 (21.0)	10 (4.3)	233 (100)
Base-Wide Misc.	1 (0.8)			87 (68.0)		3 (2.3)			19 (14.8)			18 (14.1)	128 (100)
TOTAL	**57 (1.1)**	**155 (3.1)**	**287 (5.7)**	**590 (11.7)**	**17 (0.38)**	**186 (3.7)**	**1,523 (30.2)**	**548 (10.8)**	**370 (7.4)**	**65 (1.3)**	**1,116 (22.2)**	**119 (2.4)**	**5,033 (100)**

Note:

(1) Upper number is acres, lower number is overall percent.

TABLE 2-5

PROTECTED SPECIES
MCB, CAMP LEJEUNE, NORTH CAROLINA
CONFIRMATORY SAMPLING REPORT, CTO-0371

Species	Protected Classification
Animals:	
American alligator (Alligator mississippienis)	SC
Bachmans sparrow (Aimophilia aestivalis)	FCan, SC
Green (Atlantic) turtle (Chelonia m. mydas)	T(f), T(s)
Loggerhead turtle (Caretta caretta)	T(f), T(s)
Peregrine falcon (Falco peregrinus)	E(f), E(s)
Piping plover (Charadrius melodus)	T(f), T(s)
Red-cockaded woodpecker (Picoides borealis)	E(f), E(s)
Southern Hognose Snake (Heterodon simus)	FCan, SR
Diamondback Terrapin (Malaclemys terrapin)	FCan, SC
Carolina Gopher Frog (Rana capito capito)	FCan, SC
Cooper's Hawk (Accipiter cooperii)	SC
Eastern Diamondback Rattlesnake (Crotalus adamanteus)	SR
Eastern Coral Snake (Micrurus fulvius)	SR
Pigmy Rattlesnake (Sistrurus miliarius)	SR
Black Bear (Ursus americanus)	SR
Plants:	
Rough-leaf loosestrife (Lysimachia asperulifolia)	E(f), E(s)
Seabeach Amaranth (Amaranthus pumilus)	T(f), T(s)
Chapman's Sedge (Carex chapmanii)	FCan
Hirst's Witchgrass (Dichanthelium sp.)	FCan
Pondspice (Litsea aestivalis)	FCan
Boykin's Lobelia (Lobelia boykinii)	FCan
Loose Watermilfoil (Myriophyllum laxum)	FCan,T(s)
Awned Meadowbeauty (Rhexia aristosa)	FCan,T(s)
Carolina Goldenrod (Solidago pulchra)	FCan, E(s)
Carolina Asphodel (Tofieldia glabra)	FCan
Venus Flytrap (Dionaea muscipula)	FCan
Flaxleaf Gerardia (Agalinis linifolia)	SR
Pinebarrens Goober Grass (Amphicarpum purshii)	SR
Longleaf Three-awn (Aristida palustris)	SR
Pinebarrens Sandreed (Calamovilfa brevipilis)	E(s)
Warty Sedge (Carex verrucosa)	SR
Smooth Sawgrass (Cladium mariscoides)	SR
Leconte's Flatsedge (Cyperus lecontei)	SR

TABLE 2-5 (Continued)

PROTECTED SPECIES
MCB, CAMP LEJEUNE, NORTH CAROLINA
CONFIRMATORY SAMPLING REPORT, CTO-0371

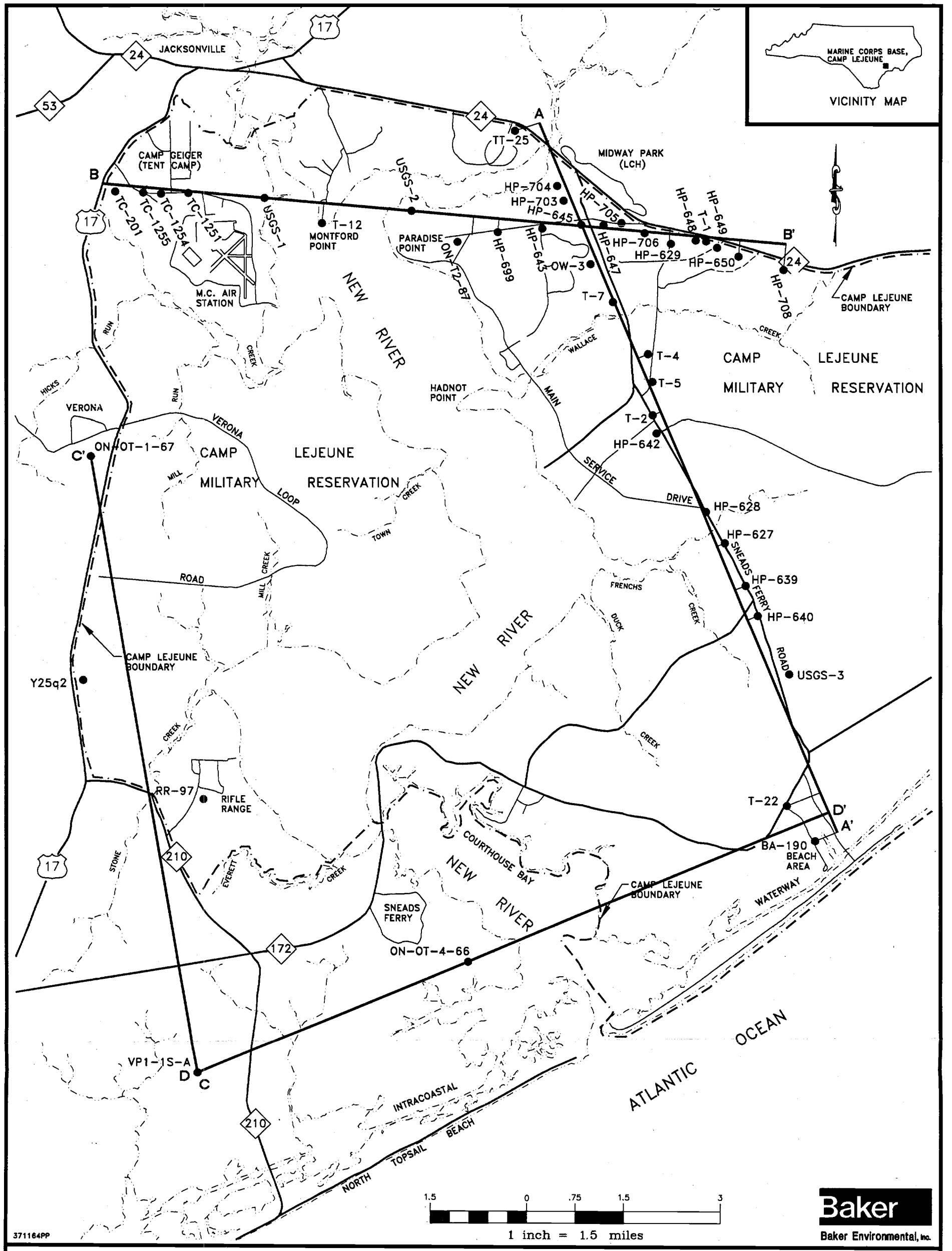
Species	Protected Classification
Erectleaf Witchgrass (Dichanthelium erectifolium)	SR
Horsetail Spikerush (Eleocharis equisetoides)	SR
Sand Spikerush (Eleocharis montevidensis)	SR
Flaxleaf Seedbox (Ludwigia linifolia)	SR
Torrey's Muhley (Muhlenbergia torreyana)	E(s)
Southeastern Panic Grass (Panicum tenerum)	SR
Spoonflower (Peltandra sagittifolia)	SR
Shadow-witch (Ponthieva racemosa)	SR
West Indies Meadowbeauty (Rhexia cubensis)	SR
Pale Beakrush (Rhynchospora pallida)	SR
Longbeak Baldsedge (Rhynchospora scirpoides)	SR
Tracy's Beakrush (Rhynchospora tracyi)	SR
Canby's Bulrush (Scirpus etuberculatus)	SR
Slender Nutrush (Scleria minor)	SR
Lejeune Goldenrod (Solidago sp.)	SR
Dwarf Bladderwort (Utricularia olivacea)	T(s)
Elliott's Yellow-eyed Grass (Xyris elliottii)	SR
Carolina Dropseed (Sporobolus sp.)	T(s)

Legend:

E(f) = Federal Endangered
T(f) = Federal Threatened
Fcan = Candidate for Federal Listing
E(s) = State Endangered
T(s) = State Threatened
SC = State Special Concern
SR = State Rare

Source: LeBlond, 1994

FIGURES



SOURCE: U.S. GEOLOGICAL SURVEY, WATER-RESOURCES INVESTIGATIONS REPORT, 93-4049, FIGURE 9

FIGURE 2-1
LOCATION OF HYDROGEOLOGIC CROSS-SECTIONS
MARINE CORPS BASE, CAMP LEJEUNE
CONFIRMITORY SAMPLING REPORT, CTO-0371

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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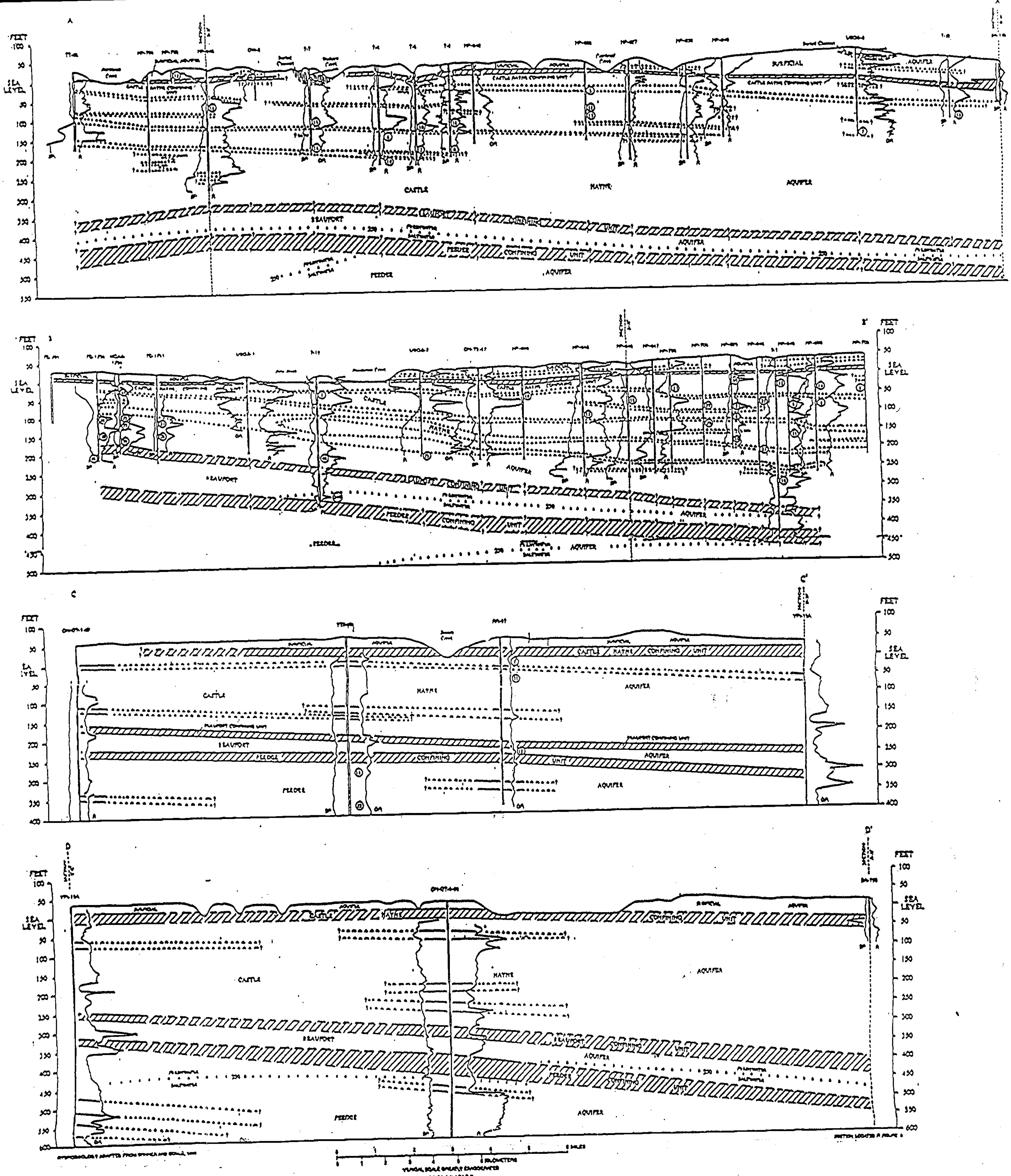

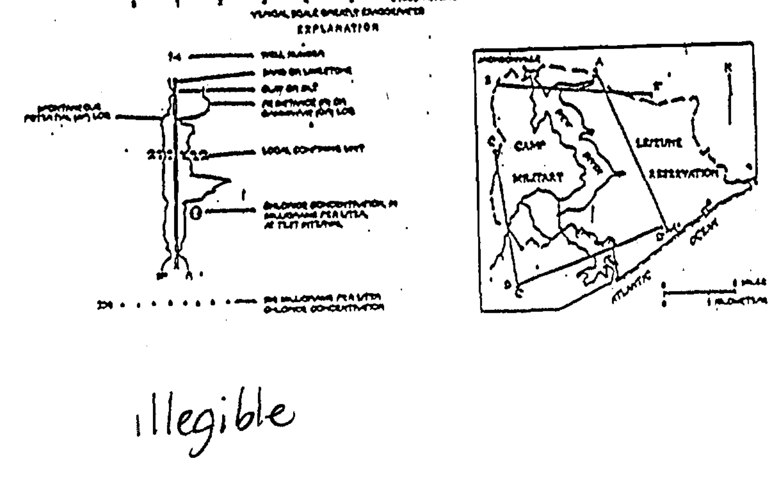

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SOURCE: U.S. GEOLOGICAL SURVEY, WATER RESOURCES INVESTIGATIONS REPORT, 93-4049, FIGURE 9

Baker

Baker Environmental, Inc.

FIGURE 2-2
HYDROGEOLOGIC CROSS-SECTIONS OF MCB, CAMP LEJEUNE AREA
CONFIRMITORY SAMPLING REPORT
CTO-0371

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

37116SPP

3.0 CONFIRMATORY SAMPLING INVESTIGATION OVERVIEW

The field program for the Confirmatory Sampling Investigation was initiated to determine if operations conducted at a SWMU had potentially impacted the environment. The Confirmatory Sampling Investigation is being completed in two phases. The first phase is complete and consisted of a soil investigation, and a surface water and sediment investigation at two units where surface water and/or sediment could have been impacted. The findings from this phase will determine the data and sampling objectives for the second phase.

3.1 Sampling Procedures

The investigative procedures used for the Confirmatory Sampling were in accordance with the Project Plans submitted August 1997 (Baker, 1997). A summary of these activities, as well as details of any modifications to the plans, are discussed in the following sections.

3.1.1 Soil Sample Collection

Surface and subsurface soil samples were collected at many of the SWMUs to determine if soil in the vicinity of to the SWMU has been impacted during operations conducted at the SWMU. Samples were collected from borings advanced by a direct-push soil sampler (i.e., Geoprobe) attached to a pick-up truck mounted rig, or by a hand unit supplied and operated by Parrott Wolff, Inc. of Hillsboro, North Carolina. The hand unit was used in instances where access to the borings was not obtainable by the truck mounted unit. Prior to sampling, utility clearance was completed at all locations by Jacksonville Professional Locators, Inc. located in Jacksonville, North Carolina.

Baker personnel supervised approximately 189 soil borings advanced to the water table at the 62 SWMUs. One boring from each SWMU was typically advanced for soil classification purposes and to identify sample depths for all borings advanced at the SWMU. The selected boring was continuously sampled and logged by the site geologist. Additional borings advanced at any SWMU were used for sample collection purposes only. Selection of the soil boring locations were based on photos, notes and observations made during the site visit conducted by Baker in October 1996.

The surface and subsurface soil samples were collected from each boring using the direct push sampler. A 2-inch outside diameter (OD) split spoon sampling device was driven 24 inches by the truck-mounted hydraulic drive assembly or by a hand-held drive hammer. Once at the desired depth, the sampler was pulled from the hole. The sampler was dissembled and handed to the geologist for logging, photoionization detector (PID) measurements and, as necessary, the soil sample was containerized for shipment. The sampler was decontaminated following procedures outlined in Section 6.4 of the Field Sampling and Analysis Plan (FSAP) (Baker, 1997) and reassembled prior to use.

The soil was removed from the split-spoon sampler using a stainless steel spoon or spatula. The portion of the sample selected for volatile organic analysis (VOA) was placed directly into the appropriate sampling jar. The VOA jar was filled completely, without headspace, labeled and placed in an ice-filled cooler for temporary storage. The remaining soil was placed in an aluminum pan and mixed thoroughly. Sample bottles for remaining analyses were filled, labeled and temporarily stored in an ice-filled cooler.

All soil samples retained for analysis were prepared and handled according to USEPA Region IV Standard Operating Procedures (SOPs) as outlined in the Project Plans (Baker, 1997). Chain-of-Custody documentation, which included information such as sample numbers, date, time of sampling, and sampling party accompanied the samples to the laboratory and is provided in Appendix C. Samples were shipped overnight via overnight courier to Quanterra Laboratories in Knoxville, Tennessee.

3.1.2 Surface Water Sample Collection

A single surface water sample was collected at SWMU 291 during the Confirmatory Sampling Investigation. The following procedures were used to collect a single surface water sample at SWMU 291. The sample was collected at the approximate mid-vertical point of the surface water body. Care was taken to ensure that the sampler did not contact and/or stir up the sediments, while still being relatively close to the sediment-water interface.

The surface water sample was collected by dipping the laboratory-supplied sample bottles directly into the water. All sample containers not containing preservative were rinsed at least once with the sample water prior to final sample collection. In addition, the sampling container used to transfer the water into sample bottles containing preservatives was rinsed once with sample water.

Care was taken when collecting the sample for analysis for VOAs to avoid excessive agitation that could result in loss of volatiles. The VOA sample was collected prior to the other parameters. Once the volatiles were collected, the remaining parameters were collected. All of the sample jars were placed in an ice-filled cooler for temporary storage. Chain-of-custody documentation accompanied the samples to the laboratory for analysis.

3.1.3 Sediment Sample Collection

Sediment samples were collected at only two SWMUs (SWMUs 291 and 339). At each sampling station, sediment samples were collected at a depth of 0 to 6 inches. These sediments were collected using a stainless steel hand-held coring instrument. As with the other media sampled during this field investigation, care was taken when collecting samples for VOAs. As stated in the Project Plans (Baker, 1997), the VOAs were collected with a clean stainless steel spoon. The remaining sediment was homogenized and transferred into their respective sample jars. This process was repeated until enough sediment was obtained to fill all the sample jars. As with other media sampled, all samples were placed in an ice-filled cooler for temporary storage until shipment to the off-site laboratory. Chain-of-custody documentation accompanied the samples to the laboratory for analysis.

3.2 Analytical Program

The analytical program for the Confirmatory Sampling Investigation focused on the suspected contaminants of concern identified for each of the SWMUs during the RFA, past and present activities conducted at the SWMU, and discussions with NC DENR, MCB, Camp Lejeune and the DoN. Table 3-1 summarizes the analytical program and sampling strategy for each of the 62 SWMUs included within the investigation. Details of the analytical program are included in Section 5.0 of the Final Project Plans (Baker, 1997).

June 92 Region III Modifications to National Functional Guidelines

3.3 Quality Assurance/Quality Control Program

Blank samples (i.e., rinsate, field, trip) provide a measure of contamination that has been introduced into a sample set during the collection, transportation, preparation and/or analysis of samples. Two primary sources on non-site related results include laboratory contaminants and naturally-occurring inorganic elements. In addition, non-site related operational activities and conditions may contribute to "on-site" contamination.

per Sharri – only underlined subject to 10x rule test must use 5x rule

bis-2ethylhexyl-

Common laboratory contaminants (i.e., acetone, 2-butanone, chloroform, methylene chloride, toluene, and phthalate ~~esters~~) were considered as positive results only when observed concentrations exceeded ten times the maximum concentration detected in any blank. If the concentration of a common laboratory contaminant was less than ten times the maximum blank concentration, then it was concluded that the chemical was not detected in that particular sample (USEPA, 1989a). Organic constituents contained in blanks that were not considered common laboratory contaminants were considered as positive results only when observed concentrations exceeded five times the maximum concentration detected in any blank (USEPA, 1989b).

Trip blanks are defined as samples which originate from the analyte-free water taken from the laboratory to the sampling site, kept with the investigative samples throughout the sampling event, and returned to the laboratory with the VOA samples. One trip blank accompanied each cooler containing samples for volatile organic analysis throughout the investigation. The purpose of a trip blank is to determine if samples were contaminated during storage and transportation back to the laboratory.

Equipment rinsates are samples obtained by running organic-free water over/through sample collection equipment after it has been cleaned. Equipment rinsates were collected daily during the field investigation. The results from the rinsates are used to evaluate the decontamination methods.

Field blanks consist of the source water used in decontamination. Field blanks were collected by pouring the water from the container directly into sample bottles. Two field blanks were collected as part of the field investigation. The first blank, sample 371FB01, was collected from distilled water used for the final rinse for small sampling equipment (i.e., split spoon sampler, stainless steel sampling spoons, etc.) decontamination. Field blank 371FB02 was collected from a potable water source at the base used for decontamination of large equipment (i.e., geoprobe rig, sampling rods) used for the field investigation.

Field duplicates were collected, homogenized, and split except for VOAs. The volatile portions of these samples were not mixed, but select segments of soil were collected from the length of the core and placed in sampling jars. Field duplicates were collected at a frequency of 10 percent.

Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples were collected to evaluate the matrix effect of the sample upon the analytical methodology. A matrix spike and matrix spike duplicate were performed for each group of samples of a similar matrix. MS/MSD samples were collected at a frequency of 5 percent.

3.4 Decontamination Procedures

Equipment decontamination was conducted in accordance with the Project Plans submitted in August 1997 (Baker, 1997). Details of decontamination procedures are described in Section 6.6 of the FSAP, which is part of the Project Plans.

3.5 Investigative Derived Waste Management

The soil cuttings generated during soil sample acquisition were minimized with the use of a direct push rig. The few cuttings that were generated were mixed with bentonite pellets and used as backfill. Decontamination fluids (i.e., soap and water) were disposed on site after completion of the field activities scheduled for the SWMU. Isopropanol used as the final rinse was allowed to air dry and therefore did not need to be contained.

3.6 References

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TABLES

TABLE 3-1 Analytical Programand Sampling Stategy Summary

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
2	SWMU 2 1700 Pond A	11	SVOAs - 8270 RCRA Metals
5	SWMU 5 575 Rack	7	VOAs - 8240 SVOAs - 8270 RCRA Metals
43	SWMU 43 Pest Control Shop (IR Site No. 11)	13	VOAs - 8240 SVOAs - 8270 Pesticides - 8080 Herbicides - 8150 RCRA Metals
46	SWMU 46 Montford Point Dump Site (IR Site No. 15)	9	SVOAs - 8270 RCRA Metals
53	SWMU 53 Coal Storage Area (IR Site No. 26)	15	SVOAs - 8270 RCRA Metals
89	SWMU 89 SLCH785 Basin	6	VOAs - 8240 SVOAs - 8270 RCRA Metals
253	SWMU 253 1205 Above Ground Storage Tank	2	VOAs - 8020 SVOAs - 8270 RCRA Metals
254	SWMU 254 1408 Dumpster	4	VOAs - 8240 SVOAs - 8270 RCRA Metals
255	SWMU 255 1502 Oil/Water Separator No. 1	11	VOAs - 8240 SVOAs - 8270 RCRA Metals
256	SWMU 256 1700 Oil/Water Separator No. 1	8	VOAs - 8240 SVOAs - 8270
257	SWMU 257 1700 Oil/Water Separator No. 2	9	VOAs - 8240 SVOAs - 8270
258	SWMU 258 S1745 Oil/Water Separator	12	VOAs - 8240 SVOAs - 8270 RCRA Metals
260	SWMU 260 1780 Oil/Water Separator No. 1	6	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
261	SWMU 261 1780 Underground Storage Tank No. 1	7	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals

TABLE 3-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
262	SWMU 262 1780 Underground Storage Tank No. 2	5	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
264	SWMU 264 2611 Container	3	VOAs - 8240 SVOAs - 8270 Pesticides - 8080 RCRA Metals
265	SWMU 265 2615 Oil/Water Separator	8	VOAs - 8240 SVOAs - 8270
268	SWMU 268 522 Dumpster	2	VOAs - 8240 SVOAs - 8270 RCRA Metals
269	SWMU 269 816 Oil/Water Separator	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
272	SWMU 272 AS137 Oil/Water Separator	8	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
273	SWMU 273 BA128/BA105 Dumpster	5	VOAs - 8240 SVOAs - 8270 RCRA Metals
275	SWMU 275 BB48 Dumpster	3	VOAs - 8240 SVOAs - 8270 PCBs - 8080 RCRA Metals
276	SWMU 276 BB49 Dumpster	3	VOAs - 8240 SVOAs 8270 PCB - 8080 RCRA Metals
277	SWMU 277 FC120 Oil/Water Separator	6	VOAs - 8240 SVOAs - 8270 RCRA Metals
279	SWMU 279 FC200 Oil/Water Separator	6	VOAs - 8240 SVOAs - 8270 RCRA Metals
280	SWMU 280 FC285 Above Ground Storage Tank	2	VOAs - 8240 SVOAs - 8270 RCRA Metals

TABLE 3-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
283	SWMU 283 FC279 Release	5	VOAs - 8020/8240 SVOAs - 8270 Pesticides/PCBs - 8080 RCRA Metals
284	SWMU 284 S947 Container	3	VOAs - 8240 SVOAs - 8270 RCRA Metals
285	SWMU 285 S947 Oil/Water Separator	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
286	SWMU 286 S947 Pile	0	Included with SWMU 284
291	SWMU 291 034 Ditch	8	VOAs - 8240/8020 SVOAs - 8270 Pesticides/PCBs - 8080 RCRA Metals
292	SWMU 292 1106/1107 Above Ground Storage Tank	0	Included with SWMU 293
293	SWMU 293 1106/1107 Oil/Water Separator	7	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
294	SWMU 294 1203 Oil/Water Separator	15	VOAs - 8020 SVOAs - 8270 RCRA Metals
295	SWMU 295 1601 Above Ground Storage Tank	7	VOAs - 8020 SVOAs - 8270 RCRA Metals
296	SWMU 296 1700 Basin B	0	Included with SWMU 53
297	SWMU 297 1780 Oil/Water Separator No. 2	0	Included with SWMU 261
298	SWMU 298 1780 Oil/Water Separator No. 3	4	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
299	SWMU 299 AS114 Above Ground Storage Tank	5	VOAs - 8020 SVOAs - 8270 RCRA Metals
300	SWMU 300 AS118 Above Ground Storage Tank	6	VOAs - 8020 SVOAs - 8270 RCRA Metals

TABLE 3-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
301	SWMU 301 AS4115 Above Ground Storage Tank	6	VOAs - 8020 SVOAs - 8270 RCRA Metals
302	SWMU 302 AS563 Above Ground Storage Tank	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
303	SWMU 303 AS515 Above Ground Storage Tank	10	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
304	SWMU 304 BA103 Oil/Water Separator	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
305	SWMU 305 BB224 Pile	7	VOAs - 8020 SVOAs - 8270 Pesticides/PCBs - 8080 RCRA Metals
306	SWMU 306 FC230 Oil/Water Separator	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
307	SWMU 307 G649 Wash Rack	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
308	SWMU 308 GP109 Oil/Water Separator	10	VOAs - 8020 SVOAs - 8270 RCRA Metals
309	SWMU 309 NH118 Underground Storage Tank	8	VOAs - 8020 SVOAs - 8270 RCRA Metals
310	SWMU 310 PT33 Pond Oil/Water Separator	14	VOAs - 8240 SVOAs - 8270 Pesticide/PCB - 8080 RCRA Metals
311	SWMU 311 S1619 Oil/Water Separator	7	VOAs - 8020 SVOAs - 8270 RCRA Metals
312	SWMU 312 Oil Water Separator S-1735 (S-1698)	9	VOAs - 8020 SVOAs - 8270 RCRA Metals
313	SWMU 313 S1753 Oil/Water Separator	8	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals

TABLE 3-1 (Continued)

SUMMARY OF THE SAMPLING STRATEGY FOR THE SWMUs
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Number[a]	SWMU Name	Number of Samples	Analyses and Method[b]
314	SWMU 314 SM187 Oil/Water Separator	9	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
315	SWMU 315 SM269 Oil/Water Separator Near Building M200	8	VOAs - 8020 SVOAs - 8270 RCRA Metals
316	SWMU 316 TC773 Oil/Water Separator	8	VOAs - 8020 SVOAs - 8270 RCRA Metals
317	SWMU 317 TT2453 Release	2	VOAs - 8020/8240 SVOA - 8270 RCRA Metals
318	SWMU 318 AS515 Oil/Water Separator	5	VOAs - 8020 SVOAs - 8270 RCRA Metals
319	SWMU 319 Camp Geiger Wastewater Treatment Plant	12	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
336	SWMU 336 AS4106 Paint Stripper	(Not able to be sampled)	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
337	SWMU 337 AS518 Paint Stripper	2	VOAs - 8240/8020 SVOAs - 8270 RCRA Metals
339	SWMU 339 AS4146 Sand Blasting Area	3	VOAs - 8240 SVOAs - 8270 RCRA Metals

Notes:

[a] SWMU = solid waste management unit
[b] VOA = volatile organic analysis
SVOA = semivolatile organic analysis
PCBs = polychlorinated biphenyls
RCRA = Resource Conservation and Recovery Act

4.0 SWMU-SPECIFIC INFORMATION AND INVESTIGATION RESULTS

This section discusses the SWMU-specific information with respect to the Confirmatory Sampling Investigation. Each SWMU (or SWMU grouping) will be presented in one of 51 separate subsections in this section. The investigation activities, sample results and evaluation, and recommendations for additional investigations are discussed for each of the SWMUs. Due to the large number of individual SWMUs (62) covered under this investigation, the tables and figures associated with each SWMU or grouping are presented directly behind the SWMU text for clarity purposes. This provides the reader with a complete package of information for each SWMU or grouping.

4.1 SWMUs 2, 53, 256, 257, and 296

This section discusses a set of five separate SWMUs which are all located adjacent to one another near the coal storage area at the Hadnot Point Industrial Area. For organizational purposes, SWMU 2 will be discussed separately; SWMUs 53 and 296 will be discussed together; and SWMUs 256 and 257 will be discussed together.

4.1.1 SWMU 2 - 1700 Pond A

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.1.1.1 SWMU Description and History

SWMU 2, the 1700 Pond A, is located within the central portion of Hadnot Point Industrial Area southwest of Gum Street near SWMUs 53, 296, 256, and 257. The SWMU consists of a reinforced concrete coal settling pond (80 feet by 40 feet by 10 feet) that receives surface water runoff from SWMU 296 (Runoff Collection Basin) and SWMU 53 (Coal Storage Area). SWMU 2 has been in operation since 1985. The perimeter around the SWMU is secured with a fence and locking gate. The ground surface around the settling pond is covered with gravel.

4.1.1.2 Confirmatory Investigation Activities

An investigation was completed on September 11, 1997 at SWMU 2 to determine if the settling pond operations have impacted the soil in the vicinity of the impoundment. All field procedures were performed in accordance with the Final Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from six soil borings which were advanced adjacent to the four sides of the settling pond. Figure 1 shows the locations of the soil borings at SWMU 2. This figure also shows the boring locations associated with the other four SWMUs in the grouping. The SWMU 2 soil borings were advanced to a depth of approximately 6.0 feet below ground surface (bgs) with groundwater being encountered at approximately 5.0 feet bgs.

Six surface soil samples (SWMU2-IS01-00, SWMU2-IS02-00, SWMU2-IS03-00, SWMU2-IS04-00, SWMU2-IS05-00, and SWMU2-IS06-00) were collected at depths of 0 to 2.0 feet bgs at all six boring locations. Five subsurface soil samples were collected at 2.0 to 4.0 feet bgs (SWMU2-IS01-01, SWMU2-IS02-01, SWMU2-IS04-01, SWMU2-IS05-01 and SWMU2-IS06-01). A subsurface soil sample was not collected from soil boring SWMU2-IS03 due to a concrete obstruction encountered at 3.0 feet bgs. The surface and subsurface soil samples were analyzed for semivolatile organic analysis (SVOAs) (EPA Method 8270) and RCRA metals (EPA Method SW846-6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. In addition, a rinsate blank (371ER04B) was collected from a sampling spatula and analyzed for the same parameters as the SWMU 2 samples. All of the samples were sent to Quanterra laboratories along with trip blanks 371TB06, 371TB07, 371TB08, and 371TB09. Analytical results for the rinsate samples and the trip blank are presented in Appendix F.

4.1.1.3 Investigation Findings

As previously mentioned, six surface soil and five subsurface soil samples were collected at SWMU 2 and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- US EPA Region III Industrial/Residential Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analyses indicate positive detections of semivolatile organic compounds (SVOCs), and metals. Figure 2 presents the constituents that have concentrations that exceed the above-listed screening criteria. As shown on Table 2 and Figure 2, only one constituent, mercury, exceeded any of the screening criteria.

The only SVOC detected in the sample set was bis(2-ethylhexyl)phthalate. This SVOC was detected within two of the surface soil samples at concentrations below the screening criteria.

Three metals (chromium, lead, and mercury) were detected within the sample set. Chromium and lead were detected in all of the samples but at concentrations below the screening criteria. Mercury was detected in one sample (SWMU2-IS02-00; 0 to 2.0 feet bgs) at a concentration of 0.047 milligrams per kilogram (mg/kg) which exceeded the North Carolina Target Concentration Method I Categories S-3:G-1 of 0.0154 mg/kg.

4.1.1.4 Recommendations

No further action is recommended for SWMU 2. Mercury concentrations in only one out of eleven samples exceeded only one of the screening criteria (the North Carolina Category S-3:G-1 criteria). The infrequency of the exceedence does not justify additional sampling at this SWMU.

4.1.2 SWMUs 53 and 296 - Coal Storage Area and Runoff Collection Basin

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.1.2.1 SWMU Description and History

SWMUs 53 and 296 (1700 Basin B) are located within the central portion of the Hadnot Point Industrial Area southwest of Gum Street near SWMUs 2, 256, and 257. SWMU 53 consists of a 300-feet by 300-feet concrete pad used for the storage of coal piles (for the steam plant), and SWMU 296 is a concrete in-ground basin surrounding SWMU 53. SWMU 296 is used for the collection of surface water runoff associated with the coal storage area. Both of the SWMUs are still in operation.

4.1.2.2 Confirmatory Investigation Activities

The Confirmatory Investigation at these two SWMUs began on September 10, 1997 and ended on September 11, 1997. The purpose of the investigation was to determine if the coal management facility had impacted the soil in the nearby area. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from seven soil borings which were advanced around the perimeter of the runoff collection basin. Figure 1 shows the locations of the soil borings. The soil borings were advanced to a depth of approximately 6.0 feet bgs with groundwater being encountered at approximately 4.0 feet bgs.

Seven surface soil samples (SWMU53-IS01-00, SWMU53-IS02-00, SWMU53-IS03-00, SWMU53-IS04-00, SWMU53-IS05-00, SWMU53-IS06-00 and SWMU53-IS07-00) were collected at depths of 0 to 2.0 feet bgs at all seven boring locations. Seven subsurface soil samples were collected at 2.0 to 4.0 feet bgs (SWMU53-IS01-01, SWMU53-IS02-01, SWMU53-IS03-01, SWMU53-IS04-01, SWMU53-IS05-01, SWMU53-IS06-01, and SWMU53-IS07-01). In addition, a field duplicate sample was collected (SWMU53-IS06-01D). All soil samples were analyzed for SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846-6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. In addition, a rinsate blank (371ER04A) was collected from a sampling spatula and analyzed for the same parameters. All of the samples were sent to Quanterra laboratories along with trip blanks 371TB06, 371TB07, 371TB08, and 371TB09. The analytical results associated with the field duplicate sample are presented in Appendix E. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.1.2.3 Investigation Findings

Seven surface soil and seven subsurface soil samples were collected from SWMUs 53 and 296 and submitted for analysis. The positive detections of the analytical results are presented on Table 3. The detected analytical results were compared to the following criteria (Table 4):

- US EPA Region III Industrial/Residential Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analyses indicate positive detections of SVOCs, and metals. Figure 3 presents the constituents that have concentrations that exceed the screening criteria. As shown on Table 4 and Figure 3, only two constituents exceeded any of the screening criteria.

Seventeen SVOCs (majority polynuclear aromatic hydrocarbons [PAHs]) were detected within the sample set but at concentrations below the screening criteria. The majority of PAH detections were from surface soil samples SWMU53-IS01-00 and SWMU53-IS02-00 and from subsurface soil samples SWMU53-IS02-01 and SWMU53-IS04-01.

Six metals (arsenic, barium, chromium, lead, mercury and selenium) were detected within the surface soil (0 to 2.0 feet bgs) sample set. Mercury was detected in two samples (SWMU53-IS01-00 and SWMU53-IS02-00) at a concentration of 0.048 mg/kg and 0.038 mg/kg, respectively. Both of these concentrations exceed the North Carolina Target Concentration Method I Category S-3:G-1 of 0.0154 mg/kg. Arsenic was detected at a concentration of 6.4 mg/kg which exceeded the screening criteria.

Four metals (arsenic, chromium, lead, and selenium) were detected within the subsurface soil sample set. None of the subsurface soil sample concentrations exceeded the screening criteria.

4.1.2.4 Recommendations

No further action is recommended for SWMUs 53 and 296. Mercury concentrations in only two out of 14 samples exceeded only one of the screening criteria (the North Carolina Category S-3:G-1 criteria). In addition, arsenic concentrations in only one of 14 samples exceeded the screening criteria. The infrequency of the exceedences does not justify additional sampling at these SWMUs.

4.1.3 SWMUs 256 and 257 - Oil/Water Separators 1700-1 and 1700-2

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.1.3.1 SWMU Description and History

SWMUs 256 and 257 are located within the central portion of Hadnot Point Industrial Area southwest of Gum Street and adjacent to SWMUs 53 and 296. SWMU 256 consists of a 15 feet by 25 feet by 12 feet concrete oil/water separator structure that receives waste water/No. 6 fuel oil from the services loading area. This SWMU has been in operation since 1984. SWMU 257 consists of a 15 feet by 15 feet by 10 feet concrete soil/water separator structure that receives waste water/No. 6 and No. 2 fuel oil from the services loading area. This SWMU has been in operation since 1984. Both SWMUs are currently in operation.

4.1.3.2 Confirmatory Investigation Activities

The Confirmatory Investigation for the two SWMUs began on September 10, 1997 and ended on September 11, 1997. The purpose of the investigation was to determine if the wastewaters received from the services loading area have impacted the soil around the area. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from eight soil borings. Four borings were advanced around the perimeter of each SWMU. Figure 1 shows the locations of the soil borings. The soil borings at SWMU 256 were advanced to a depth of approximately 6.0 feet bgs with groundwater encountered at approximately 4.0 feet bgs. The soil borings at SWMU 257 were advanced to approximately 8.0 feet bgs with groundwater being encountered at approximately 6.0 feet bgs.

Eight surface soil samples (SWMU256-IS01-00, SWMU256-IS02-00, SWMU256-IS03-00, SWMU256-IS04-00, SWMU257-IS01-00, SWMU257-IS02-00, SWMU257-IS03-00, and SWMU257-IS04-00) were collected at depths of 0 to 2.0 feet bgs at all eight boring locations. A field duplicate sample was also collected (SWMU257-IS01-00D). Subsurface soil samples were

collected at all the soil boring locations. Six of the samples were collected at 2.0 to 4.0 feet bgs (SWMU256-IS01-01, SWMU256-IS02-01, SWMU256-IS03-01, SWMU256-IS04-01, SWMU257-IS01-01, and SWMU257-IS03-01), and two of the samples were collected at 4.0 to 6.0 feet bgs (SWMU257-IS02-02 and SWMU257-IS04-02). All soil samples were analyzed for volatile organic analysis (VOAs) (EPA Method 8260) and SVOAs (EPA Method 8270). The analytical results for the surface and subsurface soil samples are presented in Appendix D. The analytical results for the field duplicate area presented in Appendix E. In addition, a rinsate blank (371ER03A) was collected from a split-spoon and analyzed for the same parameters. The samples were sent to Quanterra laboratories along with trip blanks 371TB10 and 371TB11. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.1.3.3 Investigation Findings

The following subsections present the results of each SWMU (256 and 257) separately.

SWMU 256

Four surface soil and four subsurface soil samples were collected at SWMU 256 and submitted for analysis. The positive detections of the analytical results are presented on Table 5. The detected analytical results were compared to the following criteria (Table 6):

- US EPA Region III Industrial/Residential Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analysis indicate positive detections of one volatile organic compound (VOC) and 16 SVOCs. Figure 4 shows the constituents that have concentrations that exceed the screening criteria. As shown on Table 6 and Figure 4, only one constituent exceeded any of the above-listed screening criteria.

Methylene chloride was the only VOC detected in the sample set. It was detected in three surface soil and one subsurface soil samples, all at concentrations below the screening criteria.

Sixteen SVOCs (primarily all PAHs) were detected within the sample set. The majority of SVOC detections were from the surface soil samples SWMU256-IS02-00 and SWMU256-IS03-00. The detected SVOC concentrations within surface and subsurface soil samples were below screening criteria except for benzo(a)anthracene (440 micrograms per kilogram [µg/kg]) in surface soil sample SWMU256-IS02-00. This concentration exceeded the North Carolina Target Concentrations for Method I, Category S-3:G-1 of 343 µg/kg.

SWMU 257

Four surface soil and four subsurface soil samples were collected at SWMU 257 and submitted for analysis. The positive detections of the analytical results are presented on Table 7. The detected analytical results were compared to the following criteria (Table 8):

- US EPA Region III Industrial/Residential Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analysis indicate positive detections of two VOCs and eleven SVOCs. As shown on Table 8, no constituents exceeded any of the above-listed screening criteria.

The detected VOCs included acetone and toluene. The detected concentrations were below all of the screening criteria.

Eleven SVOCs (primarily all PAHs) were detected within the sample set. All of the SVOC concentrations were below the screening criteria. The majority of SVOC detections were from the surface soil samples SWMU257-IS02-00 and SWMU257-IS03-00.

4.1.3.4 Recommendations

→ you found nothing @ depth and only slightly exceeded 1 criteria in 1 sample -> do you need to sample more?

Based on the sample analytical results, limited additional investigation is recommended for SWMU 256. No further investigation is recommended for SWMU 257.

Due to the elevated concentration of benzo(a)anthracene detected in sample SWMU256-IS02-00, an additional soil boring is recommended in the vicinity of boring SWMU256-IS02 to confirm the presence of the potential SVOC contamination. Soil samples (surface and subsurface) should be collected from this additional boring and analyzed for SVOCs.

Since there were no exceedences of the screening criteria at SWMU 257, no further investigations are recommended for this SWMU.

4.1.4 Summary of Recommendations for SWMUs 2, 53, 256, 257, and 296

No further action is recommended for SWMU 2, SWMU 53, SWMU 257, and SWMU 296. A limited investigation is recommended for SWMU 256 due to the detection of the PAH, benzo(a)anthracene.

TABLE 1
DETECTION SUMMARY
SWMU02 2
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 POND A, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU2-IS01-00	SWMU2-IS01-01	SWMU2-IS02-00	SWMU2-IS02-01	SWMU2-IS03-00	SWMU2-IS04-00
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	0' - 2'
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	370 U	760 U	170 J	390 U	3000 U	360 U
METALS (mg/kg) (6010/7410)						
Chromium	10.5	8	7.2	5.1	4.6	13.8
Lead	3.6	4.2	9.5	3	2.8	1.5
Mercury	0.037 U	0.038 U	0.047	0.039 U	0.038 U	0.036 U

Notes:

ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 02
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 POND A, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU2-IS04-01	SWMU2-IS05-00	SWMU2-IS05-01	SWMU2-IS06-00	SWMU2-IS06-01
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
SEMIVOLATILES (ug/kg) (8270)					
bis(2-Ethylhexyl) phthalate	390 U	240 J	390 U	370 U	380 U
METALS (mg/kg) (6010/7410)					
Chromium	18.1	13.4	14	12.7	7.7
Lead	7.3	2.5	6.3	2.6	4.5
Mercury	0.039 U	0.04 U	0.039 U	0.037 U	0.038 U

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 02
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 POND A, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	360 U	3000 U	170 J	240 J	SWMU2-IS05-00	2/11	205	205
METALS (mg/kg) (6010/7410)								
Chromium	ND	ND	4.6	18.1	SWMU2-IS04-01	11/11	10.46	10.5
Lead	ND	ND	1.5	9.5	SWMU2-IS02-00	11/11	4.35	3.6
Mercury	0.036 U	0.04 U	0.047	0.047	SWMU2-IS02-00	1/11	0.05	0.05

Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 02 2
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 POND A, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	170 J	240 J	SWMU2-IS05-00	410000	410000	6670	0	0	0
METALS (mg/kg) (6010/7410)									
Chromium	4.6	18.1	SWMU2-IS04-01	10000	2000	27.2	0	0	0
Lead	1.5	9.5	SWMU2-IS02-00	NE	400	270.06	0	0	0
Mercury	0.047	0.047	SWMU2-IS02-00	610	122	0.0154	0	0	1

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 3
DETECTION SUMMARY
SWMU 53 and SWMU 296
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 26, COAL STORAGE AREA
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU53-IS01-00	SWMU53-IS01-01	SWMU53-IS02-00	SWMU53-IS02-01	SWMU53-IS03-00	SWMU53-IS03-01
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
SEMIVOLATILES (ug/kg) (8270)						
2-Methylnaphthalene	170 J	40 J	220 J	78 J	39 J	380 U
Acenaphthene	360 U	370 U	350 U	80 J	350 U	380 U
Anthracene	360 U	370 U	39 J	120 J	350 U	380 U
Benzo(a)anthracene	43 J	370 U	53 J	110 J	350 U	380 U
Benzo(a)pyrene	360 U	370 U	41 J	38 J	350 U	42 J
Benzo(b)fluoranthene	55 J	370 U	88 J	73 J	350 U	380 U
Benzo(ghi)perylene	360 U	370 U	55 J	370 U	350 U	380 U
Benzo(k)fluoranthene	360 U	370 U	53 J	370 U	350 U	380 U
bis(2-Ethylhexyl) phthalate	140 J	140 J	160 J	220 J	160 J	250 J
Chrysene	73 J	370 U	130 J	98 J	350 U	380 U
Dibenzofuran	360 U	370 U	56 J	84 J	350 U	380 U
Fluoranthene	74 J	45 J	60 J	310 J	51 J	47 J
Fluorene	360 U	370 U	350 U	110 J	350 U	380 U
Indeno(1,2,3-cd)pyrene	360 U	370 U	350 U	370 U	350 U	380 U
Naphthalene	86 J	370 U	110 J	64 J	350 U	380 U
Phenanthrene	170 J	370 U	210 J	540	37 J	52 J
Pyrene	49 J	370 U	72 J	310 J	350 U	42 J
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	6.4	1.1 U	2.8	1.1 U	1.1 U	1.2 U
Barium	22	22.5 U	28	22.1 U	21.3 U	23 U
Chromium	5.4	6.9	8.8	8.5	7.7	5.5
Lead	5.7	3.6	13.5	4.7	5.3	5.3
Mercury	0.048	0.037 U	0.038	0.037 U	0.035 U	0.038 U
Selenium	1.5	0.56 U	0.86	0.55 U	0.61	0.58 U

TABLE 3
DETECTION SUMMARY
SWMU 53 and SWMU 296
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 26, COAL STORAGE AREA
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU53-IS04-00	SWMU53-IS04-01	SWMU53-IS05-00	SWMU53-IS05-01	SWMU53-IS06-00	SWMU53-IS06-01
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
SEMIVOLATILES (ug/kg) (8270)						
2-Methylnaphthalene	93 J	370 U	120 J	100 J	56 J	380 U
Acenaphthene	370 U	370 U	350 U	370 U	390 U	380 U
Anthracene	370 U	370 U	350 U	370 U	390 U	380 U
Benzo(a)anthracene	100 J	370 U	20 J	33 J	390 U	380 U
Benzo(a)pyrene	100 J	370 U	53 J	41 J	48 J	380 U
Benzo(b)fluoranthene	110 J	370 U	350 U	42 J	390 U	380 U
Benzo(ghi)perylene	62 J	370 U	350 U	370 U	390 U	380 U
Benzo(k)fluoranthene	100 J	370 U	350 U	370 U	390 U	380 U
bis(2-Ethylhexyl) phthalate	120 J	110 J	250 J	240 J	100 J	120 J
Chrysene	130 J	370 U	36 J	52 J	88 J	380 U
Dibenzofuran	370 U	370 U	350 U	370 U	390 U	380 U
Fluoranthene	85 J	370 U	350 U	60 J	390 U	380 U
Fluorene	370 U	370 U	350 U	370 U	390 U	380 U
Indeno(1,2,3-cd)pyrene	53 J	370 U	350 U	370 U	390 U	380 U
Naphthalene	370 U	370 U	69 J	51 J	390 U	380 U
Phenanthrene	74 J	370 U	78 J	87 J	130 J	380 U
Pyrene	94 J	370 U	350 U	85 J	390 U	380 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	2.1	1.1 U	1.1	1.7	1.2	1.2 U
Barium	22.2 U	22.1 U	21.2 U	22.6 U	23.6 U	23.1 U
Chromium	7.4	5.1	5.8	7.1	3.8	6.6
Lead	8.3	3	4.7	5.1	3	4.6
Mercury	0.037 U	0.037 U	0.035 U	0.037 U	0.039 U	0.038 U
Selenium	0.55	0.55 U	0.53 U	0.78	0.59 U	0.58 U

TABLE 3
DETECTION SUMMARY
SWMU 53 and SWMU 296
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 26, COAL STORAGE AREA
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU53-IS07-00	SWMU53-IS07-01
DATE SAMPLED	09-11-1997	09-11-1997
DEPTH	0' - 2'	2' - 4'
SEMIVOLATILES (ug/kg) (8270)		
2-Methylnaphthalene	370 U	390 U
Acenaphthene	370 U	390 U
Anthracene	370 U	390 U
Benzo(a)anthracene	370 U	390 U
Benzo(a)pyrene	370 U	390 U
Benzo(b)fluoranthene	370 U	390 U
Benzo(ghi)perylene	370 U	390 U
Benzo(k)fluoranthene	370 U	390 U
bis(2-Ethylhexyl) phthalate	150 J	140 J
Chrysene	370 U	390 U
Dibenzofuran	370 U	390 U
Fluoranthene	370 U	390 U
Fluorene	370 U	390 U
Indeno(1,2,3-cd)pyrene	370 U	390 U
Naphthalene	370 U	390 U
Phenanthrene	370 U	390 U
Pyrene	370 U	390 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.1 U	1.2 U
Barium	22.1 U	23.4 U
Chromium	7.4	4.4
Lead	3.2	2.9
Mercury	0.037 U	0.039 U
Selenium	0.7	0.58 U

TABLE 3
DETECTION SUMMARY
SWMU 53 and SWMU 296
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 26, COAL STORAGE AREA
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
SEMIVOLATILES (ug/kg) (8270)								
2-Methylnaphthalene	370 U	390 U	39 J	220 J	SWMU53-IS02-00	9/14	101.78	93
Acenaphthene	350 U	390 U	80 J	80 J	SWMU53-IS02-01	1/14	80	80
Anthracene	350 U	390 U	39 J	120 J	SWMU53-IS02-01	2/14	79.5	79.5
Benzo(a)anthracene	350 U	390 U	20 J	110 J	SWMU53-IS02-01	6/14	59.83	48
Benzo(a)pyrene	350 U	390 U	38 J	100 J	SWMU53-IS04-00	7/14	51.86	42
Benzo(b)fluoranthene	350 U	390 U	42 J	110 J	SWMU53-IS04-00	5/14	73.6	73
Benzo(ghi)perylene	350 U	390 U	55 J	62 J	SWMU53-IS04-00	2/14	58.5	58.5
Benzo(k)fluoranthene	350 U	390 U	53 J	100 J	SWMU53-IS04-00	2/14	76.5	76.5
bis(2-Ethylhexyl) phthalate	ND	ND	100 J	250 J	SWMU53-IS03-01,SWMU53-IS05-00	14/14	164.29	145
Chrysene	350 U	390 U	36 J	130 J	SWMU53-IS02-00,SWMU53-IS04-00	7/14	86.71	88
Dibenzofuran	350 U	390 U	56 J	84 J	SWMU53-IS02-01	2/14	70	70
Fluoranthene	350 U	390 U	45 J	310 J	SWMU53-IS02-01	8/14	91.5	60
Fluorene	350 U	390 U	110 J	110 J	SWMU53-IS02-01	1/14	110	110
Indeno(1,2,3-cd)pyrene	350 U	390 U	53 J	53 J	SWMU53-IS04-00	1/14	53	53
Naphthalene	350 U	390 U	51 J	110 J	SWMU53-IS02-00	5/14	76	69
Phenanthrene	370 U	390 U	37 J	540	SWMU53-IS02-01	9/14	153.11	87
Pyrene	350 U	390 U	42 J	310 J	SWMU53-IS02-01	6/14	108.67	78.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.1	6.4	SWMU53-IS01-00	6/14	2.55	1.9
Barium	21.2 U	23.6 U	22	28	SWMU53-IS02-00	2/14	25	25
Chromium	ND	ND	3.8	8.8	SWMU53-IS02-00	14/14	6.46	6.75
Lead	ND	ND	2.9	13.5	SWMU53-IS02-00	14/14	5.21	4.7
Mercury	0.035 U	0.039 U	0.038	0.048	SWMU53-IS01-00	2/14	0.04	0.04
Selenium	0.53 U	0.59 U	0.55	1.5	SWMU53-IS01-00	6/14	0.83	0.74

TABLE 4
STATISTICAL SUMMARY
SWMU 53 and SWMU 296
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 26, COAL STORAGE AREA
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (ug/kg) (8270)									
2-Methylnaphthalene	39 J	220 J	SWMU53-IS02-00	82000000	NE	NE	0	0	0
Acenaphthene	80 J	80 J	SWMU53-IS02-01	120000000	24000000	8160	0	0	0
Anthracene	39 J	120 J	SWMU53-IS02-01	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	20 J	110 J	SWMU53-IS02-01	7800	7800	343	0	0	0
Benzo(a)pyrene	38 J	100 J	SWMU53-IS04-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	42 J	110 J	SWMU53-IS04-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	55 J	62 J	SWMU53-IS04-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	53 J	100 J	SWMU53-IS04-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	100 J	250 J	SWMU53-IS03-01,SWMU53-IS05-00	410000	410000	6670	0	0	0
Chrysene	36 J	130 J	SWMU53-IS02-00,SWMU53-IS04-00	780000	780000	38150	0	0	0
Dibenzofuran	56 J	84 J	SWMU53-IS02-01	8200000	1640000	NE	0	0	0
Fluoranthene	45 J	310 J	SWMU53-IS02-01	82000000	16400000	276080	0	0	0
Fluorene	110 J	110 J	SWMU53-IS02-01	82000000	16400000	44297	0	0	0
Indeno(1,2,3-cd)pyrene	53 J	53 J	SWMU53-IS04-00	7800	7800	NE	0	0	0
Naphthalene	51 J	110 J	SWMU53-IS02-00	200000000	16400000	584	0	0	0
Phenanthrene	37 J	540	SWMU53-IS02-01	NE	NE	59640	0	0	0
Pyrene	42 J	310 J	SWMU53-IS02-01	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.1	6.4	SWMU53-IS01-00	3.8	3.8	26.2	1	1	0
Barium	22	28	SWMU53-IS02-00	140000	28000	848	0	0	0
Chromium	3.8	8.8	SWMU53-IS02-00	10000	2000	27.2	0	0	0
Lead	2.9	13.5	SWMU53-IS02-00	NE	400	270.06	0	0	0
Mercury	0.038	0.048	SWMU53-IS01-00	610	122	0.0154	0	0	2
Selenium	0.55	1.5	SWMU53-IS01-00	10000	2000	12.2	0	0	0

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
mg/kg = milligrams per kilograms
ug/kg = micrograms per kilograms

TABLE 5
DETECTION SUMMARY
SWMU 256
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-1, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU256-IS01-00	SWMU256-IS01-01	SWMU256-IS02-00	SWMU256-IS02-01	SWMU256-IS03-00	SWMU256-IS03-01
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)						
Methylene chloride	5.2 U	5.4 U	2.1 J	3.6 J	5.3 U	5.3 J
SEMIVOLATILES (ug/kg) (8270)						
2-Methylnaphthalene	350 U	360 U	340 U	380 U	89 J	380 U
Acenaphthylene	350 U	360 U	94 J	380 U	350 U	380 U
Anthracene	350 U	360 U	210 J	380 U	38 J	36 J
Benzo(a)anthracene	350 U	360 U	440	380 U	94 J	380 U
Benzo(a)pyrene	350 U	360 U	400	380 U	110 J	380 U
Benzo(b)fluoranthene	350 U	360 U	530	380 U	150 J	380 U
Benzo(ghi)perylene	350 U	360 U	130 J	380 U	350 U	380 U
Benzo(k)fluoranthene	350 U	360 U	560	380 U	120 J	380 U
bis(2-Ethylhexyl) phthalate	130 J	190 J	120 J	120 J	200 J	180 J
Carbazole	350 U	360 U	72 J	380 U	350 U	380 U
Chrysene	350 U	360 U	580	380 U	140 J	380 U
Fluoranthene	44 J	52 J	440	49 J	150 J	67 J
Indeno(1,2,3-cd)pyrene	350 U	360 U	130 J	380 U	350 U	380 U
Naphthalene	350 U	360 U	340 U	380 U	53 J	380 U
Phenanthrene	350 U	360 U	57 J	380 U	110 J	39 J
Pyrene	350 U	360 U	530	380 U	220 J	380 U

TABLE 5
DETECTION SUMMARY
SWMU 256
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-1, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU256-IS04-00	SWMU256-IS04-01
DATE SAMPLED	09-10-1997	09-10-1997
DEPTH	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)		
Methylene chloride	3 J	1.8 J
SEMIVOLATILES (ug/kg) (8270)		
2-Methylnaphthalene	340 U	360 U
Acenaphthylene	340 U	360 U
Anthracene	340 U	360 U
Benzo(a)anthracene	340 U	360 U
Benzo(a)pyrene	42 J	360 U
Benzo(b)fluoranthene	340 U	360 U
Benzo(ghi)perylene	340 U	360 U
Benzo(k)fluoranthene	340 U	360 U
bis(2-Ethylhexyl) phthalate	160 J	180 J
Carbazole	340 U	360 U
Chrysene	340 U	360 U
Fluoranthene	340 U	360 U
Indeno(1,2,3-cd)pyrene	340 U	360 U
Naphthalene	340 U	360 U
Phenanthrene	340 U	360 U
Pyrene	340 U	360 U

TABLE 5
DETECTION SUMMARY
SWMU 256
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-1, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Methylene chloride	5.2 U	5.4 U	1.8 J	5.3 J	SWMU256-IS03-01	5/8	3.16	3
SEMIVOLATILES (ug/kg) (8270)								
2-Methylnaphthalene	340 U	380 U	89 J	89 J	SWMU256-IS03-00	1/8	89	89
Acenaphthylene	340 U	380 U	94 J	94 J	SWMU256-IS02-00	1/8	94	94
Anthracene	340 U	380 U	36 J	210 J	SWMU256-IS02-00	3/8	94.67	38
Benzo(a)anthracene	340 U	380 U	94 J	440	SWMU256-IS02-00	2/8	267	267
Benzo(a)pyrene	350 U	380 U	42 J	400	SWMU256-IS02-00	3/8	184	110
Benzo(b)fluoranthene	340 U	380 U	150 J	530	SWMU256-IS02-00	2/8	340	340
Benzo(ghi)perylene	340 U	380 U	130 J	130 J	SWMU256-IS02-00	1/8	130	130
Benzo(k)fluoranthene	340 U	380 U	120 J	560	SWMU256-IS02-00	2/8	340	340
bis(2-Ethylhexyl) phthalate	ND	ND	120 J	200 J	SWMU256-IS03-00	8/8	160	170
Carbazole	340 U	380 U	72 J	72 J	SWMU256-IS02-00	1/8	72	72
Chrysene	340 U	380 U	140 J	580	SWMU256-IS02-00	2/8	360	360
Fluoranthene	340 U	360 U	44 J	440	SWMU256-IS02-00	6/8	133.67	59.5
Indeno(1,2,3-cd)pyrene	340 U	380 U	130 J	130 J	SWMU256-IS02-00	1/8	130	130
Naphthalene	340 U	380 U	53 J	53 J	SWMU256-IS03-00	1/8	53	53
Phenanthrene	340 U	380 U	39 J	110 J	SWMU256-IS03-00	3/8	68.67	57
Pyrene	340 U	380 U	220 J	530	SWMU256-IS02-00	2/8	375	375

TABLE 6
STATISTICAL SUMMARY
SWMU 256
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-1, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Methylene chloride	1.8 J	5.3 J	SWMU256-IS03-01	760000	760000	22.1	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
2-Methylnaphthalene	89 J	89 J	SWMU256-IS03-00	82000000	NE	NE	0	0	0
Acenaphthylene	94 J	94 J	SWMU256-IS02-00	NE	NE	11360	0	0	0
Anthracene	36 J	210 J	SWMU256-IS02-00	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	94 J	440	SWMU256-IS02-00	7800	7800	343	0	0	1
Benzo(a)pyrene	42 J	400	SWMU256-IS02-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	150 J	530	SWMU256-IS02-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	130 J	130 J	SWMU256-IS02-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	120 J	560	SWMU256-IS02-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	120 J	200 J	SWMU256-IS03-00	410000	410000	6670	0	0	0
Carbazole	72 J	72 J	SWMU256-IS02-00	290000	290000	NE	0	0	0
Chrysene	140 J	580	SWMU256-IS02-00	780000	780000	38150	0	0	0
Fluoranthene	44 J	440	SWMU256-IS02-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	130 J	130 J	SWMU256-IS02-00	7800	7800	NE	0	0	0
Naphthalene	53 J	53 J	SWMU256-IS03-00	200000000	16400000	584	0	0	0
Phenanthrene	39 J	110 J	SWMU256-IS03-00	NE	NE	59640	0	0	0
Pyrene	220 J	530	SWMU256-IS02-00	61000000	12264000	286440	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms

TABLE 7
DETECTION SUMMARY
SWMU 257
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-2, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU257-IS01-00	SWMU257-IS01-02	SWMU257-IS02-00	SWMU257-IS02-01	SWMU257-IS03-00	SWMU257-IS03-01	SWMU257-IS04-00
DATE SAMPLED	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'
VOLATILES (ug/kg) (8260)							
Acetone	22 U	23 U	58	76	21 U	830	25 U
Toluene	5.5 U	5.8 U	5.3 U	1.3	5.3 U	31 U	6.4 U
SEMIVOLATILES (ug/kg) (8270)							
2-Methylnaphthalene	160 J	380 U	160 J	61 J	350 U	410 U	420 U
Benzo(a)anthracene	370 U	380 U	43 J	370 U	350 U	410 U	420 U
Benzo(a)pyrene	370 U	380 U	36 J	46 J	37 J	73 J	420 U
Benzo(b)fluoranthene	370 U	380 U	47 J	370 U	350 U	410 U	420 U
Benzo(ghi)perylene	370 U	380 U	350 U	370 U	42 J	410 U	420 U
bis(2-Ethylhexyl) phthalate	100 J	120 J	130 J	130 J	120 J	80 J	71 J
Chrysene	38 J	380 U	50 J	370 U	41 J	410 U	420 U
Fluoranthene	370 U	380 U	49 J	370 U	46 J	410 U	420 U
Naphthalene	84 J	380 U	81 J	370 U	350 U	410 U	420 U
Phenanthrene	91 J	380 U	86 J	42 J	44 J	410 U	420 U
Pyrene	40 J	380 U	55 J	370 U	43 J	410 U	420 U

TABLE 7
DETECTION SUMMARY
SWMU 257
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-2, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU257-IS04-02
DATE SAMPLED	09-11-1997
DEPTH	4' - 6'
VOLATILES (ug/kg) (8260)	
Acetone	95
Toluene	6.6 U
SEMIVOLATILES (ug/kg) (8	
2-Methylnaphthalene	440 U
Benzo(a)anthracene	440 U
Benzo(a)pyrene	440 U
Benzo(b)fluoranthene	440 U
Benzo(ghi)perylene	440 U
bis(2-Ethylhexyl) phthalate	110 J
Chrysene	440 U
Fluoranthene	440 U
Naphthalene	440 U
Phenanthrene	440 U
Pyrene	440 U

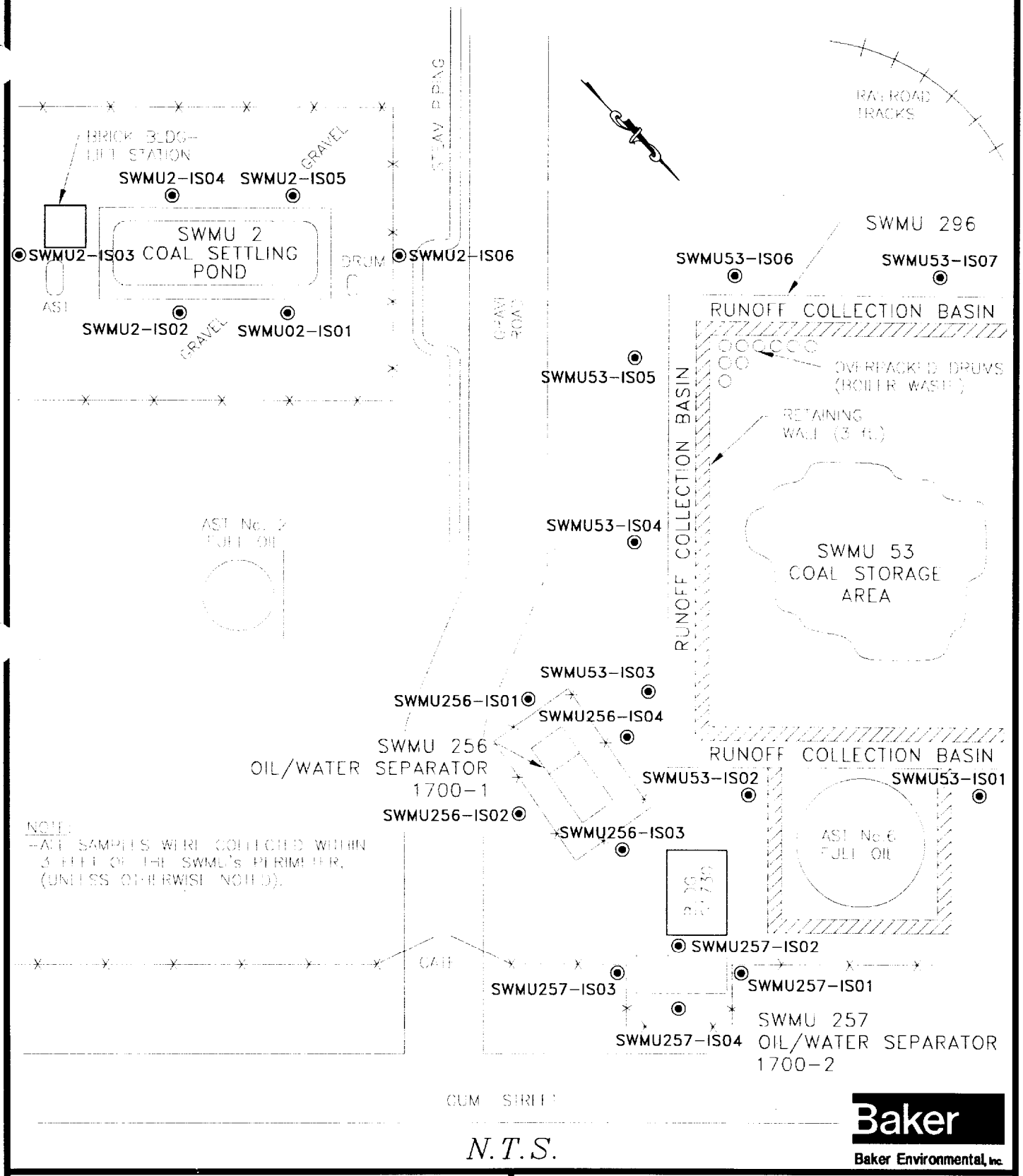
TABLE 7
DETECTION SUMMARY
SWMU 257
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-2, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	21 U	25 U	58	830	SWMU257-IS03-01	4/8	264.75	85.5
Toluene	5.3 U	31 U	1.3	1.3	SWMU257-IS02-01	1/8	1.3	1.3
SEMIVOLATILES (ug/kg) (8								
2-Methylnaphthalene	350 U	440 U	61 J	160 J	SWMU257-IS01-00,SWMU257-IS02-00	3/8	127	160
Benzo(a)anthracene	350 U	440 U	43 J	43 J	SWMU257-IS02-00	1/8	43	43
Benzo(a)pyrene	370 U	440 U	36 J	73 J	SWMU257-IS03-01	4/8	48	41.5
Benzo(b)fluoranthene	350 U	440 U	47 J	47 J	SWMU257-IS02-00	1/8	47	47
Benzo(ghi)perylene	350 U	440 U	42 J	42 J	SWMU257-IS03-00	1/8	42	42
bis(2-Ethylhexyl) phthalate	ND	ND	71 J	130 J	SWMU257-IS02-00,SWMU257-IS02-01	8/8	107.63	115
Chrysene	370 U	440 U	38 J	50 J	SWMU257-IS02-00	3/8	43	41
Fluoranthene	370 U	440 U	46 J	49 J	SWMU257-IS02-00	2/8	47.5	47.5
Naphthalene	350 U	440 U	81 J	84 J	SWMU257-IS01-00	2/8	82.5	82.5
Phenanthrene	380 U	440 U	42 J	91 J	SWMU257-IS01-00	4/8	65.75	65
Pyrene	370 U	440 U	40 J	55 J	SWMU257-IS02-00	3/8	46	43

TABLE 8
STATISTICAL SUMMARY
SWMU 257
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1700 - O/W-2, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Acetone	58	830	SWMU257-IS03-01	200000000	40000000	2810	0	0	0
Toluene	1.3	1.3	SWMU257-IS02-01	410000000	82000000	7275	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
2-Methylnaphthalene	61 J	160 J	SWMU257-IS01-00,SWMU257-IS02-00	82000000	NE	NE	0	0	0
Benzo(a)anthracene	43 J	43 J	SWMU257-IS02-00	7800	7800	343	0	0	0
Benzo(a)pyrene	36 J	73 J	SWMU257-IS03-01	780	780	NE	0	0	0
Benzo(b)fluoranthene	47 J	47 J	SWMU257-IS02-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	42 J	42 J	SWMU257-IS03-00	NE	NE	6720000	0	0	0
bis(2-Ethylhexyl) phthalate	71 J	130 J	SWMU257-IS02-00,SWMU257-IS02-01	410000	410000	6670	0	0	0
Chrysene	38 J	50 J	SWMU257-IS02-00	780000	780000	38150	0	0	0
Fluoranthene	46 J	49 J	SWMU257-IS02-00	82000000	16400000	276080	0	0	0
Naphthalene	81 J	84 J	SWMU257-IS01-00	200000000	16400000	584	0	0	0
Phenanthrene	42 J	91 J	SWMU257-IS01-00	NE	NE	59640	0	0	0
Pyrene	40 J	55 J	SWMU257-IS02-00	61000000	12264000	286440	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms



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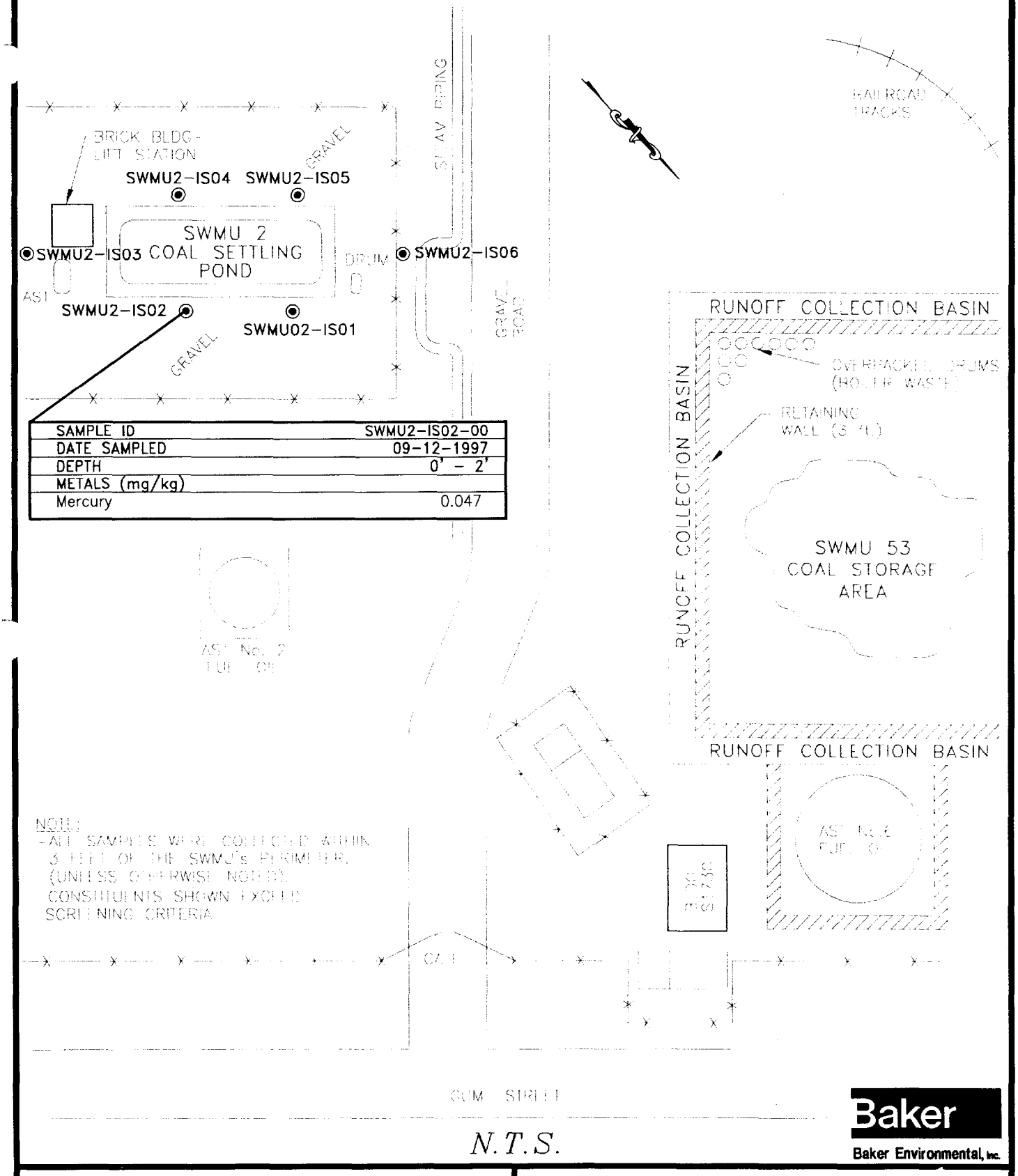
LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SAMPLE LOCATIONS
SWMUs 2, 53, 256, 257, AND 296
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



SAMPLE ID	SWMU2-IS02-00
DATE SAMPLED	09-12-1997
DEPTH	0' - 2'
METALS (mg/kg)	
Mercury	0.047

N.T.S.

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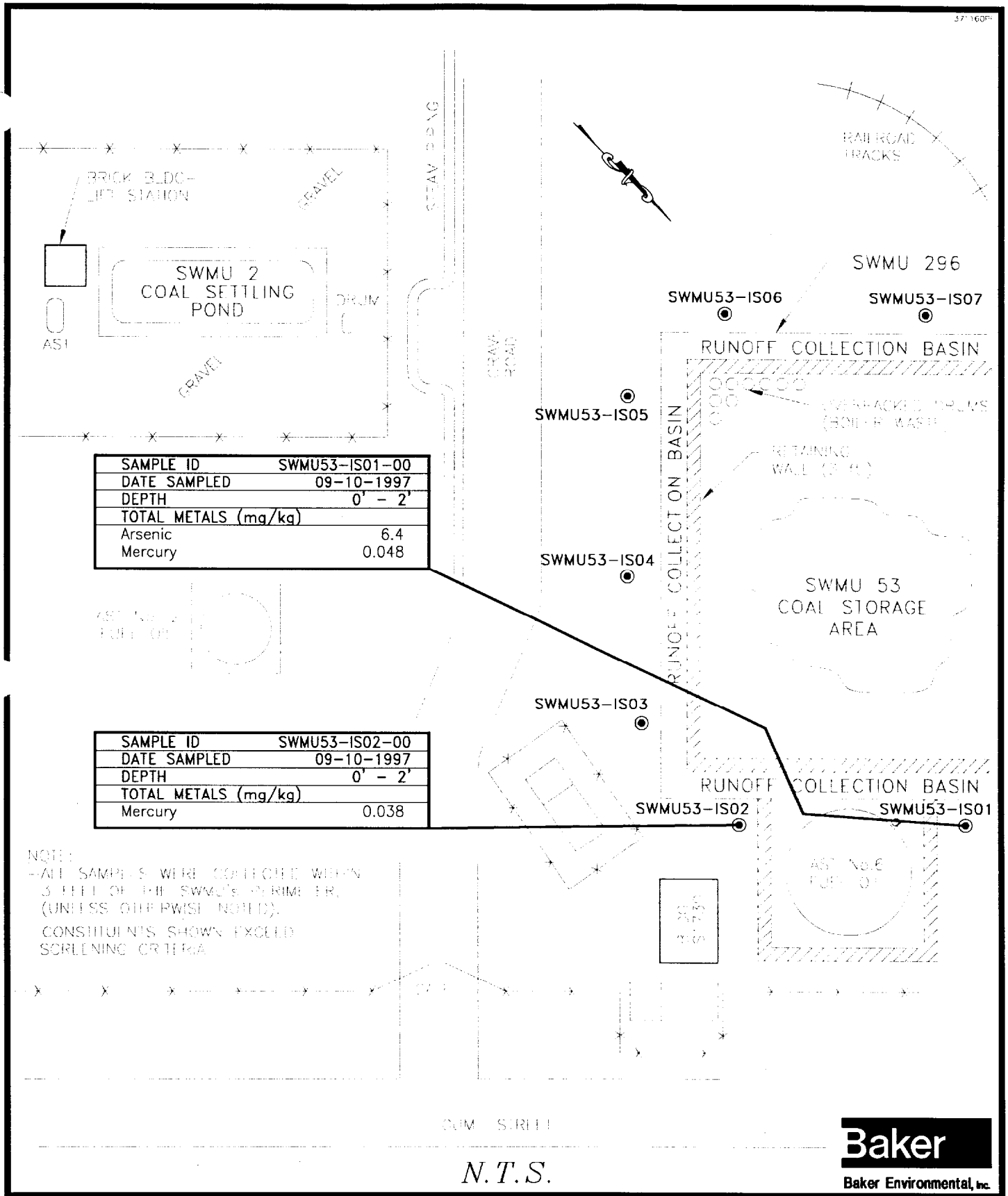
LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 2
SWMU INVESTIGATION PLAN
SWMU 2
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



SAMPLE ID	SWMU53-IS01-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Arsenic	6.4
Mercury	0.048

SAMPLE ID	SWMU53-IS02-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Mercury	0.038

NOTE:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA

N.T.S.

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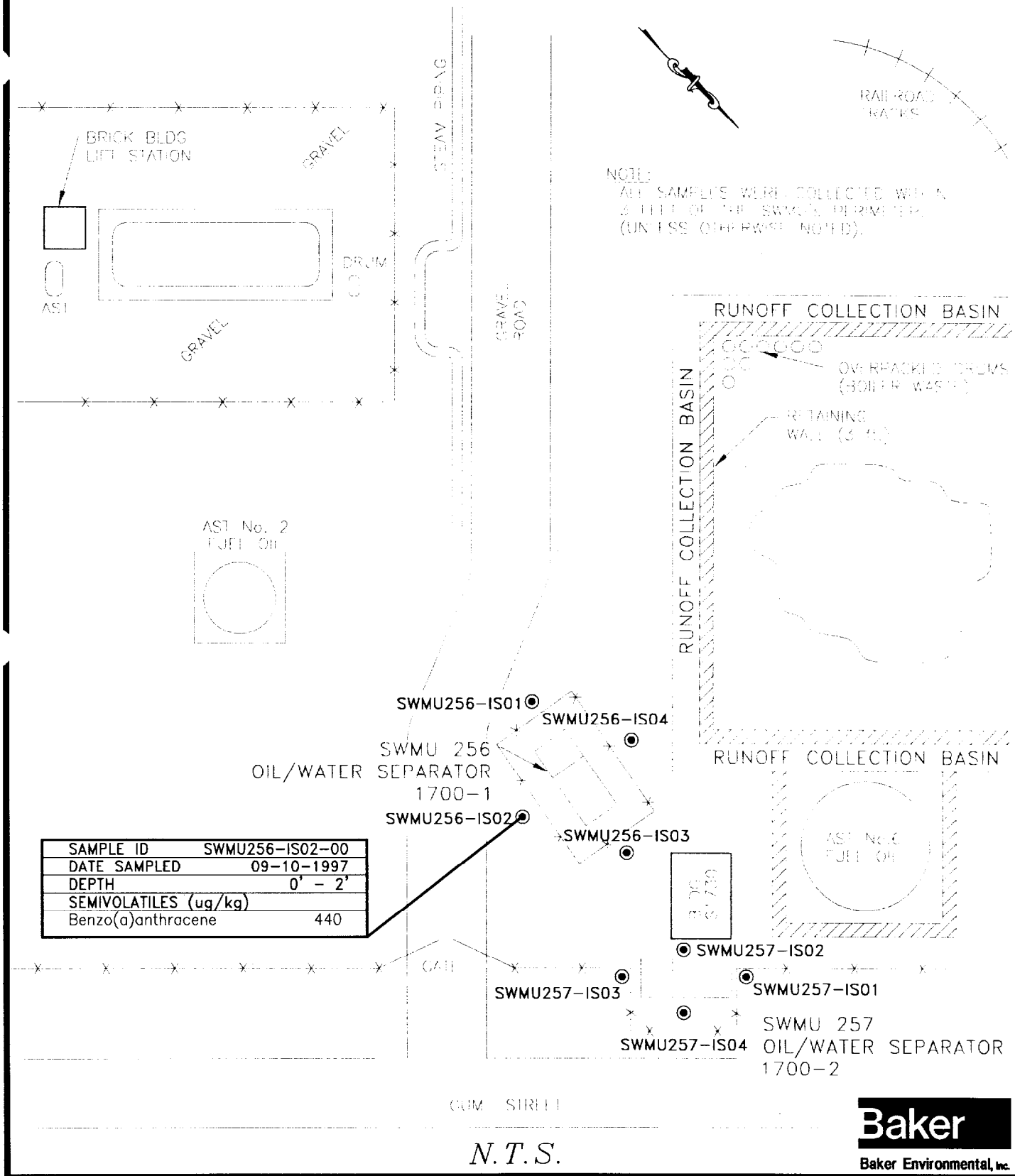
LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 3
SWMU INVESTIGATION PLAN
SWMUs 53 AND 296
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA

FIGURE 4
SWMU INVESTIGATION PLAN
SWMUs 256 AND 257
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.2 SWMU 5 - 575 Rack

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.2.1 SWMU Description and History

SWMU 5 is located within the Hadnot Point Industrial Area south of Main Service Road near Cogdels Creek. The SWMU consists of a vehicle wash rack, a wash water collection structure, an oil/water separator and associated piping. The wash rack is constructed of concrete and has the dimensions of 50-feet by 30-feet. It was constructed in the 1980s and is still in used. The perimeter around the SWMU is secured with a fence and locking gate. The ground surface around the wash rack is covered with asphalt and the wash water collection basin and an oil/water separator are in grass areas. The SWMU is used to wash vehicles, and the liquids generated drained to a collection structure and put through an oil/water separator.

4.2.2 Confirmatory Investigation Activities

An investigation was completed on September 11, 1997 at the SWMU to determine if liquid (contaminated with petroleum products) collected at the wash racks has impacted the soil in the vicinity of the oil/water separator and piping leading to the collection structure. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from three soil borings. The three soil borings were advanced adjacent to the oil/water separator and associated piping leading to the collection structure. Two of the borings were advanced along the north and southwest sides of the oil/water separator, and one soil boring was advanced adjacent to the piping. Figure 1 shows the locations of the soil borings. The soil borings were advanced to depths of approximately 14.0 feet bgs with groundwater being encountered at approximately 14.0 feet bgs.

Three surface soil samples (SWMU5-IS01-00, SWMU5-IS02-00 and SWMU5-IS03-00) were collected at depths of 0 to 2.0 feet bgs at all three boring locations. Two subsurface soil samples were collected at 10.0 to 12.0 feet bgs (SWMU5-IS02-05 and SWMU5-IS03-05), and one subsurface soil sample was collected at 12.0 to 14.0 feet bgs (SWMU5-IS01-06). In addition, a field duplicate sample was collected at a depth of 10.0 to 12.0 feet bgs (SWMU5-IS02-05D). All soil samples were analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846-6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. The analytical results for the field duplicate are presented in Appendix E. A rinsate blank (371ER04A) was collected from a sampling spatula and analyzed for the same parameters. All of the samples were sent to Quanterra laboratories along with trip blanks 371TB06, 371TB07, 371TB08, and 371TB09. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.2.3 Investigation Findings

Three surface soil and three subsurface soil samples were collected and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- US EPA Region III Industrial/Residential Risk Based Concentrations (RBCs)

- North Carolina Risk Analysis Framework, Method I, Category S-2, (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analyses indicate positive detections of VOCs, SVOCs, and metals. Figure 1 presents the constituents that have concentrations that exceed the screening criteria. As shown on Table 2 and Figure 1, only one constituent exceeded any of the screening criteria.

The SVOC bis(2-ethylhexyl)phthalate was detected within all three of the subsurface soil samples but at levels below the screening criteria.

Three metals (chromium, lead, and mercury) were detected within the sample set. Chromium and lead were detected in all of the samples at concentrations below criteria. Mercury was detected in one sample (SWMU5-IS01-06; 12.0 to 14.0 feet bgs) at a concentration of 0.055 mg/kg. This concentrations exceeds the North Carolina Target Concentrations Method I Categories S-3:G-1 and S-3:G-3 of 0.0154 mg/kg and 0.00042 mg/kg, respectively.

why was this comparison done? need to say it due to proximity to Cogdels Creek

4.2.4 Recommendations

No further action is recommended for SWMU 5. Mercury concentrations in only one of the six samples exceeded the screening criteria. The sample with the exceedence was collected at a depth of 12.0 to 14.0 feet. The infrequency of the mercury concentration exceedence and the depth of the sample does not justify additional sampling at this SWMU.

TABLE 1
DETECTION SUMMARY
SWMU 5
SWMU CONFIRMATORY SAMPLING (CTO-0371)
575 RACK, 2nd LAI, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU5-IS01-00	SWMU5-IS01-06	SWMU5-IS02-00	SWMU5-IS02-05	SWMU5-IS03-00	SWMU5-IS03-05
DATE SAMPLED	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	12' - 14'	0' - 2'	10' - 12'	0' - 2'	10' - 12'
VOLATILES (ug/kg) (8260)						
Acetone	22 U	24 U	21 U	24 U	59	24 U
Ethylbenzene	5.6 U	2.7 J	5.3 U	6.1 U	5.6 U	5.9 U
Methylene chloride	2.2 J	2.6 J	5.3 U	6.1 U	5.6 U	5.9 U
Tetrachloroethene	5.6 U	6.3	5.3 U	6.1 U	5.6 U	5.9 U
Trichloroethene	5.6 U	4 J	5.3 U	6.1 U	5.6 U	5.9 U
Xylenes (total)	5.6 U	1.9 J	5.3 U	6.1 U	5.6 U	5.9 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	370 U	350 J	350 U	76 J	370 U	65 J
TOTAL METALS (mg/kg) (6010/7410)						
Chromium	12.6	10.3	5.9	8.6	14.5	10.6
Lead	5.6	38.5	4.2	4.6	6	6.7
Mercury	0.037 U	0.055	0.035 U	0.04 U	0.037 U	0.039 U

TABLE 1
DETECTION SUMMARY
SWMU 5
SWMU CONFIRMATORY SAMPLING (CTO-0371)
575 RACK, 2nd LAI, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	21 U	24 U	59	59	SWMU5-IS03-00	1/6	59	59
Ethylbenzene	5.3 U	6.1 U	2.7 J	2.7 J	SWMU5-IS01-06	1/6	2.7	2.7
Methylene chloride	5.3 U	6.1 U	2.2 J	2.6 J	SWMU5-IS01-06	2/6	2.4	2.4
Tetrachloroethene	5.3 U	6.1 U	6.3	6.3	SWMU5-IS01-06	1/6	6.3	6.3
Trichloroethene	5.3 U	6.1 U	4 J	4 J	SWMU5-IS01-06	1/6	4	4
Xylenes (total)	5.3 U	6.1 U	1.9 J	1.9 J	SWMU5-IS01-06	1/6	1.9	1.9
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	350 U	370 U	65 J	350 J	SWMU5-IS01-06	3/6	163.67	76
TOTAL METALS (mg/kg) (6010/7410)								
Chromium	ND	ND	5.9	14.5	SWMU5-IS03-00	6/6	10.42	10.45
Lead	ND	ND	4.2	38.5	SWMU5-IS01-06	6/6	10.93	5.8
Mercury	0.035 U	0.04 U	0.055	0.055	SWMU5-IS01-06	1/6	0.06	0.06

TABLE 2
STATISTICAL SUMMARY
SWMU 5
SWMU CONFIRMATORY SAMPLING (CTO 0371)
575 RACK, 2nd LAI, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260)							
Acetone	59	59	SWMU5-IS03-00	200000000	40000000	2810	NE
Ethylbenzene	2.7 J	2.7 J	SWMU5-IS01-06	200000000	40000000	241	241000
Methylene chloride	2.2 J	2.6 J	SWMU5-IS01-06	760000	760000	22.1	17700
Tetrachloroethene	6.3	6.3	SWMU5-IS01-06	110000	110000	7.4	235
Trichloroethene	4 J	4 J	SWMU5-IS01-06	520000	520000	18.3	1510
Xylenes (total)	1.9 J	1.9 J	SWMU5-IS01-06	1000000000	200000000	4958	NE
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	65 J	350 J	SWMU5-IS01-06	410000	410000	6670	32900
TOTAL METALS (mg/kg) (6010/7410)							
Chromium	5.9	14.5	SWMU5-IS03-00	10000	2000	27.2	NE
Lead	4.2	38.5	SWMU5-IS01-06	NE	400	270.06	1130
Mercury	0.055	0.055	SWMU5-IS01-06	610	122	0.0154	0.00042

why is this added? not even mentioned in text

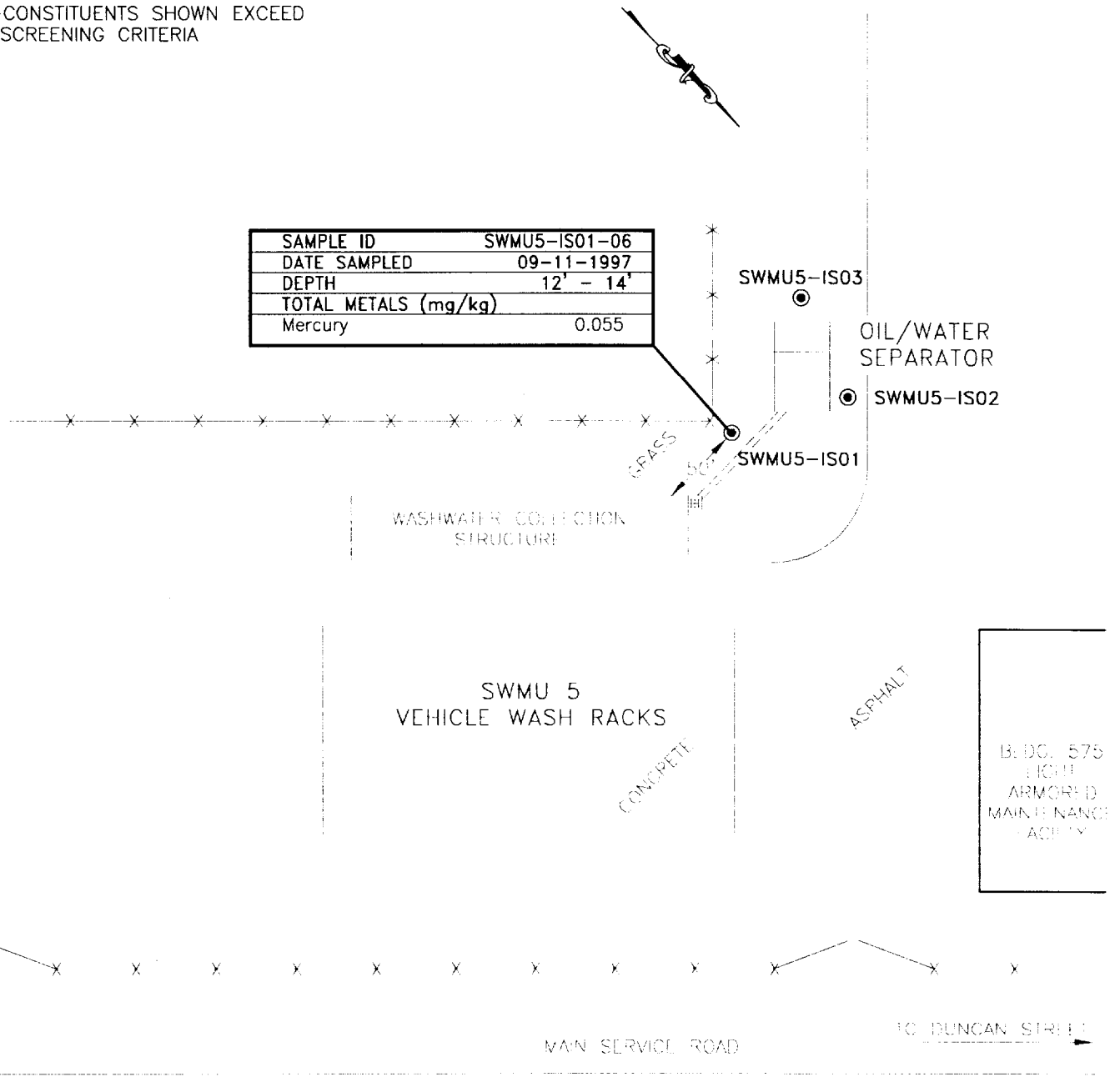
NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 5
SWMU CONFIRMATORY SAMPLING (CTO 0371)
575 RACK, 2nd LAI, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260)				
Acetone	0	0	0	0
Ethylbenzene	0	0	0	0
Methylene chloride	0	0	0	0
Tetrachloroethene	0	0	0	0
Trichloroethene	0	0	0	0
Xylenes (total)	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Chromium	0	0	0	0
Lead	0	0	0	0
Mercury	0	0	1	1

NOTES:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).

-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA



N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 5
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.3 SWMU 43 - Former IR Site No. 11; Pest Control Shop

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.3.1 SWMU Description and History

SWMU 43 is an oil water separator located east of Holcomb Boulevard, near former Installation Restoration (IR) Site 11 which is used as a control and staging area for pesticide/herbicide related operations. In addition to pesticide/herbicide storage, the IR Site 11 area is used for mixing, filling, cleaning and maintenance of equipment used for application purposes. Prior to 1976, IR Site 11 was used as a disposal area for radioactive-contaminated animal carcasses. The site was remedied of this problem in 1977.

Water used to clean the pesticide/herbicide equipment is collected in the wash area and transported via underground piping to an oil/water separator (SWMU 43). A drainage ditch is located directly south of the SWMU and would collect spilled product (if any) that may escape the collection system.

4.3.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 43 was developed to determine if the operations pertaining to the wash area and the oil/water separator have impacted surface and subsurface soils surrounding the SWMU. In addition, the investigation will determine if surface soils within the ditch immediately south of the SWMU have been contaminated.

Two samples were collected from each of four soil borings, SWMU43-IS01 through SWMU43-IS04, advanced on September 10, 1997 and three surface soil samples (SWMU43-SS01, SWMU43-SS02, and SWMU43-SS03) were collected on September 17, 1997 in the vicinity of SWMU 43. The subsurface soil samples were collected from ground surface to 2.0 feet bgs and from just above the water table at a depth of 2.0 to 4.0 feet bgs. Groundwater was encountered at 4.0 feet bgs. As depicted on Figure 1, a soil boring was advanced on each of the four sides of the oil/water separator to determine if contamination resides in the soils surrounding the SWMU.

The three additional surface soil samples were collected from the ditch located directly south of the SWMU. These surface soil samples were collected from the ground surface to 1.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270), pesticides (EPA Method 8080), herbicides (EPA Method 8150), and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Duplicate samples were collected from soil boring SWMU43-IS02 (surface sample) and SWMU43-IS04 (subsurface sample). The analytical results for the field duplicates are presented in Appendix E. Equipment rinsate blanks 371ER02B and 371ER08B were collected from a split spoon sampler and a stainless steel sampling spoon used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB05, 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.3.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the previously listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs.

Acetone and methylene chloride were the only VOCs detected in the samples collected during the confirmatory sampling investigation. Both compounds are common laboratory contaminants and neither exceeded the criteria used for comparison (see Table 2).

Benzo(a)pyrene was detected in surface soil sample SWMU43-IS01-00 at a concentration which exceeded the Region III RBCs and the North Carolina, Category S-2 Target Concentration. Benzo(a)anthracene was detected in the same surface soil sample at a concentration exceeding the North Carolina, Category S-3:G-1 Target Concentration.

Two pesticides (4,4'-DDT and chlordane) were detected at a concentration which exceeded the comparison criteria. The 4,4'-DDT concentration was detected in excess of the Region III RBC and the North Carolina, Category S-2 Target Concentration in sample SWMU43-IS01-00. Chlordane was detected in excess of the North Carolina, Category S-3:G-1 Target Concentration in five samples. Chlordane was detected in samples SWMU43-IS02-00, -IS02-01, -IS03-00, -IS03-01, and -SS03-00 at a concentration which exceeded the target concentration. No herbicides were detected at a concentration that exceeded the comparison criteria.

Metals which exceeded comparison criteria include arsenic, chromium and mercury. Arsenic concentrations exceeded the Region III RBC and the North Carolina, Category S-2 Target Concentration in samples SWMU43-IS01-00 and SWMU43-IS02-00. The chromium concentration in sample SWMU43-IS02-00 and the mercury concentration detected in SWMU43-SS01-00 exceeded the target concentration established for North Carolina, Category S-3:G-1.

4.3.4 Recommendations

In summary, the surface soil sample collected from soil boring SWMU43-IS01 was the most contaminated sample at the site (Table 1). As shown on Figure 1, the sample was obtained from the boring located between the wash area (where equipment is cleaned) and the oil/water separator (SWMU 43). An additional investigation is recommended for SWMU 43 and should include soil samples in the vicinity of SWMU43-IS01 and installation of temporary groundwater monitoring wells for the purpose of collecting groundwater samples. Samples collected during this additional investigation should be analyzed for SVOAs, pesticides, and metals.

be more specific
. # samples
. types of analyses.

TABLE 1
DETECTION SUMMARY
SWMU 43
SWMU CONFIRMATORY SAMPLING, CTO-0371
IR NUMBER 11, PEST CONTROL SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU43-IS01-00	SWMU43-IS01-01	SWMU43-IS02-00	SWMU43-IS02-01	SWMU43-IS03-00	SWMU43-IS03-01
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)						
Acetone	23 U	12 J	24 U	190	2700	21 U
Methylene chloride	5.8 U	5.8 U	1.9 J	3.4 J	1.9 J	2.5 J
SEMIVOLATILES (ug/kg) (8270)						
Anthracene	150 J	380 U	390 U	390 U	360 U	340 U
Benzo(a)anthracene	940 J	380 U	390 U	390 U	360 U	340 U
Benzo(a)pyrene	910 J	380 U	390 U	390 U	360 U	340 U
Benzo(b)fluoranthene	660 J	380 U	390 U	390 U	360 U	340 U
Benzo(ghi)perylene	440 J	380 U	390 U	390 U	360 U	340 U
Benzo(k)fluoranthene	990 J	380 U	390 U	390 U	360 U	340 U
bis(2-Ethylhexyl) phthalate	390 J	380 U	390 U	390 U	45 J	340 U
Butyl benzyl phthalate	390 U	380 U	390 U	390 U	360 U	340 U
Carbazole	140 J	380 U	390 U	390 U	360 U	340 U
Chrysene	1100 J	380 U	390 U	390 U	360 U	340 U
Dibenz(a,h)anthracene	120 J	380 U	390 U	390 U	360 U	340 U
Fluoranthene	1500	380 U	390 U	390 U	360 U	340 U
Fluorene	39 J	380 U	390 U	390 U	360 U	340 U
Indeno(1,2,3-cd)pyrene	470 J	380 U	390 U	390 U	360 U	340 U
Phenanthrene	670	380 U	390 U	390 U	360 U	340 U
Pyrene	580 J	380 U	390 U	390 U	360 U	340 U
PESTICIDES (ug/kg) (8080)						
4,4'-DDD	17000	42	4 U	2 U	5.9	3.5 U
4,4'-DDE	990 U	20 U	40	17	3.9	3.5 U
4,4'-DDT	25000	300	35	34	3.8 U	3.5 U
Chlordane (technical)	9900 U	200 U	110	47	400	580
HERBICIDES (ug/kg) (8050)						
Dalapon	47 U	47 U	47 U	69	44 U	42 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	3.8	2.1	4.1	3.3	1.8	2.6
Barium	39.7	31.3	24.1	23.7 U	22.1 U	20.9 U
Cadmium	2.3	0.58 U	0.59 U	0.59 U	0.55 U	0.52 U
Chromium	7.4	16.8	28.2	17.3	14.1	14.3
Lead	25.9	7.4	8.6	6.8	8	4.4
Mercury	0.039 U	0.038 U	0.039 U	0.039 U	0.036 U	0.034 U
Selenium	0.58 U	0.58 U	0.64	0.59 U	0.55 U	0.52 U

TABLE 1
DETECTION SUMMARY
SWMU 43
SWMU CONFIRMATORY SAMPLING, CTO-0371
IR NUMBER 11, PEST CONTROL SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU43-IS04-00	SWMU43-IS04-01	SWMU43-SS01-00	SWMU43-SS02-00	SWMU43-SS03-00
DATE SAMPLED	09-10-1997	09-10-1997	09-17-1997	09-17-1997	09-17-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	0' - 2'	0' - 2'
VOLATILES (ug/kg) (8260)					
Acetone	22 U	250	26 U	24 U	26 U
Methylene chloride	1.8 J	1.8 J	6.5 U	6 U	2.4 J
SEMIVOLATILES (ug/kg) (8270)					
Anthracene	370 U	380 U	430 U	400 U	420 U
Benzo(a)anthracene	370 U	380 U	430 U	400 U	420 U
Benzo(a)pyrene	370 U	380 U	430 U	400 U	420 U
Benzo(b)fluoranthene	370 U	380 U	430 U	400 U	420 U
Benzo(ghi)perylene	370 U	380 U	430 U	400 U	420 U
Benzo(k)fluoranthene	370 U	380 U	430 U	400 U	420 U
bis(2-Ethylhexyl) phthalate	370 U	380 U	59 J	100 J	190 J
Butyl benzyl phthalate	65 J	380 U	430 U	400 U	420 U
Carbazole	370 U	380 U	430 U	400 U	420 U
Chrysene	370 U	380 U	430 U	400 U	420 U
Dibenz(a,h)anthracene	370 U	380 U	430 U	400 U	420 U
Fluoranthene	370 U	380 U	430 U	400 U	420 U
Fluorene	370 U	380 U	430 U	400 U	420 U
Indeno(1,2,3-cd)pyrene	370 U	380 U	430 U	400 U	420 U
Phenanthrene	370 U	380 U	430 U	400 U	420 U
Pyrene	370 U	380 U	430 U	400 U	420 U
PESTICIDES (ug/kg) (8080)					
4,4'-DDD	1.9 U	2 U	11 U	2.1 U	8.8 U
4,4'-DDE	1.9 U	2.2	92	2.1 U	46
4,4'-DDT	1.9 U	8.1	120	2.1 U	110
Chlordane (technical)	19 U	20 U	110 U	21 U	300
HERBICIDES (ug/kg) (8050)					
Dalapon	44 U	55	52 U	48 U	51 U
TOTAL METALS (mg/kg) (6010/7410)					
Arsenic	1.1 U	1.6	2.2	2.2	1.3
Barium	22.2 U	23 U	25.8 U	31	25.7 U
Cadmium	0.55 U	0.57 U	0.65 U	0.6 U	0.64 U
Chromium	4.9	15.1	6.9	20.4	6.1
Lead	4.5	6.9	11.5	7.1	12.1
Mercury	0.037 U	0.038 U	0.048	0.04 U	0.042 U
Selenium	0.55 U	0.57 U	0.65 U	0.92	0.64 U

TABLE 1
DETECTION SUMMARY
SWMU 43
SWMU CONFIRMATORY SAMPLING, CTO-0371
IR NUMBER 11, PEST CONTROL SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	21 U	26 U	12 J	2700	SWMU43-IS03-00	4/11	788	220
Methylene chloride	5.8 U	6.5 U	1.8 J	3.4 J	SWMU43-IS02-01	7/11	2.24	1.9
SEMIVOLATILES (ug/kg) (8270)								
Anthracene	340 U	430 U	150 J	150 J	SWMU43-IS01-00	1/11	150	150
Benzo(a)anthracene	340 U	430 U	940 J	940 J	SWMU43-IS01-00	1/11	940	940
Benzo(a)pyrene	340 U	430 U	910 J	910 J	SWMU43-IS01-00	1/11	910	910
Benzo(b)fluoranthene	340 U	430 U	660 J	660 J	SWMU43-IS01-00	1/11	660	660
Benzo(ghi)perylene	340 U	430 U	440 J	440 J	SWMU43-IS01-00	1/11	440	440
Benzo(k)fluoranthene	340 U	430 U	990 J	990 J	SWMU43-IS01-00	1/11	990	990
bis(2-Ethylhexyl) phthalate	340 U	390 U	45 J	390 J	SWMU43-IS01-00	5/11	156.8	100
Butyl benzyl phthalate	340 U	430 U	65 J	65 J	SWMU43-IS04-00	1/11	65	65
Carbazole	340 U	430 U	140 J	140 J	SWMU43-IS01-00	1/11	140	140
Chrysene	340 U	430 U	1100 J	1100 J	SWMU43-IS01-00	1/11	1100	1100
Dibenz(a,h)anthracene	340 U	430 U	120 J	120 J	SWMU43-IS01-00	1/11	120	120
Fluoranthene	340 U	430 U	1500	1500	SWMU43-IS01-00	1/11	1500	1500
Fluorene	340 U	430 U	39 J	39 J	SWMU43-IS01-00	1/11	39	39
Indeno(1,2,3-cd)pyrene	340 U	430 U	470 J	470 J	SWMU43-IS01-00	1/11	470	470
Phenanthrene	340 U	430 U	670	670	SWMU43-IS01-00	1/11	670	670
Pyrene	340 U	430 U	580 J	580 J	SWMU43-IS01-00	1/11	580	580
PESTICIDES (ug/kg) (8080)								
4,4'-DDD	1.9 U	11 U	5.9	17000	SWMU43-IS01-00	3/11	5682.63	42
4,4'-DDE	1.9 U	990 U	2.2	92	SWMU43-SS01-00	6/11	33.52	28.5
4,4'-DDT	1.9 U	3.8 U	8.1	25000	SWMU43-IS01-00	7/11	3658.16	110
Chlordane (technical)	19 U	9900 U	47	580	SWMU43-IS03-01	5/11	287.4	300
HERBICIDES (ug/kg) (8050)								
Dalapon	42 U	52 U	55	69	SWMU43-IS02-01	2/11	62	62
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.1 U	1.3	4.1	SWMU43-IS02-00	10/11	2.5	2.2
Barium	20.9 U	25.8 U	24.1	39.7	SWMU43-IS01-00	4/11	31.53	31.15
Cadmium	0.52 U	0.65 U	2.3	2.3	SWMU43-IS01-00	1/11	2.3	2.3
Chromium	ND	ND	4.9	28.2	SWMU43-IS02-00	11/11	13.77	14.3
Lead	ND	ND	4.4	25.9	SWMU43-IS01-00	11/11	9.38	7.4
Mercury	0.034 U	0.042 U	0.048	0.048	SWMU43-SS01-00	1/11	0.05	0.05
Selenium	0.52 U	0.65 U	0.64	0.92	SWMU43-SS02-00	2/11	0.78	0.78

TABLE 2
STATISTICAL SUMMARY
SWMU 43
SWMU CONFIRMATORY SAMPLING, CTO-0371
IR NUMBER 11, PEST CONTROL SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

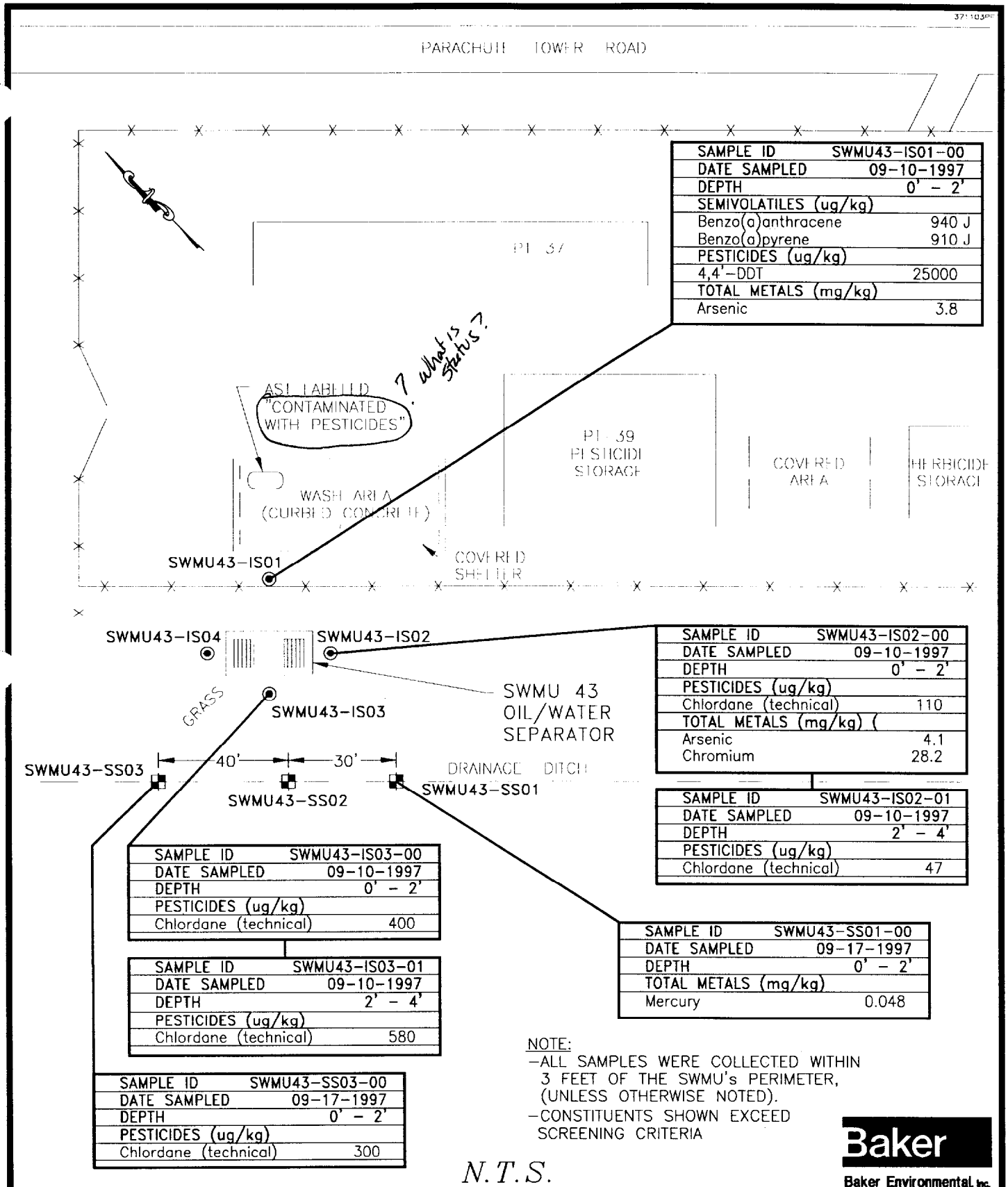
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count
VOLATILES (ug/kg) (8260)									
Acetone	12 J	2700	SWMU43-IS03-00	200000000	40000000	2810	0	0	0
Methylene chloride	1.8 J	3.4 J	SWMU43-IS02-01	760000	760000	22.1	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Anthracene	150 J	150 J	SWMU43-IS01-00	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	940 J	940 J	SWMU43-IS01-00	7800	7800	343	0	0	1
Benzo(a)pyrene	910 J	910 J	SWMU43-IS01-00	780	780	NE	1	1	0
Benzo(b)fluoranthene	660 J	660 J	SWMU43-IS01-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	440 J	440 J	SWMU43-IS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	990 J	990 J	SWMU43-IS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	45 J	390 J	SWMU43-IS01-00	410000	410000	6670	0	0	0
Butyl benzyl phthalate	65 J	65 J	SWMU43-IS04-00	410000000	82000000	27800	0	0	0
Carbazole	140 J	140 J	SWMU43-IS01-00	290000	290000	NE	0	0	0
Chrysene	1100 J	1100 J	SWMU43-IS01-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	120 J	120 J	SWMU43-IS01-00	780	780	NE	0	0	0
Fluoranthene	1500	1500	SWMU43-IS01-00	82000000	16400000	276080	0	0	0
Fluorene	39 J	39 J	SWMU43-IS01-00	82000000	16400000	44297	0	0	0
Indeno(1,2,3-cd)pyrene	470 J	470 J	SWMU43-IS01-00	7800	7800	NE	0	0	0
Phenanthrene	670	670	SWMU43-IS01-00	NE	NE	59640	0	0	0
Pyrene	580 J	580 J	SWMU43-IS01-00	61000000	12264000	286440	0	0	0
PESTICIDES (ug/kg) (8080)									
4,4'-DDD	5.9	17000	SWMU43-IS01-00	24000	24000	NE	0	0	0
4,4'-DDE	2.2	92	SWMU43-SS01-00	17000	17000	NE	0	0	0
4,4'-DDT	8.1	25000	SWMU43-IS01-00	17000	17000	NE	1	1	0
Chlordane (technical)	47	580	SWMU43-IS03-01	16000	4400	27.8	0	0	5
HERBICIDES (ug/kg) (8050)									
Dalapon	55	69	SWMU43-IS02-01	61000000	12200000	NE	0	0	0

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 43
SWMU CONFIRMATORY SAMPLING, CTO-0371
IR NUMBER 11, PEST CONTROL SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.3	4.1	SWMU43-IS02-00	3.8	3.8	26.2	2	2	0
Barium	24.1	39.7	SWMU43-IS01-00	140000	28000	848	0	0	0
Cadmium	2.3	2.3	SWMU43-IS01-00	1000	200	2.72	0	0	0
Chromium	4.9	28.2	SWMU43-IS02-00	10000	2000	27.2	0	0	1
Lead	4.4	25.9	SWMU43-IS01-00	NE	400	270.06	0	0	0
Mercury	0.048	0.048	SWMU43-SS01-00	610	122	0.0154	0	0	1
Selenium	0.64	0.92	SWMU43-SS02-00	10000	2000	12.2	0	0	0

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU43-IS01-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	940 J
Benzo(a)pyrene	910 J
PESTICIDES (ug/kg)	
4,4'-DDT	25000
TOTAL METALS (mg/kg)	
Arsenic	3.8

SAMPLE ID	SWMU43-IS02-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
PESTICIDES (ug/kg)	
Chlordane (technical)	110
TOTAL METALS (mg/kg) (	
Arsenic	4.1
Chromium	28.2

SAMPLE ID	SWMU43-IS02-01
DATE SAMPLED	09-10-1997
DEPTH	2' - 4'
PESTICIDES (ug/kg)	
Chlordane (technical)	47

SAMPLE ID	SWMU43-IS03-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
PESTICIDES (ug/kg)	
Chlordane (technical)	400

SAMPLE ID	SWMU43-IS03-01
DATE SAMPLED	09-10-1997
DEPTH	2' - 4'
PESTICIDES (ug/kg)	
Chlordane (technical)	580

SAMPLE ID	SWMU43-SS01-00
DATE SAMPLED	09-17-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Mercury	0.048

SAMPLE ID	SWMU43-SS03-00
DATE SAMPLED	09-17-1997
DEPTH	0' - 2'
PESTICIDES (ug/kg)	
Chlordane (technical)	300

NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA

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LEGEND
- ◉ SOIL BORING AND SAMPLE LOCATION
- ⊡ SURFACE SOIL LOCATION

mg/kg – MILLIGRAM/KILOGRAM
ug/kg – MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 43
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.4 SWMU 46 - Former IR Site No. 15, Montford Point Dump Site

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.4.1 SWMU Description and History

SWMU 46, also considered as Former IR Site 15, is the Montford Point Dump Site. The site was previously to be used to dispose sewage treatment sludge, among other materials such as litter, asphalt and sand. The site operated between 1948 and 1958. During Baker's site visit in October 1996, It was noted that a number of soil mounds were located throughout the site as depicted on Figure 1. However, during the confirmatory investigation conducted in September 1997, Baker personnel had noted that most of the mounded material had been removed. Unnamed dirt and gravel roads lead to a helicopter landing site located adjacent to the SWMU. The SWMU, as well as the landing site, is covered with grass and surrounded by trees.

4.4.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 46 was developed to determine if material disposed at the site during site operation or in the recent past has impacted surface and subsurface soils surrounding the SWMU.

A total of four soil borings, SWMU46-IS01 through SWMU46-IS04, were advanced on September 9, 1997 in the vicinity of the SWMU. As depicted on Figure 1, the four borings were advanced in the portion of the SWMU where the mounded material had been observed. The borings were strategically positioned to determine if contamination resides in the soils. Two samples were collected from each boring. The samples were collected from ground surface to 2.0 feet bgs and from just above the water table at a depth of 6.0 to 8.0 feet bgs. Groundwater was encountered at 9.5 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Duplicate samples were collected from soil boring SWMU46-IS04 (subsurface sample). The analytical results for the field duplicates are presented in Appendix E. Equipment rinsate blanks 371ER01B was collected from a stainless steel spatula used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report.

4.4.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1, and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminants that exceeded the previously listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs.

No SVOCs were detected at concentrations exceeding the comparison criteria. The only compound that was detected in any of the samples was bis(2-ethylhexyl)phthalate. This compound is commonly not site related and does not pose any risk to the environment at the concentrations detected in the soils from this SWMU.

Arsenic, cadmium, lead and mercury was detected in samples collected from SWMU 46 at concentrations exceeding the comparison criteria. Arsenic, detected at a concentration of 6.1 mg/kg in sample SWMU46-IS03-04, exceeded the Region III RBCs and the North Carolina, Category S-2 Target Concentration of 3.8 mg/kg. Cadmium concentrations detected in sample SWMU46-IS02-04 (4.5 mg/kg) exceeded the North Carolina, Category S-3:G-1 Target Concentration of 2.72 mg/kg. Lead was detected at a concentration of 12,300 mg/kg in sample SWMU46-IS02-04 exceeding both the North Carolina, Categories S-2 and S-3:G-1 Target Concentration by more than one order of magnitude. Mercury was detected in samples SWMU46-IS01-00 (0.048 mg/kg) and SWMU46-IS03-00 (0.053 mg/kg) at a concentration exceeding the North Carolina, Category S-3:G-1 Target Concentration.

4.4.4 Recommendations

The metals detected at this SWMU, except mercury, are commonly detected in the soils of MCB Camp Lejeune. The concentrations of lead in the subsurface soil sample from boring SWMU46-IS02 are relatively high and may warrant additional soil and groundwater samples in the vicinity of this boring. The elevated lead concentrations in this sample may be indicative of a localized area of contamination at the SWMU and therefore, it is recommended that one groundwater sample be collected in the vicinity of boring SMWU46-IS02. Additionally, another soil sample should be collected in the area to confirm the concentration of lead in the soils. The lead concentration detected in the subsurface soil sample SWMU46-IS02-04 was considerably higher than the other samples collected at the site and warrants confirmation. Any additional samples collected at this site should be analyzed for metals.

Be more specific #/type samples.

TABLE 1
DETECTION SUMMARY
SWMU 46
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 15, MONTFORD POINT DUMP SITE (1948-1958)
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU46-IS01-00	SWMU46-IS01-04	SWMU46-IS02-00	SWMU46-IS02-04	SWMU46-IS03-00	SWMU46-IS03-04	SWMU46-IS04-00
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	8' - 10'	0' - 2'	8' - 10'	0' - 2'	8' - 10'	0' - 2'
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	350 U	370 U	360 U	77 J	42 J	410 U	370 U
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.3	1.1 U	2	1.7	1.1 U	6.1	1.1
Barium	21 U	22.7 U	22 U	36.6	21.1 U	25.3	22.3 U
Cadmium	0.53 U	0.57 U	0.55 U	4.5	0.53 U	0.61 U	0.56 U
Chromium	9.3	3.5	7.1	7.4	3.5	21.5	4.1
Lead	38.6	1	8	12300	28.9	7.2	5.7
Mercury	0.048	0.037 U	0.036 U	0.037 U	0.053	0.041 U	0.037 U

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 46
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 15, MONTFORD POINT DUMP SITE (1948-1958)
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU46-IS04-04
DATE SAMPLED	09-09-1997
DEPTH	8' - 10'
SEMIVOLATILES (ug/kg) (8270)	
bis(2-Ethylhexyl) phthalate	400 U
TOTAL METALS (mg/kg) (6010/7410)	
Arsenic	1.2 U
Barium	24.2 U
Cadmium	0.61 U
Chromium	3
Lead	1.8
Mercury	0.04 U

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 46
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 15, MONTFORD POINT DUMP SITE (1948-1958)
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	350 U	410 U	42 J	77 J	SWMU46-IS02-04	2/8	59.5	59.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.1	6.1	SWMU46-IS03-04	5/8	2.44	1.7
Barium	21 U	24.2 U	25.3	36.6	SWMU46-IS02-04	2/8	30.95	30.95
Cadmium	0.53 U	0.61 U	4.5	4.5	SWMU46-IS02-04	1/8	4.5	4.5
Chromium	ND	ND	3	21.5	SWMU46-IS03-04	8/8	7.43	5.6
Lead	ND	ND	1	12300	SWMU46-IS02-04	8/8	1548.9	7.6
Mercury	0.036 U	0.041 U	0.048	0.053	SWMU46-IS03-00	2/8	0.05	0.05

Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 46
SWMU CONFIRMATORY SAMPLING (CTO-0371)
IR NUMBER 15, MONTFORD POINT DUMP SITE (1948-1958)
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	42 J	77 J	SWMU46-IS02-04	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.1	6.1	SWMU46-IS03-04	3.8	3.8	26.2	1	1	0
Barium	25.3	36.6	SWMU46-IS02-04	140000	28000	848	0	0	0
Cadmium	4.5	4.5	SWMU46-IS02-04	1000	200	2.72	0	0	1
Chromium	3	21.5	SWMU46-IS03-04	10000	2000	27.2	0	0	0
Lead	1	12300	SWMU46-IS02-04	NE	400	270.06	0	1	1
Mercury	0.048	0.053	SWMU46-IS03-00	610	122	0.0154	0	0	2

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

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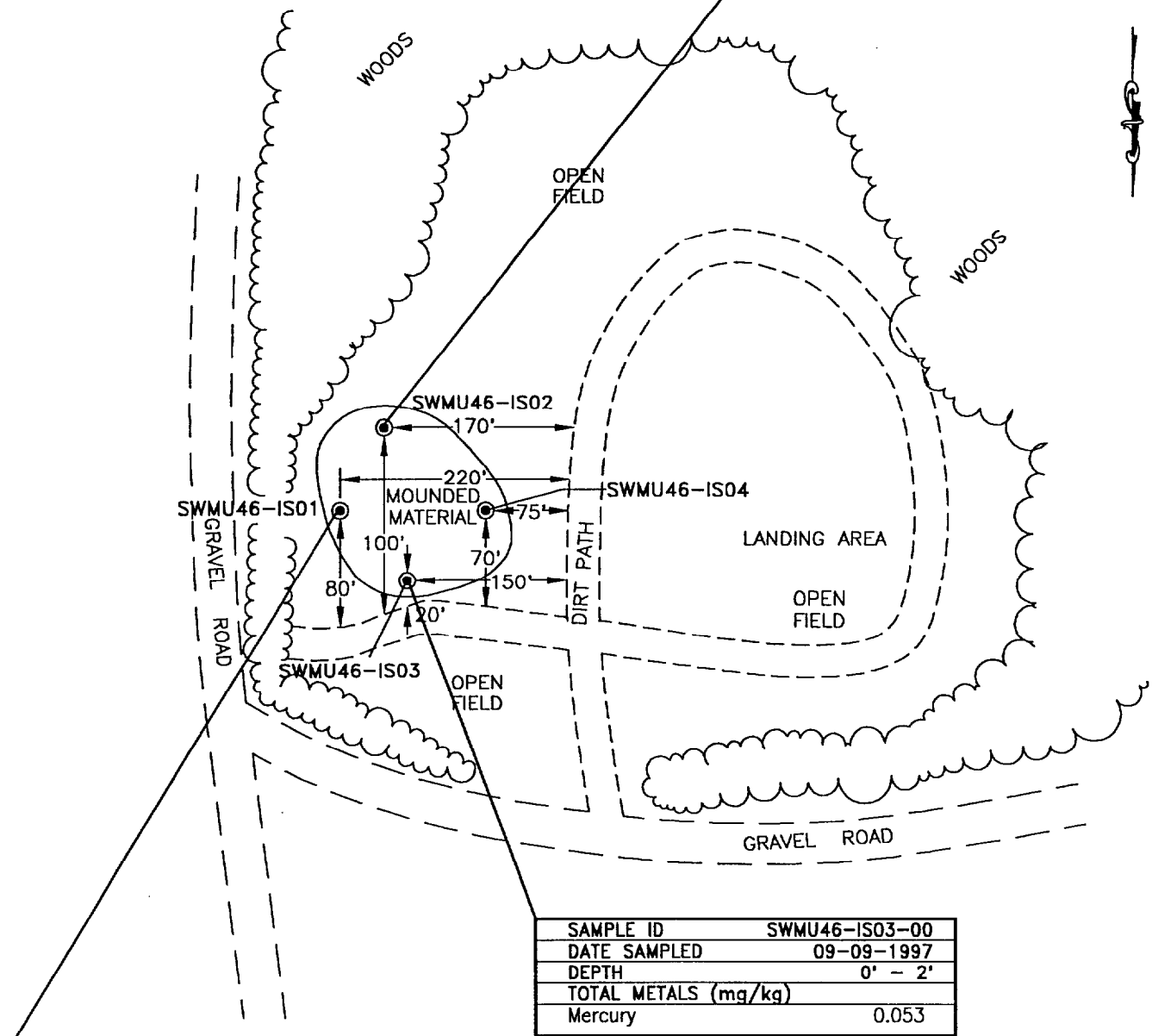
SAMPLE ID	SWMU46-IS02-04
DATE SAMPLED	09-09-1997
DEPTH	8' - 10'
TOTAL METALS (mg/kg)	
Cadmium	4.5
Lead	12300



SAMPLE ID	SWMU46-IS03-00
DATE SAMPLED	09-09-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Mercury	0.053

SAMPLE ID	SWMU46-IS01-00
DATE SAMPLED	09-09-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Mercury	0.048

SAMPLE ID	SWMU46-IS03-04
DATE SAMPLED	09-09-1997
DEPTH	8' - 10'
TOTAL METALS (mg/kg)	
Arsenic	6.1

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg MILLIGRAM/KILOGRAM

NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 46
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.5 SWMU 89 - SCCH785 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.5.1 SWMU Description and History

SWMU 89 consists of an oil/water separator that is associated with a vehicle wash rack. The SWMU is located within 1 mile of the Main Gate, just south of North Carolina State Highway 24, and east of Northeast Creek. The oil water separator is in a grassy area adjacent to a gravel parking area which is behind Building 45. The separator has dimensions of 15 feet by 10 feet, and is not currently being used. At the time of the investigation, water (with an oily sheen) was observed inside of the separator. The walls of the structure are stained. There are several monitoring wells in the vicinity of the SWMU. A site plan is presented on Figure 1.

4.5.2 Confirmatory Investigation Activities

The soil investigation for SWMU 89 was developed to determine if activities associated with the presence of the oil/water separator and wash rack impacted surface and subsurface soils in the vicinity of the SWMU.

Three borings, SWMU89-IS01, SWMU89-IS02, and SWMU89-IS03 were advanced at the SWMU on September 10, 1997 at the locations depicted on Figure 1. Two samples were collected from each boring. One sample from each boring was collected from the ground surface to 2.0 feet bgs (SWMU89-IS01-00, SWMU89-IS02-00, and SWMU89-IS03-00). From borings SWMU89-IS02, and SWMU89-IS03, samples were collected from just above the water table at a depth of 8.0 to 10.0 feet bgs (SWMU89-IS02-04 and SWMU89-IS03-04). Groundwater was encountered at a depth of approximately 10.5 feet bgs during drilling.

A strong fuel odor was observed in the soils obtained from depths of 2.0 to 6.0 feet bgs in boring SWMU89-IS01. As such, in order to more accurately characterize contamination at the site, a sample was collected from the 2.0 to 4.0 foot bgs interval (SWMU89-IS01-01) from this boring.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8260), SVOAs (USEPA Method 8270), and RCRAs metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER02B was collected from a split-spoon sampler which was used to collect soil samples from the SWMU. Results for the rinsate blank are included in Appendix F. Trip blank 371TB05 was shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.5.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)

- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

Contaminants detected at concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Eleven VOCs were detected in the samples collected during the confirmatory sampling investigation. Ten SVOCs were detected. The presence of several of these compounds (e.g., 2-butanone, 2-hexanone, acetone, bromoform, methylene chloride, and bis[2-ethylhexyl]phthalate) could possibly be attributable to sampling, decontamination, or analytical procedures. However, the presence of the remaining compounds (primarily solvents, petroleum-related compounds, and PAHs) are most likely attributable to operations/activities at the SWMU. Four metals (arsenic, barium, chromium, and lead) were detected.

Four of the detected organic compounds were present at levels exceeding the aforementioned comparison criteria. The concentration of bromoform (2.2 µg/kg in one sample (SWMU89-IS02-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (1.25 µg/kg). The concentration of ethylbenzene (470 J µg/kg and 3600 µg/kg) in two samples (SWMU89-IS02-04 and SWMU89-IS03-04, respectively) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water), Target Concentration (241 µg/kg). The concentration of methylene chloride (670 J µg/kg and 5600 µg/kg) in two samples (SWMU89-IS02-04 and SWMU89-IS03-04, respectively) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water), Target Concentration (22.1 µg/kg). The concentration of naphthalene (19000 µg/kg) in one sample (SWMU89-IS03-04) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water), Target Concentration (584 µg/kg). No other criteria for the remaining analyzed organic compounds or any of the analyzed metals were exceeded in any of the remaining samples.

4.5.4 Recommendations

Additional investigative activities are recommended at SWMU 89 to further characterize contamination which is apparently related to site operations/activities. This recommendation is predicated on the prevalence of (potentially site-related) VOCs and SVOCs, and the exceedence of applicable screening criteria. It is recommended that a minimum of three temporary monitoring well borings (with soil sample acquisition) be advanced with subsequent collection of groundwater samples. Soil and groundwater samples should be analyzed for VOAs and SVOAs. Re-sampling of existing monitoring wells (pending condition and location) should be considered to increase the amount for groundwater data available for the SWMU. If appropriate, the number of temporary monitoring wells to be installed should be reduced if groundwater samples are acquired from any of the existing monitoring wells.

TABLE 1
DETECTION SUMMARY
SWMU 89
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SLCH785-BASIN, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU89-IS01-00	SWMU89-IS01-01	SWMU89-IS02-00	SWMU89-IS02-04	SWMU89-IS03-00	SWMU89-IS03-04
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	8' - 10'	0' - 2'	8' - 10'
VOLATILES (ug/kg) (8260)						
1,1,2,2-Tetrachloroethane	5.2 U	53 U	7.1	1700 U	5.5 U	3400 U
1,1,2-Trichloroethane	5.2 U	53 U	1.9 J	1700 U	5.5 U	3400 U
2-Butanone	21 U	210 U	17 J	6800 U	22 U	14000 U
2-Hexanone	21 U	210 U	13 J	6800 U	22 U	14000 U
4-Methyl-2-pentanone	21 U	210 U	16 J	6800 U	22 U	3000 J
Acetone	21 U	210 U	23	6800 U	22 U	14000 U
Bromoform	5.2 U	53 U	2.2 J	1700 U	5.5 U	3400 U
Ethylbenzene	5.2 U	53 U	5.4 U	470 J	5.5 U	3600
Methylene chloride	1.9 J	53 U	4.3 J	670 J	3.5 J	5600
Tetrachloroethene	5.2 U	53 U	2.1 J	1700 U	5.5 U	3400 U
Xylenes (total)	5.2 U	53 U	5.4 U	1700 U	5.5 U	1100 J
SEMIVOLATILES (ug/kg) (8270)						
2-Methylnaphthalene	350 U	430 J	360 U	370	360 U	110000
Acenaphthene	350 U	180 J	360 U	85 J	360 U	3000 J
Anthracene	350 U	1800 U	360 U	75 J	360 U	1800 J
bis(2-Ethylhexyl) phthalate	89 J	460 J	96 J	220 J	73 J	7300 U
Dibenzofuran	350 U	1800 U	360 U	360 U	360 U	3000 J
Fluoranthene	46 J	230 J	52 J	55 J	48 J	1000 J
Fluorene	350 U	1800 U	360 U	130 J	360 U	5100 J
Naphthalene	350 U	250 J	360 U	98 J	360 U	19000
Phenanthrene	350 U	1800 U	360 U	310 J	360 U	13000
Pyrene	350 U	1800 U	360 U	77 J	360 U	7300 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.6	1.1 U	1.6	1.1 U	1.4	1.1 U
Barium	21 U	21.3 U	22.4	21.7 U	35.1	22 U
Chromium	6.5	3.7	5.3	3.2	5.4	4.1
Lead	4.7	41.9	5.3	6.2	8.9	3.2

TABLE 1
DETECTION SUMMARY
SWMU 89
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SLCH785-BASIN, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
1,1,2,2-Tetrachloroethane	5.2 U	3400 U	7.1	7.1	SWMU89-IS02-00	1/6	7.1	7.1
1,1,2-Trichloroethane	5.2 U	3400 U	1.9 J	1.9 J	SWMU89-IS02-00	1/6	1.9	1.9
2-Butanone	21 U	14000 U	17 J	17 J	SWMU89-IS02-00	1/6	17	17
2-Hexanone	21 U	14000 U	13 J	13 J	SWMU89-IS02-00	1/6	13	13
4-Methyl-2-pentanone	21 U	6800 U	16 J	3000 J	SWMU89-IS03-04	2/6	1508	1508
Acetone	21 U	14000 U	23	23	SWMU89-IS02-00	1/6	23	23
Bromoform	5.2 U	3400 U	2.2 J	2.2 J	SWMU89-IS02-00	1/6	2.2	2.2
Ethylbenzene	5.2 U	53 U	470 J	3600	SWMU89-IS03-04	2/6	2035	2035
Methylene chloride	53 U	53 U	1.9 J	5600	SWMU89-IS03-04	5/6	1255.94	4.3
Tetrachloroethene	5.2 U	3400 U	2.1 J	2.1 J	SWMU89-IS02-00	1/6	2.1	2.1
Xylenes (total)	5.2 U	1700 U	1100 J	1100 J	SWMU89-IS03-04	1/6	1100	1100
SEMIVOLATILES (ug/kg) (8270)								
2-Methylnaphthalene	350 U	360 U	370	110000	SWMU89-IS03-04	3/6	36933.33	430
Acenaphthene	350 U	360 U	85 J	3000 J	SWMU89-IS03-04	3/6	1088.33	180
Anthracene	350 U	1800 U	75 J	1800 J	SWMU89-IS01-01,SWMU89-IS03-04	2/6	937.5	937.5
bis(2-Ethylhexyl) phthalate	7300 U	7300 U	73 J	460 J	SWMU89-IS01-01	5/6	187.6	96
Dibenzofuran	350 U	1800 U	3000 J	3000 J	SWMU89-IS03-04	1/6	3000	3000
Fluoranthene	ND	ND	46 J	1000 J	SWMU89-IS03-04	6/6	238.5	53.5
Fluorene	350 U	1800 U	130 J	5100 J	SWMU89-IS03-04	2/6	2615	2615
Naphthalene	350 U	360 U	98 J	19000	SWMU89-IS03-04	3/6	6449.33	250
Phenanthrene	350 U	1800 U	310 J	13000	SWMU89-IS03-04	2/6	6655	6655
Pyrene	350 U	7300 U	77 J	77 J	SWMU89-IS02-04	1/6	77	77
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.1 U	1.4	1.6	SWMU89-IS01-00,SWMU89-IS02-00	3/6	1.53	1.6
Barium	21 U	22 U	22.4	35.1	SWMU89-IS03-00	2/6	28.75	28.75
Chromium	ND	ND	3.2	6.5	SWMU89-IS01-00	6/6	4.7	4.7
Lead	ND	ND	3.2	41.9	SWMU89-IS01-01	6/6	11.7	5.75

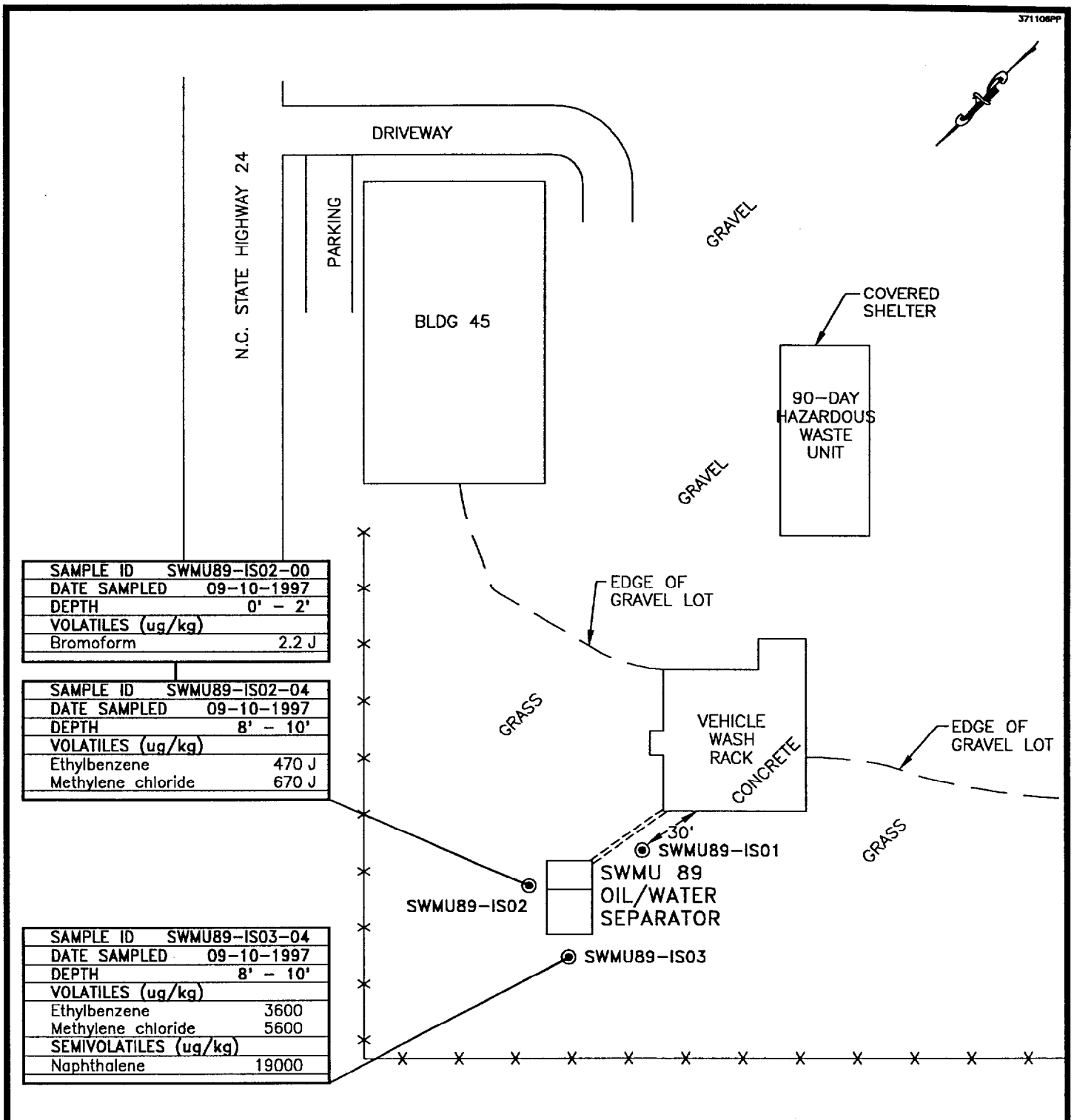
TABLE 2
STATISTICAL SUMMARY
SWMU 89
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SLCH785-BASIN, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260)							
1,1,2,2-Tetrachloroethane	7.1	7.1	SWMU89-IS02-00	29000	29000	NE	151
1,1,2-Trichloroethane	1.9 J	1.9 J	SWMU89-IS02-00	100000	100000	NE	584
2-Butanone	17 J	17 J	SWMU89-IS02-00	1000000000	200000000	692	NE
2-Hexanone	13 J	13 J	SWMU89-IS02-00	82000000	NE	NE	NE
4-Methyl-2-pentanone	16 J	3000 J	SWMU89-IS03-04	NE	NE	NE	NE
Acetone	23	23	SWMU89-IS02-00	200000000	40000000	2810	NE
Bromoform •	2.2 J	2.2 J	SWMU89-IS02-00	720000	720000	1.25	1250
Ethylbenzene •	470 J	3600	SWMU89-IS03-04	200000000	40000000	241	241000
Methylene chloride •	1.9 J	5600	SWMU89-IS03-04	760000	760000	22.1	17700
Tetrachloroethene	2.1 J	2.1 J	SWMU89-IS02-00	110000	110000	7.4	235
Xylenes (total)	1100 J	1100 J	SWMU89-IS03-04	1000000000	200000000	4958	NE
SEMIVOLATILES (ug/kg) (8270)							
2-Methylnaphthalene	370	110000	SWMU89-IS03-04	82000000	NE	NE	NE
Acenaphthene	85 J	3000 J	SWMU89-IS03-04	120000000	24000000	8160	174000
Anthracene	75 J	1800 J	SWMU89-IS01-01,SWMU89-IS03-04	610000000	122000000	995000	306000
bis(2-Ethylhexyl) phthalate	73 J	460 J	SWMU89-IS01-01	410000	410000	6670	32900
Dibenzofuran	3000 J	3000 J	SWMU89-IS03-04	8200000	1640000	NE	NE
Fluoranthene	46 J	1000 J	SWMU89-IS03-04	82000000	16400000	276080	131000
Fluorene	130 J	5100 J	SWMU89-IS03-04	82000000	16400000	44297	150000
Naphthalene •	98 J	19000	SWMU89-IS03-04	200000000	16400000	584	NE
Phenanthrene	310 J	13000	SWMU89-IS03-04	NE	NE	59640	NE
Pyrene	77 J	77 J	SWMU89-IS02-04	61000000	12264000	286440	109000
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.4	1.6	SWMU89-IS01-00,SWMU89-IS02-00	3.8	3.8	26.2	65.5
Barium	22.4	35.1	SWMU89-IS03-00	140000	28000	848	NE
Chromium	3.2	6.5	SWMU89-IS01-00	10000	2000	27.2	NE
Lead	3.2	41.9	SWMU89-IS01-01	NE	400	270.06	1130

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
mg/kg = milligrams per kilograms
ug/kg = micrograms per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 89
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SLCH785-BASIN, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceed Count
VOLATILES (ug/kg) (8260)				
1,1,2,2-Tetrachloroethane	0	0	0	0
1,1,2-Trichloroethane	0	0	0	0
2-Butanone	0	0	0	0
2-Hexanone	0	0	0	0
4-Methyl-2-pentanone	0	0	0	0
Acetone	0	0	0	0
Bromoform	0	0	1	0
Ethylbenzene	0	0	2	0
Methylene chloride	0	0	2	0
Tetrachloroethene	0	0	0	0
Xylenes (total)	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
2-Methylnaphthalene	0	0	0	0
Acenaphthene	0	0	0	0
Anthracene	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0
Dibenzofuran	0	0	0	0
Fluoranthene	0	0	0	0
Fluorene	0	0	0	0
Naphthalene	0	0	1	0
Phenanthrene	0	0	0	0
Pyrene	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Barium	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0



NOTES:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).

-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 89
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.6 SWMU 253 - 1205 Aboveground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.6.1 SWMU Description and History

SWMU 253 is the former location of a steel, 500-gallon aboveground storage tank (AST). The tank, which previously stored used oil was located south of the intersection of Birch and Hammond Roads in Hadnot Point, in a fenced-in, asphalt parking lot behind Building 1205. No evidence of contamination/spills were observed at the SWMU during the investigation. A site plan is presented on Figure 1.

4.6.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 253 was developed to determine if the presence of the former AST (e.g., spills, overfills, leaks, etc.) impacted surface and subsurface soils surrounding the SWMU.

One boring, SWMU253-IS01 was advanced at the SWMU on September 10, 1997. As depicted on Figure 1, the soil boring was advanced in the general vicinity of the former AST location. Two samples were collected from the boring. The samples were collected from the ground surface to 2.0 feet bgs (SWMU253-IS01-00), and from just above the water table at a depth of 8.0 to 10.0 feet bgs (SWMU253-IS01-04). Groundwater was encountered at a depth of approximately 11.0 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8260), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER07B was collected from a stainless steel sampling spatula used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB10 and 371TB11 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.6.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

No VOCs were detected in the samples collected during the confirmatory sampling investigation. A total of 13 SVOCs (primarily PAHs) were detected in the samples. These compounds are possibly

attributable to the presence of the asphalt which was penetrated by the boring. Three different metals (arsenic, chromium, and lead) were detected. None of the detected compounds/analytes were present at levels exceeding the aforementioned comparison criteria.

4.6.4 Recommendations

No further action is recommended at SWMU 253. No VOCs were detected and the SVOCs and metals that were detected in the samples collected from SWMU 253 did not exceed any of the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 253
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1205 - AST, H and S COMPANY HQSVC CO 2D MEF
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU253-IS01-00	SWMU253-IS01-04
DATE SAMPLED	09-15-1997	09-15-1997
DEPTH	0' - 2'	8' - 10'
VOLATILES (ug/kg) (8020)	ND	ND
SEMIVOLATILES (ug/kg) (8270)		
Anthracene	23 J	74 J
Benzo(a)anthracene	88 J	150 J
Benzo(a)pyrene	84 J	79 J
Benzo(b)fluoranthene	110 J	140 J
Benzo(ghi)perylene	67 J	58 J
Benzo(k)fluoranthene	110 J	93 J
bis(2-Ethylhexyl) phthalate	88 J	140 J
Carbazole	350 U	110 J
Chrysene	130 J	180 J
Fluoranthene	320 J	670
Indeno(1,2,3-cd)pyrene	68 J	59 J
Phenanthrene	190 J	400
Pyrene	220 J	450
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.1 U	3.2
Chromium	5.4	5.3
Lead	1.8	2.6

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 253
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1205 - AST, H and S COMPANY HQSVC CO 2D MEF
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/2	ND	ND
SEMIVOLATILES (ug/kg) (8270)								
Anthracene	ND	ND	23 J	74 J	SWMU253-IS01-04	2/2	48.5	48.5
Benzo(a)anthracene	ND	ND	88 J	150 J	SWMU253-IS01-04	2/2	119	119
Benzo(a)pyrene	ND	ND	79 J	84 J	SWMU253-IS01-00	2/2	81.5	81.5
Benzo(b)fluoranthene	ND	ND	110 J	140 J	SWMU253-IS01-04	2/2	125	125
Benzo(ghi)perylene	ND	ND	58 J	67 J	SWMU253-IS01-00	2/2	62.5	62.5
Benzo(k)fluoranthene	ND	ND	93 J	110 J	SWMU253-IS01-00	2/2	101.5	101.5
bis(2-Ethylhexyl) phthalate	ND	ND	88 J	140 J	SWMU253-IS01-04	2/2	114	114
Carbazole	350 U	350 U	110 J	110 J	SWMU253-IS01-04	1/2	110	110
Chrysene	ND	ND	130 J	180 J	SWMU253-IS01-04	2/2	155	155
Fluoranthene	ND	ND	320 J	670	SWMU253-IS01-04	2/2	495	495
Indeno(1,2,3-cd)pyrene	ND	ND	59 J	68 J	SWMU253-IS01-00	2/2	63.5	63.5
Phenanthrene	ND	ND	190 J	400	SWMU253-IS01-04	2/2	295	295
Pyrene	ND	ND	220 J	450	SWMU253-IS01-04	2/2	335	335
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.1 U	3.2	3.2	SWMU253-IS01-04	1/2	3.2	3.2
Chromium	ND	ND	5.3	5.4	SWMU253-IS01-00	2/2	5.35	5.35
Lead	ND	ND	1.8	2.6	SWMU253-IS01-04	2/2	2.2	2.2

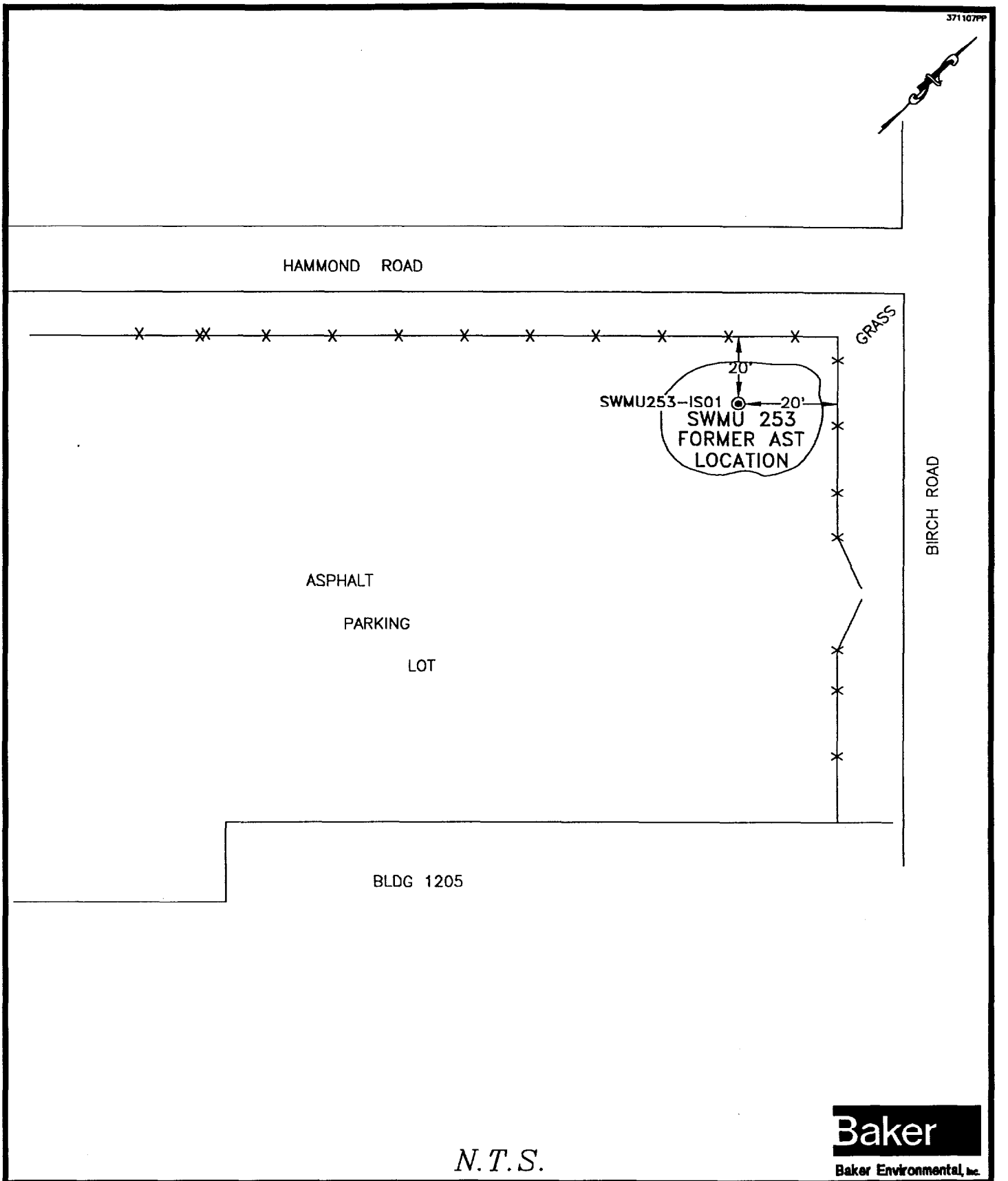
Notes:

ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 253
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1205 - AST, H and S COMPANY HQSVC CO 2D MEF
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (ug/kg) (8270)									
Anthracene	23 J	74 J	SWMU253-IS01-04	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	88 J	150 J	SWMU253-IS01-04	7800	7800	343	0	0	0
Benzo(a)pyrene	79 J	84 J	SWMU253-IS01-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	110 J	140 J	SWMU253-IS01-04	7800	7800	NE	0	0	0
Benzo(ghi)perylene	58 J	67 J	SWMU253-IS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	93 J	110 J	SWMU253-IS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	88 J	140 J	SWMU253-IS01-04	410000	410000	6670	0	0	0
Carbazole	110 J	110 J	SWMU253-IS01-04	290000	290000	NE	0	0	0
Chrysene	130 J	180 J	SWMU253-IS01-04	780000	780000	38150	0	0	0
Fluoranthene	320 J	670	SWMU253-IS01-04	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	59 J	68 J	SWMU253-IS01-00	7800	7800	NE	0	0	0
Phenanthrene	190 J	400	SWMU253-IS01-04	NE	NE	59640	0	0	0
Pyrene	220 J	450	SWMU253-IS01-04	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	3.2	3.2	SWMU253-IS01-04	3.8	3.8	26.2	0	0	0
Chromium	5.3	5.4	SWMU253-IS01-00	10000	2000	27.2	0	0	0
Lead	1.8	2.6	SWMU253-IS01-04	NE	400	270.06	0	0	0

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

NOTE: NO SCREENING CRITERIA WERE EXCEEDED.

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 253
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.7 SWMU 254 - 1408 Dumpster

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.7.1 SWMU Description and History

SWMU 254 is a dumpster identified in the RFA Report (EnSafe, 1996) as containing unpunched paint cans and approximately one gallon of Citrakleen. During the Baker site visit (October 1996), the dumpster could not be located. Since all dumpsters at the Base are emptied on a weekly basis, the materials observed during the EnSafe site visit were probably removed from the container within a week of their observation. Building 1408 is located west of the assumed location of the dumpster, and a drainage ditch is west of the dumpster location.

4.7.2 Confirmatory Investigation Activities

The soil investigation at SWMU 254 was confined to one soil boring located at the assumed dumpster location to confirm the apparent absence of impact on the soils in the area. A surface soil sample was collected from the drainage ditch west of the dumpster location to characterize any potential impact on the ditch from any contents that may have leaked from the former dumpster.

One soil boring, SWMU254-IS01, was advanced at the SWMU on September 12, 1997. A surface and subsurface sample was collected from this boring. An additional surface soil sample was collected in the drainage ditch near the dumpster. Figure 1 presents the locations of the soil boring and surface soil sample. Two surface soil and one subsurface soil samples were collected and submitted for analysis. A duplicate subsurface sample was also collected from soil boring SWMU254-IS01. The surface soil samples were collected from ground surface to 2.0 feet bgs and the subsurface soil sample was collected from above the water table at a depth of 6.0 to 8.0 feet bgs. Groundwater was encountered at a depth of 9.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER05A, associated with September 12th sample collection, was collected from a stainless steel spatula. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB10 and 371TB11 were shipped with the VOA fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.7.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

No VOCs were detected above comparison criterions.

The SVOCs which exceeded comparison criteria were benzo(a)anthracene (SWMU254-IS01-00, 6000 µg/kg and SWMU254-SS01-00, 370 µg/kg), benzo(a)pyrene (SWMU254-IS01-00, 9,000 µg/kg), benzo(a)fluoranthene (SWMU254-IS01-00, 15000 µg/kg) and dibenzo(a,h)anthracene (SWMU254-IS01-00; 2800 µg/kg). Benzo(a)anthracene exceeded the North Carolina Category S-3:G-1 Target Concentration of 343 µg/kg. Benzo(a)pyrene exceeded the Region III Industrial RBC (780 µg/kg) and the North Carolina Category S-2 Target Concentration (780 µg/kg). Benzo(a)fluoranthene exceeded the Region III Industrial RBC (7800 µg/kg) and the North Carolina Category S-2 Target Concentration (7800 µg/kg). Dibenzo(a,h)anthracene exceeded the Region III Industrial RBC (780 µg/kg) and the North Carolina Category S-2 Target Concentration (780 µg/kg). These compounds were not detected in the rinsate blank for the day's sampling.

Mercury was the only metal detected above comparison criteria. Mercury was detected in samples SWMU254-IS01-00 (0.067 mg/kg) and SWMU254-SS01-00 (0.062 mg/kg), and exceeded the North Carolina Category S-3:G-1 Target Concentration of 0.0154 mg/kg. No metals were detected in the rinsate blank for this day's sampling.

Soil boring SWMU254-IS01 and surface soil sample SWMU254-SS01 exhibited organic and metal constituents in exceedence of the Region III Industrial RBCs, the North Carolina Category S-2 Target Concentrations and/or the North Carolina Category S-3:G-1 Target Concentration comparison criteria. Refer to Figure 1 for the location of boring SWMU254-IS01 and surface soil sample SWMU254-SS01.

4.7.4 Recommendations

Additional investigation activities are recommended for SWMU 254. This activity should consist of a minimum of four soil borings north, east and west of boring SWMU254-IS01(further out than the Phase I soil borings), and up and down gradient in the drainage ditch from sample location SWMU254-SS01 to confirm and define the contamination. A surface and subsurface soil sample would be collected from each boring. Additionally, a minimum of two temporary groundwater monitoring wells would be installed. One monitoring well would be north of soil boring SWMU254-IS01 and the second well would be south/southeast of soil boring SWMU254-IS01. Soil and groundwater samples collected during this additional investigation would be analyzed for SVOAs and metals.

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TABLE 1
DETECTION SUMMARY
SWMU 254
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1408 DUMPSTER, BASE MOTOR TRANSPORT
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU254-IS01-00	SWMU254-IS01-03	SWMU254-SS01-00
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'
VOLATILES (ug/kg) (8260)			
Acetone	31	25 U	23 U
Methylene chloride	2.8 J	6.2 U	5.6 U
Tetrachloroethene	2.3 J	6.2 U	5.6 U
Toluene	2.5 J	6.2 U	5.6 U
SEMIVOLATILES (ug/kg) (8270)			
Acenaphthylene	1000 J	410 U	76 J
Anthracene	1600 J	410 U	100 J
Benzo(a)anthracene	6000	410 U	370
Benzo(a)pyrene	9000	410 U	500
Benzo(b)fluoranthene	15000	410 U	770
Benzo(ghi)perylene	7700	410 U	520
Benzo(k)fluoranthene	7200	410 U	420
bis(2-Ethylhexyl) phthalate	1000 J	240 J	280 J
Carbazole	2100 J	410 U	110 J
Chrysene	9900	410 U	540
Dibenz(a,h)anthracene	2800	410 U	370 U
Fluoranthene	17000	410 U	910
Indeno(1,2,3-cd)pyrene	7400	410 U	480
Phenanthrene	5000	410 U	270 J
Pyrene	13000	410 U	690
TOTAL METALS (mg/kg) (6010/7410)			
Arsenic	1.3 U	1.2 U	1.1
Barium	36.1	24.8 U	51.4
Cadmium	1.8	0.62 U	1.6
Chromium	22.3	3.3	19.8
Lead	89.5	2.2	174
Mercury	0.067	0.041 U	0.062
Selenium	0.66 U	0.62 U	0.59

TABLE 1
DETECTION SUMMARY
SWMU 254
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1408 DUMPSTER, BASE MOTOR TRANSPORT
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	23 U	25 U	31	31	SWMU254-IS01-00	1/3	31	31
Methylene chloride	5.6 U	6.2 U	2.8 J	2.8 J	SWMU254-IS01-00	1/3	2.8	2.8
Tetrachloroethene	5.6 U	6.2 U	2.3 J	2.3 J	SWMU254-IS01-00	1/3	2.3	2.3
Toluene	5.6 U	6.2 U	2.5 J	2.5 J	SWMU254-IS01-00	1/3	2.5	2.5
SEMIVOLATILES (ug/kg) (8270)								
Acenaphthylene	410 U	410 U	76 J	1000 J	SWMU254-IS01-00	2/3	538	538
Anthracene	410 U	410 U	100 J	1600 J	SWMU254-IS01-00	2/3	850	850
Benzo(a)anthracene	410 U	410 U	370	6000	SWMU254-IS01-00	2/3	3185	3185
Benzo(a)pyrene	410 U	410 U	500	9000	SWMU254-IS01-00	2/3	4750	4750
Benzo(b)fluoranthene	410 U	410 U	770	15000	SWMU254-IS01-00	2/3	7885	7885
Benzo(ghi)perylene	410 U	410 U	520	7700	SWMU254-IS01-00	2/3	4110	4110
Benzo(k)fluoranthene	410 U	410 U	420	7200	SWMU254-IS01-00	2/3	3810	3810
bis(2-Ethylhexyl) phthalate	ND	ND	240 J	1000 J	SWMU254-IS01-00	3/3	506.67	280
Carbazole	410 U	410 U	110 J	2100 J	SWMU254-IS01-00	2/3	1105	1105
Chrysene	410 U	410 U	540	9900	SWMU254-IS01-00	2/3	5220	5220
Dibenz(a,h)anthracene	370 U	410 U	2800	2800	SWMU254-IS01-00	1/3	2800	2800
Fluoranthene	410 U	410 U	910	17000	SWMU254-IS01-00	2/3	8955	8955
Indeno(1,2,3-cd)pyrene	410 U	410 U	480	7400	SWMU254-IS01-00	2/3	3940	3940
Phenanthrene	410 U	410 U	270 J	5000	SWMU254-IS01-00	2/3	2635	2635
Pyrene	410 U	410 U	690	13000	SWMU254-IS01-00	2/3	6845	6845
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.2 U	1.3 U	1.1	1.1	SWMU254-SS01-00	1/3	1.1	1.1
Barium	24.8 U	24.8 U	36.1	51.4	SWMU254-SS01-00	2/3	43.75	43.75
Cadmium	0.62 U	0.62 U	1.6	1.8	SWMU254-IS01-00	2/3	1.7	1.7
Chromium	ND	ND	3.3	22.3	SWMU254-IS01-00	3/3	15.13	19.8
Lead	ND	ND	2.2	174	SWMU254-SS01-00	3/3	88.57	89.5
Mercury	0.041 U	0.041 U	0.062	0.067	SWMU254-IS01-00	2/3	0.06	0.06
Selenium	0.62 U	0.66 U	0.59	0.59	SWMU254-SS01-00	1/3	0.59	0.59

TABLE 2
STATISTICAL SUMMARY
SWMU 254
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1408 DUMPSTER, BASE MOTOR TRANSPORT
MCB, CAMP LEJEUNE, NORTH CAROLINA

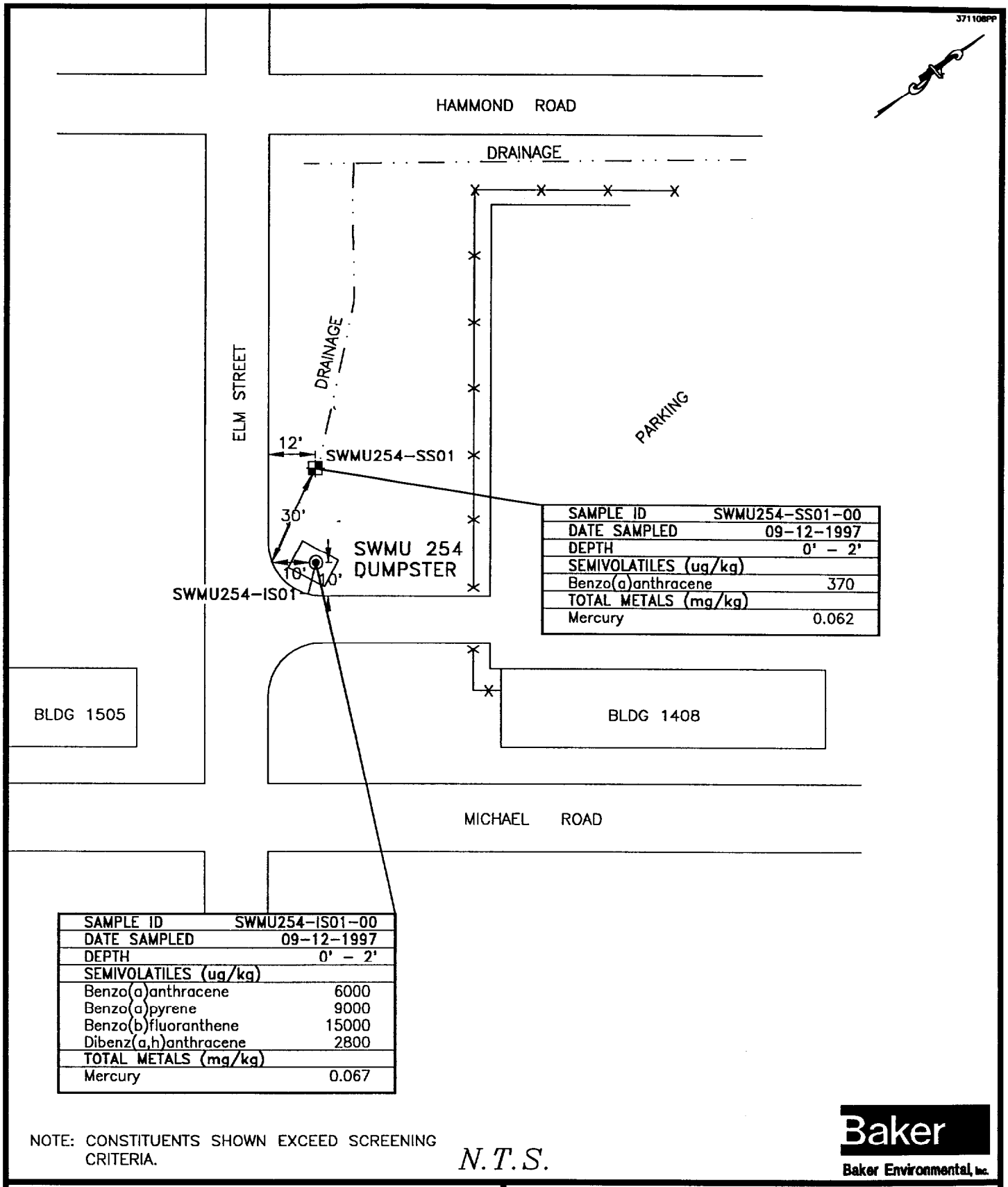
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Acetone	31	31	SWMU254-IS01-00	200000000	40000000	2810	0	0	0
Methylene chloride	2.8 J	2.8 J	SWMU254-IS01-00	760000	760000	22.1	0	0	0
Tetrachloroethene	2.3 J	2.3 J	SWMU254-IS01-00	110000	110000	7.4	0	0	0
Toluene	2.5 J	2.5 J	SWMU254-IS01-00	410000000	82000000	7275	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Acenaphthylene	76 J	1000 J	SWMU254-IS01-00	NE	NE	11360	0	0	0
Anthracene	100 J	1600 J	SWMU254-IS01-00	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	370	6000	SWMU254-IS01-00	7800	7800	343	0	0	2
Benzo(a)pyrene	500	9000	SWMU254-IS01-00	780	780	NE	1	1	0
Benzo(b)fluoranthene	770	15000	SWMU254-IS01-00	7800	7800	NE	1	1	0
Benzo(ghi)perylene	520	7700	SWMU254-IS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	420	7200	SWMU254-IS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	240 J	1000 J	SWMU254-IS01-00	410000	410000	6670	0	0	0
Carbazole	110 J	2100 J	SWMU254-IS01-00	290000	290000	NE	0	0	0
Chrysene	540	9900	SWMU254-IS01-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	2800	2800	SWMU254-IS01-00	780	780	NE	1	1	0
Fluoranthene	910	17000	SWMU254-IS01-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	480	7400	SWMU254-IS01-00	7800	7800	NE	0	0	0
Phenanthrene	270 J	5000	SWMU254-IS01-00	NE	NE	59640	0	0	0
Pyrene	690	13000	SWMU254-IS01-00	61000000	12264000	286440	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 254
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1408 DUMPSTER, BASE MOTOR TRANSPORT
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.1	1.1	SWMU254-SS01-00	3.8	3.8	26.2	0	0	0
Barium	36.1	51.4	SWMU254-SS01-00	140000	28000	848	0	0	0
Cadmium	1.6	1.8	SWMU254-IS01-00	1000	200	2.72	0	0	0
Chromium	3.3	22.3	SWMU254-IS01-00	10000	2000	27.2	0	0	0
Lead	2.2	174	SWMU254-SS01-00	NE	400	270.06	0	0	0
Mercury	0.062	0.067	SWMU254-IS01-00	610	122	0.0154	0	0	2
Selenium	0.59	0.59	SWMU254-SS01-00	10000	2000	12.2	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU254-SS01-00
DATE SAMPLED	09-12-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	370
TOTAL METALS (mg/kg)	
Mercury	0.062

SAMPLE ID	SWMU254-IS01-00
DATE SAMPLED	09-12-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	6000
Benzo(a)pyrene	9000
Benzo(b)fluoranthene	15000
Dibenz(a,h)anthracene	2800
TOTAL METALS (mg/kg)	
Mercury	0.067

NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

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LEGEND

- ◉ SOIL BORING AND SAMPLE LOCATION
- SURFACE SOIL LOCATION
- mg/kg MILLIGRAM/KILOGRAM
- ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 254
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.8 SWMU 255 - Building 1502 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.8.1 SWMU Description and History

SWMU 255 is a covered, concrete oil/water separator located in the vicinity of Building 1502, located at the intersection of Elm Street and Gibb Road. A surface water drainage ditch is located west of the site and parallels Gibb Road. The area surrounding the SWMU is covered with grass. The grit chamber associated with the SWMU is detached and offset to the northeast. The dimensions of the oil/water separator is approximately four feet by eight feet. The date of operation for the SWMU is unknown. During Baker's site visit, it was evident that the grit chamber had overflowed in the past causing contamination of the surface soils. Additionally, evidence that a spill may have occurred was observed in the adjacent concrete drainage channel. Building 1502 is presently used for vehicle maintenance.

4.8.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 255 was developed to determine if the operations pertaining to the wash area and the oil/water separator have impacted surface and subsurface soils surrounding the SWMU, and if soils within the ditch have been impacted.

A total of four soil borings, SWMU255-IS01 through SWMU255-IS04, were advanced on September 14, 1997. A surface and subsurface soil sample were collected from each soil boring. In addition, three surface soil samples were collected along the length of the surface water ditch located along the west side of the oil/water separator on September 17, 1997. As depicted on Figure 1, a soil boring was advanced on each of the four sides of the oil/water separator to determine if contamination resides in the soils surrounding the SWMU. Surface and subsurface soil samples were collected from each of the soil borings. The samples were collected from ground surface to 2.0 feet bgs and from just above the water table at a depth of 8.0 to 10.0 feet bgs. Groundwater was encountered at 10.5 feet bgs.

Surface soil samples collected from the surface water ditch were identified as surface soil sample locations SWMU255-SS01 through SWMU255-SS03. The samples were collected from ground surface to 6.0 inches bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270), and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blanks 371ER06B and 371ER08B were collected from a split spoon sampler and a stainless steel sampling spoon used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB10, 371TB11 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.8.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminant concentrations that exceed the previously listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs.

Acetone, methylene chloride and toluene were the only VOCs detected in the samples collected from the SWMU. None of these compounds exceeded the screening criteria.

The only SVOC that was detected at a concentration exceeding a screening criteria was pentachlorophenol. This compound was detected at a concentration of 210 J µg/kg in sample SWMU255-SS01-00. The concentration was in excess of the North Carolina, Category S-3;G-1. As noted in Figure 1, this sample was collected in the adjacent drainage ditch directly west of the oil/water separator.

Mercury was the only metal that exceeded the screening criteria and did so only once. Sample SWMU255-IS01-00 was contaminated with mercury at a detected concentration of 0.053 µg/kg. North Carolina, Category S-3;G-1 Target Concentration was the only criteria exceeded by the detection of mercury. All other metals were not detected above any screening criteria. Soil boring SWMU255-IS01 was located on the east side of the oil/water separator and directly south of the grit chamber (Figure 1). This is the same location that evidence of release was noted during the Baker site visit in October 1996.

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4.8.4 Recommendations

In summary, sample SWMU255-SS01-00 was the most contaminated sample at the site. Twelve SVOCs and two metals were detected in this sample. The sample was collected from the drainage ditch adjacent to the oil/water separator. Baker recommends a second phase of soil sampling be conducted at the SWMU. A soil boring should be advanced in the vicinity of sample SWMU255-SS01-00 to determine if subsurface soils in the area of this sample have been impacted and to what degree (if any). Although the North Carolina, Category S-1:G-1 Target Concentrations are intended to be limits that indicate groundwater contamination may result due to contaminant concentrations in soil, Baker recommends that soil be collected from just above the water table and a temporary groundwater monitoring well be installed at the SWMU. The water table was determined to be at 10.5 feet bgs and may not be impacted by contaminants detected at the surface. Samples collected during this phase should be analyzed for SVOCs and metals, only.

VOC Why metals?

TABLE 1
DETECTION SUMMARY
SWMU 255
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1502 - OW/-1, MCB LOGISTICS VEHICLE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU255-IS01-00	SWMU255-IS01-04	SWMU255-IS02-00	SWMU255-IS02-04	SWMU255-IS03-00	SWMU255-IS03-03
DATE SAMPLED	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997
DEPTH	0' - 2'	8' - 10'	0' - 2'	8' - 10'	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8260)						
Acetone	19 J	180 J	21 U	47 J	23 U	100 J
Methylene chloride	9.4 J	2.6 J	3.6 J	2.1 J	10 J	1.9 J
Toluene	5.7 U	5.5 U	1.5 J	5.5 U	2.5 J	5.7 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	380 U	360 U	350 U	370 U	370 U	380 U
Benzo(a)pyrene	380 U	360 U	350 U	370 U	370 U	380 U
Benzo(b)fluoranthene	380 U	360 U	350 U	370 U	370 U	380 U
Benzo(ghi)perylene	380 U	360 U	350 U	370 U	370 U	380 U
Benzo(k)fluoranthene	380 U	360 U	350 U	370 U	370 U	380 U
bis(2-Ethylhexyl) phthalate	160 J	130 J	79 J	100 J	160 J	140 J
Chrysene	380 U	360 U	350 U	370 U	370 U	380 U
Fluoranthene	380 U	360 U	350 U	370 U	370 U	380 U
Indeno(1,2,3-cd)pyrene	380 U	360 U	350 U	370 U	370 U	380 U
Pentachlorophenol	1800 U	1800 U	1700 U	1800 U	1800 U	1800 U
Phenanthrene	380 U	360 U	350 U	370 U	370 U	380 U
Pyrene	380 U	360 U	350 U	370 U	370 U	380 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.1 U	1 U	1.1 U	1.1 U	1.1 U
Barium	71.6	22.1 U	20.9 U	22.2 U	22.6 U	22.9 U
Cadmium	0.67	0.55 U	0.52 U	0.55 U	0.56 U	0.57 U
Chromium	7.1	4	6.7	8.9	6.8	4.9
Lead	60.8	2.2	44.8	4.5	54.2	2.6
Mercury	0.053	0.036 U	0.035 U	0.037 U	0.037 U	0.038 U

TABLE 1
DETECTION SUMMARY
SWMU 255
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1502 - OW/-1, MCB LOGISTICS VEHICLE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU255-IS04-00	SWMU255-IS04-02	SWMU255-SS01-00	SWMU255-SS02-00	SWMU255-SS03-00
DATE SAMPLED	09-14-1997	09-14-1997	09-17-1997	09-17-1997	09-17-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	0' - 2'	0' - 2'
VOLATILES (ug/kg) (8260)					
Acetone	24 U	66 J	27 U	25 U	24 U
Methylene chloride	5.9 U	2.1 J	6.8 U	6.3 U	5.9 U
Toluene	5.9 U	6 U	6.8 U	6.3 U	5.9 U
SEMIVOLATILES (ug/kg) (8270)					
Benzo(a)anthracene	390 U	400 U	63 J	410 U	390 U
Benzo(a)pyrene	390 U	400 U	91 J	43 J	390 U
Benzo(b)fluoranthene	390 U	400 U	120 J	410 U	390 U
Benzo(ghi)perylene	390 U	400 U	47 J	410 U	390 U
Benzo(k)fluoranthene	390 U	400 U	130 J	410 U	390 U
bis(2-Ethylhexyl) phthalate	140 J	460	300 J	89 J	65 J
Chrysene	390 U	400 U	100 J	45 J	390 U
Fluoranthene	390 U	400 U	160 J	49 J	390 U
Indeno(1,2,3-cd)pyrene	390 U	400 U	47 J	410 U	390 U
Pentachlorophenol	1900 U	1900 U	210 J	2000 U	1900 U
Phenanthrene	390 U	400 U	72 J	410 U	390 U
Pyrene	390 U	400 U	190 J	89 J	390 U
TOTAL METALS (mg/kg) (6010/7410)					
Arsenic	1.2 U	1.2 U	1.4 U	1.3 U	1.2
Barium	23.6 U	24.1 U	27.1 U	25.1 U	23.5 U
Cadmium	0.59 U	0.6 U	0.68 U	0.63 U	0.59 U
Chromium	8.6	4.8	7.9	5.7	6.8
Lead	31.5	17.7	47.7	52.3	10.1
Mercury	0.039 U	0.04 U	1.4 U	1.3 U	1.2 U

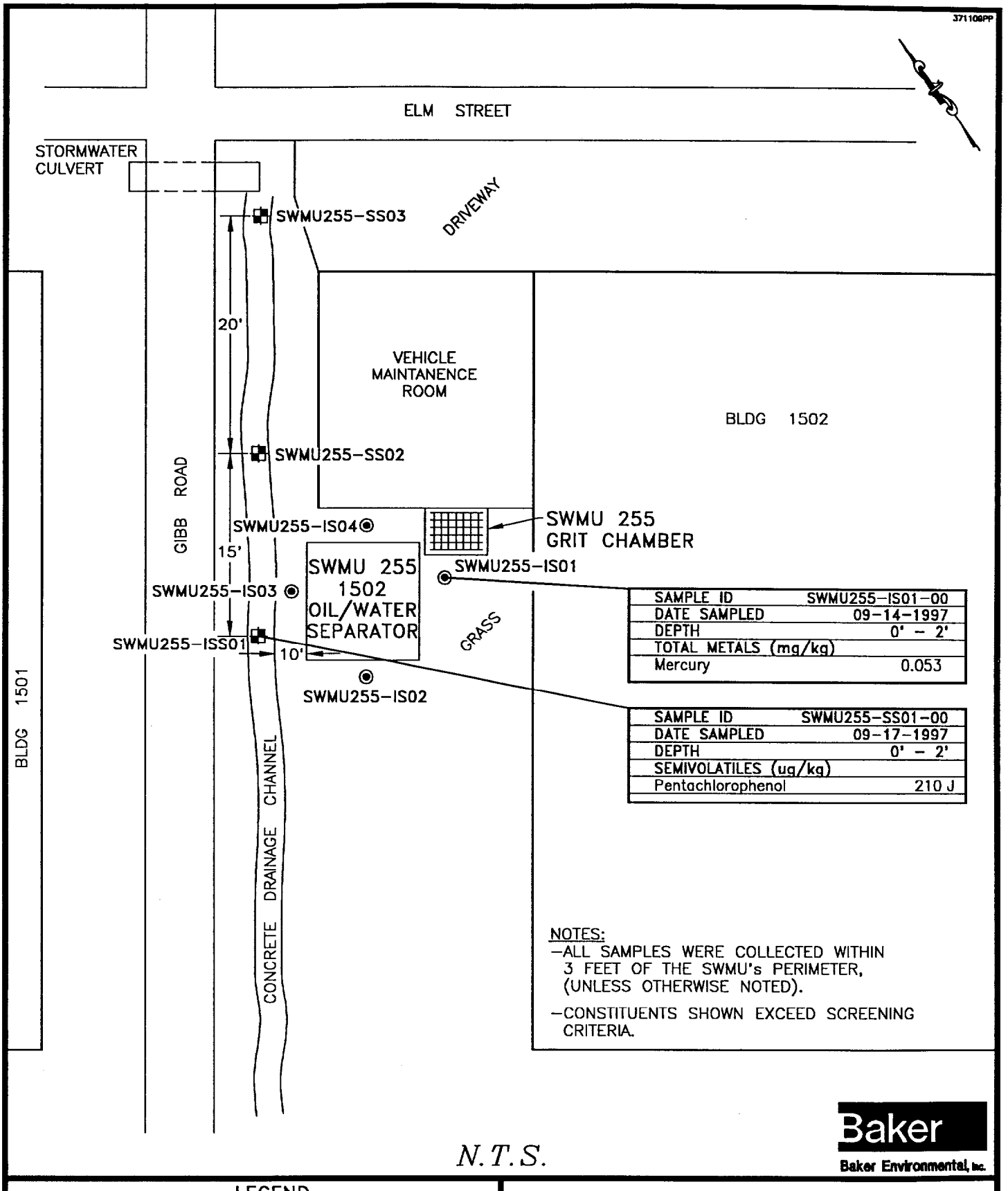
TABLE 1
DETECTION SUMMARY
SWMU 255
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1502 - OW/-1, MCB LOGISTICS VEHICLE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	21 U	27 U	19 J	180 J	SWMU255-IS01-04	5/11	82.4	66
Methylene chloride	5.9 U	6.8 U	1.9 J	10 J	SWMU255-IS03-00	7/11	4.53	2.6
Toluene	5.5 U	6.8 U	1.5 J	2.5 J	SWMU255-IS03-00	2/11	2	2
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	350 U	410 U	63 J	63 J	SWMU255-SS01-00	1/11	63	63
Benzo(a)pyrene	350 U	400 U	43 J	91 J	SWMU255-SS01-00	2/11	67	67
Benzo(b)fluoranthene	350 U	410 U	120 J	120 J	SWMU255-SS01-00	1/11	120	120
Benzo(ghi)perylene	350 U	410 U	47 J	47 J	SWMU255-SS01-00	1/11	47	47
Benzo(k)fluoranthene	350 U	410 U	130 J	130 J	SWMU255-SS01-00	1/11	130	130
bis(2-Ethylhexyl) phthalate	ND	ND	65 J	460	SWMU255-IS04-02	11/11	165.73	140
Chrysene	350 U	400 U	45 J	100 J	SWMU255-SS01-00	2/11	72.5	72.5
Fluoranthene	350 U	400 U	49 J	160 J	SWMU255-SS01-00	2/11	104.5	104.5
Indeno(1,2,3-cd)pyrene	350 U	410 U	47 J	47 J	SWMU255-SS01-00	1/11	47	47
Pentachlorophenol	1700 U	2000 U	210 J	210 J	SWMU255-SS01-00	1/11	210	210
Phenanthrene	350 U	410 U	72 J	72 J	SWMU255-SS01-00	1/11	72	72
Pyrene	350 U	400 U	89 J	190 J	SWMU255-SS01-00	2/11	139.5	139.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1 U	1.4 U	1.2	1.2	SWMU255-SS03-00	1/11	1.2	1.2
Barium	20.9 U	27.1 U	71.6	71.6	SWMU255-IS01-00	1/11	71.6	71.6
Cadmium	0.52 U	0.68 U	0.67	0.67	SWMU255-IS01-00	1/11	0.67	0.67
Chromium	ND	ND	4	8.9	SWMU255-IS02-04	11/11	6.56	6.8
Lead	ND	ND	2.2	60.8	SWMU255-IS01-00	11/11	29.85	31.5
Mercury	0.035 U	1.4 U	0.053	0.053	SWMU255-IS01-00	1/11	0.05	0.05

TABLE 2
STATISTICAL SUMMARY
SWMU 255
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1502 - OW/-1, MCB LOGISTICS VEHICLE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Acetone	19 J	180 J	SWMU255-IS01-04	200000000	40000000	2810	0	0	0
Methylene chloride	1.9 J	10 J	SWMU255-IS03-00	760000	760000	22.1	0	0	0
Toluene	1.5 J	2.5 J	SWMU255-IS03-00	410000000	82000000	7275	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Benzo(a)anthracene	63 J	63 J	SWMU255-SS01-00	7800	7800	343	0	0	0
Benzo(a)pyrene	43 J	91 J	SWMU255-SS01-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	120 J	120 J	SWMU255-SS01-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	47 J	47 J	SWMU255-SS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	130 J	130 J	SWMU255-SS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	65 J	460	SWMU255-IS04-02	410000	410000	6670	0	0	0
Chrysene	45 J	100 J	SWMU255-SS01-00	780000	780000	38150	0	0	0
Fluoranthene	49 J	160 J	SWMU255-SS01-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	47 J	47 J	SWMU255-SS01-00	7800	7800	NE	0	0	0
Pentachlorophenol	210 J	210 J	SWMU255-SS01-00	48000	48000	23.1	0	0	1
Phenanthrene	72 J	72 J	SWMU255-SS01-00	NE	NE	59640	0	0	0
Pyrene	89 J	190 J	SWMU255-SS01-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.2	1.2	SWMU255-SS03-00	3.8	3.8	26.2	0	0	0
Barium	71.6	71.6	SWMU255-IS01-00	140000	28000	848	0	0	0
Cadmium	0.67	0.67	SWMU255-IS01-00	1000	200	2.72	0	0	0
Chromium	4	8.9	SWMU255-IS02-04	10000	2000	27.2	0	0	0
Lead	2.2	60.8	SWMU255-IS01-00	NE	400	270.06	0	0	0
Mercury	0.053	0.053	SWMU255-IS01-00	610	122	0.0154	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



LEGEND

- ◉ SOIL BORING AND SAMPLE PLAN
- ⊞ SURFACE SOIL LOCATION
- mg/kg MILLIGRAM/KILOGRAM
- ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 255
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.9 SWMU 258 - S1745 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.9.1 SWMU Description and History

SWMU 258 is located within the central portion of Hadnot Point Industrial Area adjacent to Michael Road and Building 1711. The SWMU consists of a concrete oil/water separator and concrete grit chamber. The grit chamber receives a mixture of solids and fluids from the adjacent vehicle wash rack and retains the solid fraction while passing the fluids (which contained water, waste oil, and grease) to the oil/water separator. During the site visit, paint and petroleum stains were noted on the system. It is unknown when the SWMU started operations, but the SWMU is currently in use. The perimeter around the SWMU is secured with a fence and locking gate. The ground surface around the system is covered with asphalt and grass.

4.9.2 Confirmatory Investigation Activities

An investigation was completed on September 11, 1997 at the SWMU to determine if operations at the oil/water separator and grit chamber have impacted the soil in the vicinity of the system. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from six soil borings which were advanced around the oil/water separator and grit chamber. Figure 1 shows the locations of the soil borings. The soil borings were advanced to depths of approximately 4.0 to 6.0 feet bgs with groundwater being encountered at approximately 3.0 and 4.0 feet bgs. Six surface soil samples (SWMU258-IS01-00, SWMU258-IS02-00, SWMU258-IS03-00, SWMU258-IS04-00, SWMU258-IS05-00, and SWMU258-IS06-00) were collected at depths of 0 to 2.0 feet bgs at all six boring locations. Five subsurface soil samples were collected at 2.0 to 4.0 feet bgs (SWMU258-IS02-01, SWMU258-IS03-01, SWMU258-IS04-01, SWMU258-IS05-01, and SWMU258-IS06-01). A subsurface soil sample was not collected from soil boring SWMU258-IS01 because the sample interval of 2.0 to 4.0 feet bgs was saturated with groundwater. A field duplicate sample was collected (SWMU258-IS01-01D) at the 0 to 2.0 feet interval. All soil samples were analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846-6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. The analytical results for the field duplicate are presented in Appendix E. A rinsate blank (371ER04A) was collected from a sampling spatula and analyzed for the same parameters. The samples were sent to Quanterra laboratories along with trip blanks 371TB06, 371TB07, 371TB08, and 371TB09. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.9.3 Investigation Findings

Six surface soil and six subsurface soil samples were collected and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- USEPA Region III Industrial/Residential Risk Based Concentrations (RBCs)

- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analyses indicate positive detections of VOCs, SVOCs, and metals. Figure 1 presents the constituents that have concentrations that exceed the screening criteria. As shown on Table 2 and Figure 1, four constituents exceeded the screening criteria.

Seven VOCs were detected in the sample set including 1,1,2,2-tetrachlorethane; 2-butanone; 2-hexanone; 4-methyl-2-pentanone; acetone; bromoform; and methylene chloride. Of the detected VOCs, only acetone and bromoform concentrations exceeded the screening criteria. Acetone detected in surface soil sample SWMU258-IS05-00 (3,100 µg/kg) exceeded the North Carolina Target Concentrations for Method I, Category S-3:G-1 of 2,810 µg/kg. Concentrations of bromoform detected in subsurface soil sample SWMU258-IS02-01 (1.6J µg/kg) exceeded the North Carolina Target Concentrations for Method I, Category S-3:G-1 of 1.25 µg/kg.

Three SVOCs were detected in the sample set: bis(2-ethylhexyl)phthalate; flouranthene, and pyrene. The SVOC concentrations did not exceed any screening criteria.

Four metals (cadmium, chromium, lead, and mercury) were detected within the sample set. Detected concentrations of chromium and lead did not exceed any screening criteria. Concentrations of cadmium (3.2 mg/kg) exceeded the North Carolina Target Concentrations for Method I, Category S-3:G-1 of 2.72 mg/kg in one surface soil sample (SWMU258-IS01-00). Mercury was detected in two samples (SWMU258-IS02-00 and SWMU258-IS02-01) at concentrations of 0.099 mg/kg and 0.04 mg/kg, respectively. Both of these concentrations exceeded the North Carolina Target Concentrations Method I Categories S-3:G-1 of 0.0154 mg/kg.

4.9.4 Recommendations

No further action is recommended for SWMU 258. Acetone and bromoform are common laboratory contaminants. The exceeding cadmium concentration only slightly exceeded one of the screening criteria. Mercury concentrations exceeded one of screening criteria in two of the samples.

Can this be dismissed as easily?

TABLE 1
DETECTION SUMMARY
SWMU 258
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1745-O/W, TRUCK COMPANY OPERATIONS, HQ BATTERY, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU258-IS01-00	SWMU258-IS02-00	SWMU258-IS02-01	SWMU258-IS03-00	SWMU258-IS03-01	SWMU258-IS04-00
DATE SAMPLED	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'
VOLATILES (ug/kg) (8260)						
1,1,2,2-Tetrachloroethane	5.7 U	5.9 U	4.1 J	5.7 U	6.2 U	5.6 U
2-Butanone	23 U	24 U	15 J	23 U	25 U	23 U
2-Hexanone	23 U	24 U	10 J	23 U	25 U	23 U
4-Methyl-2-pentanone	23 U	24 U	10 J	23 U	25 U	23 U
Acetone	23 U	24 U	8.2 J	23 U	25 U	23 U
Bromoform	5.7 U	5.9 U	1.6 J	5.7 U	6.2 U	5.6 U
Methylene chloride	5 J	5.9 U	6.1 U	5.7 U	6.2 U	5.6 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	1500 U	100 J	400 U	NA	410 U	94 J
Fluoranthene	1500 U	46 J	400 U	NA	410 U	370 U
Pyrene	1500 U	64 J	400 U	NA	410 U	370 U
TOTAL METALS (mg/kg) (6010/7410)						
Cadmium	3.2	1.3	0.61 U	NA	0.62 U	0.56 U
Chromium	19	19.2	10.5	NA	10	10.9
Lead	36.2	62.7	11.7	NA	9.8	4.5
Mercury	0.037 U	0.099	0.04	NA	0.041 U	0.037 U

TABLE 1
DETECTION SUMMARY
SWMU 258
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1745-O/W, TRUCK COMPANY OPERATIONS, HQ BATTERY, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU258-IS04-01	SWMU258-IS05-00	SWMU258-IS05-01	SWMU258-IS06-00	SWMU258-IS06-01
DATE SAMPLED	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)					
1,1,2,2-Tetrachloroethane	5.9 U	5.4 U	5.8 U	5.5 U	6.1 U
2-Butanone	23 U	22 U	23 U	22 U	24 U
2-Hexanone	23 U	22 U	23 U	22 U	24 U
4-Methyl-2-pentanone	23 U	22 U	23 U	22 U	24 U
Acetone	23 U	3100	18 J	22 U	24 U
Bromoform	5.9 U	5.4 U	5.8 U	5.5 U	6.1 U
Methylene chloride	5.9 U	6	5.8 U	5.5 U	6.3
SEMIVOLATILES (ug/kg) (8270)					
bis(2-Ethylhexyl) phthalate	53 J	54 J	380 U	370 U	400 U
Fluoranthene	390 U	360 U	380 U	370 U	400 U
Pyrene	390 U	360 U	380 U	370 U	400 U
TOTAL METALS (mg/kg) (6010/7410)					
Cadmium	0.59 U	0.54 U	0.58 U	0.55 U	0.61 U
Chromium	9.6	11.1	8.8	9.6	8.2
Lead	12.2	3.6	13.1	8.7	3.9
Mercury	0.039 U	0.036 U	0.038 U	0.037 U	0.04 U

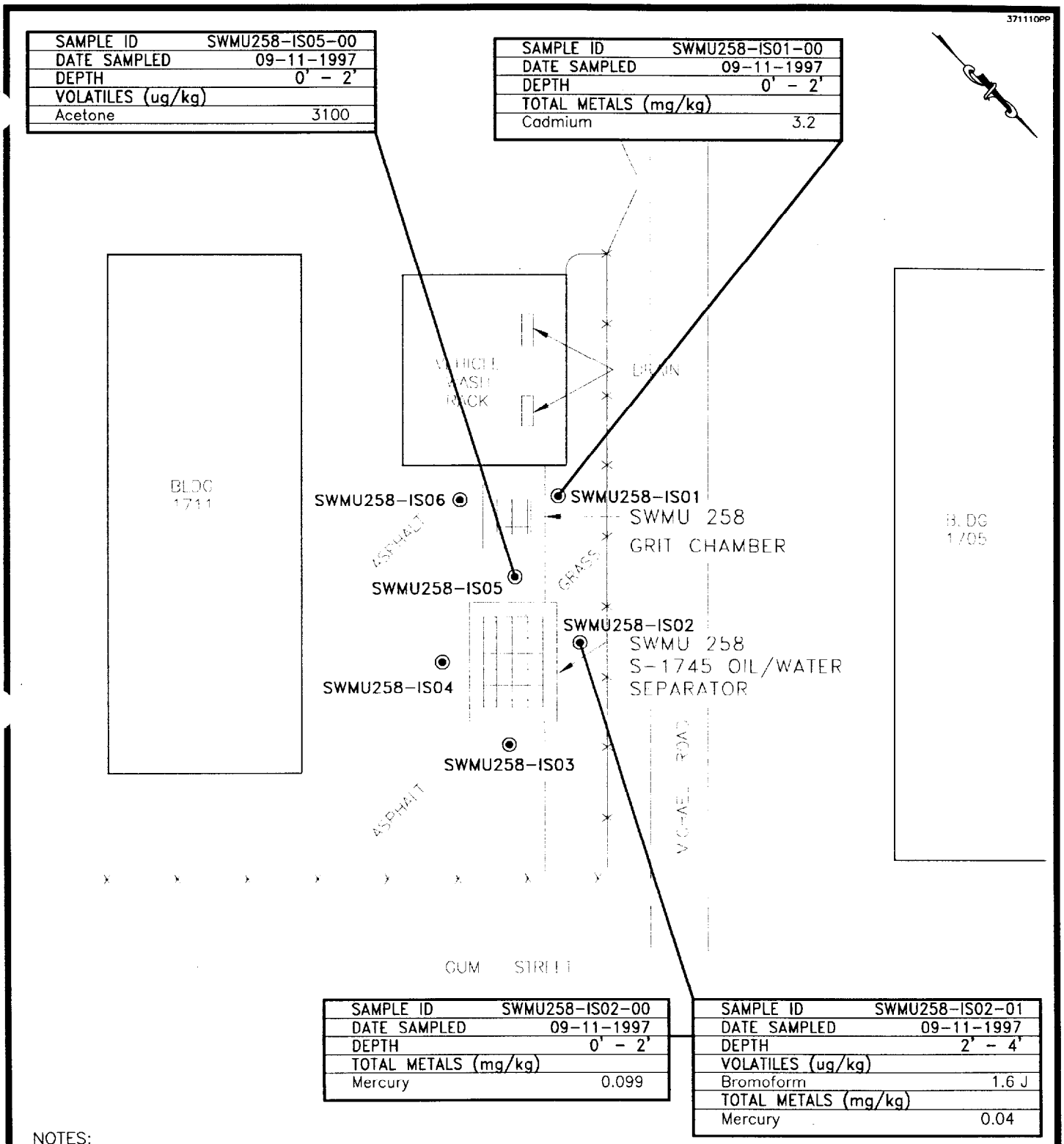
TABLE 1
DETECTION SUMMARY
SWMU 258
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1745-O/W, TRUCK COMPANY OPERATIONS, HQ BATTERY, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
1,1,2,2-Tetrachloroethane	5.4 U	6.2 U	4.1 J	4.1 J	SWMU258-IS02-01	1/11	4.1	4.1
2-Butanone	22 U	25 U	15 J	15 J	SWMU258-IS02-01	1/11	15	15
2-Hexanone	22 U	25 U	10 J	10 J	SWMU258-IS02-01	1/11	10	10
4-Methyl-2-pentanone	22 U	25 U	10 J	10 J	SWMU258-IS02-01	1/11	10	10
Acetone	22 U	25 U	8.2 J	3100	SWMU258-IS05-00	3/11	1042.07	18
Bromoform	5.4 U	6.2 U	1.6 J	1.6 J	SWMU258-IS02-01	1/11	1.6	1.6
Methylene chloride	5.5 U	6.2 U	5 J	6.3	SWMU258-IS06-01	3/11	5.77	6
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	370 U	1500 U	53 J	100 J	SWMU258-IS02-00	4/10	75.25	74
Fluoranthene	360 U	1500 U	46 J	46 J	SWMU258-IS02-00	1/10	46	46
Pyrene	360 U	1500 U	64 J	64 J	SWMU258-IS02-00	1/10	64	64
TOTAL METALS (mg/kg) (6010/7410)								
Cadmium	0.54 U	0.62 U	1.3	3.2	SWMU258-IS01-00	2/10	2.25	2.25
Chromium	ND	ND	8.2	19.2	SWMU258-IS02-00	10/10	11.69	10.25
Lead	ND	ND	3.6	62.7	SWMU258-IS02-00	10/10	16.64	10.75
Mercury	0.036 U	0.041 U	0.04	0.099	SWMU258-IS02-00	2/10	0.07	0.07

TABLE 2
STATISTICAL SUMMARY
SWMU 258
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1745-O/W, TRUCK COMPANY OPERATIONS, HQ BATTERY, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
1,1,2,2-Tetrachloroethane	4.1 J	4.1 J	SWMU258-IS02-01	29000	29000	NE	0	0	0
2-Butanone	15 J	15 J	SWMU258-IS02-01	1000000000	200000000	692	0	0	0
2-Hexanone	10 J	10 J	SWMU258-IS02-01	82000000	NE	NE	0	0	0
4-Methyl-2-pentanone	10 J	10 J	SWMU258-IS02-01	NE	NE	NE	0	0	0
Acetone	8.2 J	3100	SWMU258-IS05-00	200000000	40000000	2810	0	0	1
Bromoform	1.6 J	1.6 J	SWMU258-IS02-01	720000	720000	1.25	0	0	1
Methylene chloride	5 J	6.3	SWMU258-IS06-01	760000	760000	22.1	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	53 J	100 J	SWMU258-IS02-00	410000	410000	6670	0	0	0
Fluoranthene	46 J	46 J	SWMU258-IS02-00	82000000	16400000	276080	0	0	0
Pyrene	64 J	64 J	SWMU258-IS02-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Cadmium	1.3	3.2	SWMU258-IS01-00	1000	200	2.72	0	0	1
Chromium	8.2	19.2	SWMU258-IS02-00	10000	2000	27.2	0	0	0
Lead	3.6	62.7	SWMU258-IS02-00	NE	400	270.06	0	0	0
Mercury	0.04	0.099	SWMU258-IS02-00	610	122	0.0154	0	0	2

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTES:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION
mg/kg MILLIGRAM/KILOGRAM
ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 258
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.10 SWMUs 260, 261, 262, 297, and 298 - 1780-Oil/Water Separators-1, -2, and -3, Underground Storage Tanks -1 and -2

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.10.1 SWMU Description and History

SWMU 260 is a concrete oil/water separator that contains waste oil, grease, water, and debris. It has been in operation since 1988. SWMU 261 is a 550 gallon steel underground storage tank (UST) containing oil, grease, and water. SWMU 262 is also a 550 gallon steel UST containing oil, grease, and water. Both USTs have been in operation since 1970. SWMUs 297 and 298 are steel oil/water separator associated with SWMUs 261 and 262, respectively. They contain oil, grease, and water debris. The years of operation for SWMUs 297 and 298 are unknown. It was noted during the October 1996 site visit by Baker personnel that there is a ditch that accepts discharge from SWMU 297 and transports it to a nearby creek. how far? what direction?

4.10.2 Confirmatory Investigation Activities

The soil investigation for SWMUs 260, 261, 262, 297, and 298 was developed to determine if contamination resides in the soils in the vicinity of the SWMUs.

A total of eleven soil borings were advanced to investigate the soil quality surrounding the SWMUs. Three soil borings (SWMU260-IS01 through SWMU260-IS03) were advanced 3.0 feet from the perimeter of SWMU 260. Three soil borings (SWMU261-IS02, SWMU297-IS01, and SWMU297-IS02) were advanced within 3.0 feet of the perimeter of SWMUs 261 and 297. Soil boring SWMU261-IS01 was advanced 5.0 feet from SWMU 261. Four soil borings (SWMU262-IS01, SWMU262-IS02, SWMU298-IS01, and SWMU298-IS02) were advanced within 3.0 feet of the perimeter of SWMUs 262 and 298. In addition, a surface soil sample (SWMU261-SS01) was collected 15 feet from SWMUs 261 and 297 in the drainage ditch leading away from the SWMUs. The sample locations are depicted on Figure 1.

During advancement of soil borings associated with SWMUs 260, 261, and 297, split-spoon samples were collected continuously to a total depth of 18.0 feet bgs. Groundwater was encountered at a depth of 16.0 feet bgs. One surface soil sample and one subsurface soil sample were collected from each boring in accordance with the Final Project Plans submitted in August, 1997. The surface soil samples (SWMU260-IS01-00 through SWMU260-IS03-00, SWMU261-IS01-00 and SWMU261-IS02-00, SWMU297-IS01-00 and SWMU297-IS02-00) were collected from 0 to 2.0 feet bgs. A duplicate sample, SWMU261-IS01-00D, was also collected from this depth. Duplicate sample results can be found in Appendix E. The subsurface soil samples SWMU260-IS01-07, SWMU260-IS02-07, and SWMU260-IS03-07 were collected from just above the water table at a depth of 14.0 to 16.0 feet bgs. The subsurface soil samples SWMU261-IS01-06, SWMU261-IS02-06, SWMU297-IS01-06, and SWMU297-IS02-06 were collected from 12.0 to 14.0 feet bgs. A duplicate sample, SWMU261-IS02-06D, was also collected from this depth.

During advancement of soil borings associated with SWMU 262, split-spoon samples were collected continuously to a total depth of 20.0 feet bgs. Groundwater was encountered at a depth of 18.0 feet bgs. One surface soil sample and one subsurface soil sample were collected from each boring in accordance with the Final Project Plans submitted in August, 1997. The surface soil samples

(SWMU262-IS01-00 and SWMU262-IS02-00) were collected from 0 to 2.0 feet bgs. The subsurface soil samples SWMU260-IS01-06 and SWMU262-IS02-08 were collected from 12.0 to 14.0 and 16.0 to 18.0 feet bgs, respectively.

During advancement of soil borings associated with SWMU 298, split-spoon samples were collected continuously to a total depth of 14.0 feet bgs. Groundwater was encountered at a depth of 13.5 feet bgs. One surface soil sample and one subsurface soil sample were collected from each boring in accordance with the Final Project Plans submitted in August, 1997. The surface soil samples (SWMU298-IS01-00 and SWMU298-IS02-00) were collected from 0 to 2.0 feet bgs. The subsurface soil samples SWMU298-IS01-06 and SWMU298-IS02-04 were collected from 12.0 to 14.0 and 8.0 to 10.0 feet bgs, respectively.

All soil samples were analyzed for VOAs (EPA Methods 8260 and 8020), SVOAs (EPA Method 8270), and RCRA metals (EPA Method 6010/7410). The analytical data from the surface and subsurface soil samples are presented in Appendix D.

The following equipment rinsate blanks were collected in assocation with specific SWMUs: 371ER04A for SWMU 260, 371ER05A for SWMU 298, 371ER05B for SWMUs 261 and 297, 371ER07B for SWMU 262, and 371ER08B for SWMU 261. These rinsate blanks were collected from spatulas, split spoon samplers, and stainless steel spoons used to collect soil samples from the SWMUs. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB06 through 371TB13 were shipped with the volatile fractions of the soil samples. The results are included in Appendix F. Two field blanks, 371FB01 and 371FB02, were also collected as described in Section 3.5 of this report. The analytical results of the field blanks are presented in Appendix F.

4.10.3 Investigation Findings

A total of 23 samples were obtained at SWMUs 260, 261, 262, 297, and 298 and submitted for the analyses previously mentioned. Tables 1 through 8 present the positive detection results and the comparison of the positive detections to a specific set of screening criteria. The criteria include:

- USEPA Region III Industrial RBCs
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

The following sections discuss the analytical results of each SWMU individually.

4.10.3.1 SWMU 260

As presented in Table 1, one VOC, methylene chloride, was detected in the soil samples submitted for laboratory analysis under EPA Method 8260. Methylene chloride was detected in three out of

six soil samples (SWMU260-IS01-00, SWMU260-IS02-07 and SWMU260-IS03-07) with estimated concentrations ranging from 2.3J to 2.6J µg/kg. Methylene chloride was also detected in the associated rinsate blank, 371ER04A, and trip blank, 371TB07, at an estimated concentration of 1.7J µg/kg. The detected concentrations of methylene chloride in the soil samples do not exceed ten times the maximum blank concentration. Therefore, methylene chloride is attributed to laboratory contamination and excluded from further evaluation. As shown in Table 2, the detected concentrations of methylene chloride did not exceed USEPA Region III Industrial RBCs or state criteria.

As presented in Table 1, one VOC, 1,3-dichlorobenzene, was detected in the soil samples submitted for laboratory analysis under EPA Method 8020. 1,3-Dichlorobenzene was detected in two out of six soil samples (SWMU260-IS01-00 and SWMU260-IS02-00) at concentrations of 21 and 12 µg/kg, respectively. As shown in Table 2, the detected concentrations of 1,3-dichlorobenzene did not exceed USEPA Region III Industrial RBCs or state criteria.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in three out of six soil samples with concentrations ranging from 150J to 880 µg/kg. Bis(2-ethylhexyl)phthalate was detected in field blank 371FB02 at a concentration of 92 µg/kg. Although bis(2-ethylhexyl)phthalate was detected in the soil samples, it was not detected at a level that exceeded ten times the maximum blank concentration. Therefore, bis(2-ethylhexyl)phthalate is attributed to laboratory contamination and excluded from further evaluation. In addition, as shown in Table 2, neither of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria.

Two of the eight RCRA metals (chromium and lead) were detected in the surface and subsurface soil samples collected at SWMU 260. As shown in Table 1, chromium and lead were detected in every sample. However, as shown in Table 2, the detected concentrations of chromium or lead did not exceed USEPA Region III Industrial RBCs or state criteria.

4.10.3.2 SWMUs 261 and 297

As presented in Table 3, ten VOCs were detected in the soil samples submitted for laboratory analysis under EPA Method 8260: 1,1,2-trichloroethane, 1,2-dichloroethene (total), 4-methyl-2-pentanone, acetone, bromomethane, chloroethane, methylene chloride, tetrachloroethene, toluene, and xylenes (total). 1,1,2-Trichloroethane, 1,2-dichloroethene (total), 4-methyl-2-pentanone, bromomethane, methylene chloride, tetrachloroethene, toluene, and xylenes (total) were detected in one of the nine soil samples (SWMU261-IS02-00). These VOCs were detected at concentrations below their respective USEPA Region III Industrial RBCs or state criteria (refer to Table 6). It should be noted that tetrachloroethene was also detected in the field blank 371FB01 at an estimated concentration of 0.94J µg/kg. Chloroethane was detected in one out of nine soil samples (SWMU261-IS02-00) at a concentration (2.9J µg/kg) that exceeded its Method I, Category S-3:G-1 Target Concentration. Acetone was detected in four out of nine soil samples with concentrations ranging from 30J to 45 µg/kg. As shown in Table 4, the detected concentrations of acetone did not exceed USEPA Region III Industrial RBCs or state criteria. Acetone was also detected in field blank 371FB01 at a concentration of 59 µg/kg.

As presented in Table 3, four VOCs were detected in the soil samples submitted for laboratory analysis under EPA Method 8020: 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and xylenes (total). 1,2-Dichlorobenzene and 1,3-dichlorobenzene was detected in one out of nine

soil samples (SWMU261-SS01-00) at concentrations of 180 and 220 µg/kg, respectively. 1,4-Dichlorobenzene was detected in two out of nine soil samples (SWMU261-SS01-00 and SWMU297-IS01-00) at concentrations of 210 and 1.8 µg/kg, respectively. Xylenes (total) was detected in two out of nine soil samples (SWMU261-SS01-00 and SWMU297-IS01-00) at concentrations of 210 and 1.2 µg/kg. As shown in Table 4, the detected concentrations of 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and xylenes (total) did not exceed USEPA Region III Industrial RBCs or state criteria.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in every soil sample with estimated concentrations ranging from 76J to 500J µg/kg. Bis(2-ethylhexyl)phthalate was detected in field blank 371FB02 at a concentration of 92 µg/kg. Although bis(2-ethylhexyl)phthalate was detected in the soil samples, it was not detected at a level that exceeded ten times the maximum blank concentration. Therefore, bis(2-ethylhexyl)phthalate is attributed to laboratory contamination and excluded from further evaluation. In addition, as shown in Table 4, none of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria. In addition, three noncarcinogenic PAHs were detected in one out of nine soil samples (SWMU297-IS01-00): fluoranthene, phenanthrene, and pyrene. As shown in Table 4, the detected concentrations of fluoranthene, phenanthrene, and pyrene did not exceed USEPA Region III Industrial RBCs or state criteria.

Six of the eight RCRA metals (arsenic, barium, cadmium, chromium, lead, and mercury) were detected in the surface and subsurface soil samples collected at SWMUs 261 and 297. Arsenic and barium were detected at maximum concentrations that did not exceed USEPA Region III Industrial RBCs or state criteria. As shown in Table 3, cadmium was detected in two out of nine samples. The maximum detected concentration of cadmium (31.6 mg/kg) was found in the surface soil sample, SWMU261-SS01-00. As shown in Table 4, this concentration exceeded the Method I, Category S-3:G-1 Target Concentration for cadmium. Chromium was detected in every soil sample. The maximum detected concentration of chromium (65.8 mg/kg) was found in the surface soil sample, SWMU261-SS01-00. This concentration exceeded the Method I, Category S-3:G-1 Target Concentration for chromium. Lead was detected in every sample with concentrations ranging from 3 to 604 mg/kg. The maximum detected concentration of lead was found in the surface soil sample, SWMU261-SS01-00. As shown in Table 4, this concentration exceeded the Method I, Category S-3:G-1 Target Concentration for lead. Also, mercury was detected in three out of nine surface soil samples with concentrations ranging from 0.047 to 0.063 mg/kg. As shown in Table 6, all three concentrations exceeded the Method I, Category S-3:G-1 and Category S-3:G-1 Target Concentrations for mercury.

4.10.3.3 SWMU 262

As presented in Table 5, four VOCs were detected in the soil samples submitted for laboratory analysis under EPA Method 8260: 2-butanone, 2-hexanone, acetone, and methylene chloride. 2-Butanone was detected in two out of five samples at estimated concentrations of 4.5J (SWMU262-IS01-06) and 6.7J µg/kg (SWMU262-IS02-08), respectively. 2-Hexanone was detected in one out of five samples at a estimated concentration of 4.2J µg/kg (SWMU262-IS02-08). Acetone was detected in two out of five soil samples at concentrations of 40 (SWMU262-IS02-08) and 110 µg/kg (SWMU262-IS01-06). Acetone was also detected in field blank 371FB01 at a concentration of 59 µg/kg. Methylene chloride was detected in two out of five soil samples at estimated concentrations of 2.1J (SWMU262-IS02-00) to 2.8J µg/kg (SWMU262-IS01-06). As

shown in Table 6, the detected concentrations of 2-butanone, 2-hexanone, acetone, and methylene chloride did not exceed USEPA Region III Industrial RBCs or state criteria.

As presented in Table 5, one VOC, 1,3-dichlorobenzene, was detected in one out of five soil samples submitted for laboratory analysis under EPA Method 8020. The detected concentration of 1,3-dichlorobenzene (SWMU262-IS02-08, 15 µg/kg) did not exceed USEPA Region III Industrial RBCs or state criteria. This is presented on Table 7.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in three out of five soil samples with estimated concentrations ranging from 72J to 130J µg/kg. Bis(2-ethylhexyl)phthalate was detected in field blank 371FB02 at a concentration of 92 µg/kg. Although bis(2-ethylhexyl)phthalate was detected in the soil samples, it was not detected at a level that exceeded ten times the maximum blank concentration. Therefore, bis(2-ethylhexyl)phthalate is attributed to laboratory contamination and excluded from further evaluation. In addition, as shown in Table 6, none of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria.

Five of the eight RCRA metals (arsenic, cadmium, chromium, lead, and selenium) were detected in the surface and subsurface soil samples collected at SWMU 262. As shown in Table 5, arsenic, cadmium, and selenium were detected in one out of five samples, while chromium and lead were detected in every sample. However, as shown in Table 6, the detected concentrations of arsenic, cadmium, chromium, lead, or selenium did not exceed USEPA Region III Industrial RBCs or state criteria.

4.10.3.4 SWMU 298

As presented in Table 7, one VOC, acetone, was detected in the soil samples submitted for laboratory analysis under EPA Method 8260. Acetone was detected in two out of four soil samples with concentrations ranging from 30 to 49 µg/kg. As shown in Table 8, the detected concentrations of acetone did not exceed USEPA Region III Industrial RBCs or state criteria. Acetone was also detected in field blank 371FB01 at a concentration of 59 µg/kg.

As presented in Table 7, one VOC, 1,3-dichlorobenzene, was detected every soil sample submitted for laboratory analysis under EPA Method 8020. The detected concentrations of 1,3-dichlorobenzene ranged from 5.2 to 15 µg/kg. As shown in Table 8, the detected concentrations of 1,3-dichlorobenzene did not exceed USEPA Region III Industrial RBCs or state criteria.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in every soil sample with estimated concentrations ranging from 110J to 200J µg/kg. Bis(2-ethylhexyl)phthalate was detected in field blank 371FB02 at a concentration of 92 µg/kg. Although bis(2-ethylhexyl)phthalate was detected in every soil sample, it was not detected at a level that exceeded ten times the maximum blank concentration. Therefore, bis(2-ethylhexyl)phthalate is attributed to laboratory contamination and excluded from further evaluation. In addition, as shown in Table 8, none of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria.

Three of the eight RCRA metals (cadmium, chromium, and lead) were detected in the surface and subsurface soil samples collected at SWMU 298. As shown in Table 7, cadmium was detected in one out of four samples, while chromium and lead were detected in every sample. However, as

shown in Table 8, the detected concentrations of cadmium, chromium, or lead did not exceed USEPA Region III Industrial RBCs or state criteria.

4.10.4 Recommendations

Additional investigation activities are recommended for SWMUs 261 and 297. No further action is recommended for SWMUs 260, 262, and 298. Additional soil borings in the vicinity of SWMUs 261 and 297 should be advanced to further investigate the presence of cadmium, chromium, lead, and mercury. The maximum detected concentrations of these metals that exceeded criteria were from the surface soil sample taken from the drainage ditch (SWMU261-SS01-00). Chloroethane was detected in one sample (SWMU261-IS02-00) at a concentration that exceeded its Method I, Category S-3:G-1 Target Concentration, it's presence may be site related. Soil samples will be submitted for analysis of VOAs and metals.

why VOAs?
only 1 exceedance
barely above stds
is this necessary?

TABLE 1
DETECTION SUMMARY
SWMU 260
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-1, TRUCK COMPANY MAINTENANCE HQ BN 2D, MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU260-IS01-00	SWMU260-IS01-07	SWMU260-IS02-00	SWMU260-IS02-07	SWMU260-IS03-00	SWMU260-IS03-07
DATE SAMPLED	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	14' - 16'	0' - 2'	14' - 16'	0' - 2'	14' - 16'
VOLATILES (ug/kg) (8260A)						
Methylene chloride	2.3 J	5.6 U	5.2 U	2.4 J	5.3 U	2.6 J
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	21	1.1 U	12	1.1 U	1.1 U	1.1 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	350 U	150 J	340 U	880	350 U	400
TOTAL METALS(mg/kg) (6010/7410)						
Chromium	8.3	9.6	5.9	7.4	9.1	8.9
Lead	21.3	28.4	8.9	5	16.5	3.1

TABLE 1
DETECTION SUMMARY
SWMU 260
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-1, TRUCK COMPANY MAINTENANCE HQ BN 2D, MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Methylene chloride	5.2 U	5.6 U	2.3 J	2.6 J	SWMU260-IS03-07	3/6	2.43	2.4
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1.1 U	1.1 U	12	21	SWMU260-IS01-00	2/6	16.5	16.5
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	340 U	350 U	150 J	880	SWMU260-IS02-07	3/6	476.67	400
TOTAL METALS(mg/kg) (6010/7410)								
Chromium	ND	ND	5.9	9.6	SWMU260-IS01-07	6/6	8.2	8.6
Lead	ND	ND	3.1	28.4	SWMU260-IS01-07	6/6	13.87	12.7

TABLE 2
STATISTICAL SUMMARY
SWMU 260
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-1, TRUCK COMPANY MAINTENANCE HQ BN 2D, MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260A)							
Methylene chloride	2.3 J	2.6 J	SWMU260-IS03-07	760000	760000	22.1	17700
VOLATILES (ug/kg) (8020)							
1,3-Dichlorobenzene	12	21	SWMU260-IS01-00	180000000	36000000	23700	248000
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	150 J	880	SWMU260-IS02-07	410000	410000	6670	32900
TOTAL METALS(mg/kg) (6010/7410)							
Chromium	5.9	9.6	SWMU260-IS01-07	10000	2000	27.2	NE
Lead	3.1	28.4	SWMU260-IS01-07	NE	400	270.06	1130

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 260
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-1, TRUCK COMPANY MAINTENANCE HQ BN 2D, MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260A)				
Methylene chloride	0	0	0	0
VOLATILES (ug/kg) (8020)				
1,3-Dichlorobenzene	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
TOTAL METALS(mg/kg) (6010/7410)				
Chromium	0	0	0	0
Lead	0	0	0	0

TABLE 3
DETECTION SUMMARY
SWMU 261~~297~~ and SWMU 297
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-1, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU261-IS01-00	SWMU261-IS01-06	SWMU261-IS02-00	SWMU261-IS02-06	SWMU261-SS01-00	SWMU297-IS01-00
DATE SAMPLED	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-17-1997	09-13-1997
DEPTH	0' - 2'	12' - 14'	0' - 2'	12' - 14'	0' - 2'	0' - 2'
VOLATILES (ug/kg) (8260A)						
1,1,2-Trichloroethane	5.4 U	5.7 U	1.4 J	5.7 U	73 U	5.8 U
1,2-Dichloroethene (total)	5.4 U	5.7 U	2.2 J	5.7 U	73 U	5.8 U
4-Methyl-2-pentanone	22 U	23 U	4.4 J	23 U	290 U	23 U
Acetone	22 U	34	22 U	30 J	290 U	23 U
Bromomethane	11 U	11 U	3.3 J	11 U	150 U	12 U
Chloroethane	11 U	11 U	2.9 J	11 U	150 U	12 U
Methylene chloride	5.4 U	5.7 U	3.1 J	5.7 U	73 U	5.8 U
Tetrachloroethene	5.4 U	5.7 U	2.1 J	5.7 U	73 U	5.8 U
Toluene	5.4 U	5.7 U	1.4 J	5.7 U	73 U	5.8 U
Xylenes (total)	5.4 U	5.7 U	2.6 J	5.7 U	73 U	5.8 U
VOLATILES (ug/kg) (8020)						
1,2-Dichlorobenzene	1.1 U	1.1 U	1.1 U	1.1 U	180	1.2 U
1,3-Dichlorobenzene	1.1 U	1.1 U	1.1 U	1.1 U	220	1.2 U
1,4-Dichlorobenzene	1.1 U	1.1 U	1.1 U	1.1 U	210	1.8
Xylenes (total)	1.1 U	1.1 U	1.1 U	1.1 U	210	1.2
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	76 J	140 J	98 J	110 J	500 J	500 J
Fluoranthene	360 U	370 U	360 U	380 U	4800 U	79 J
Phenanthrene	360 U	370 U	360 U	380 U	4800 U	71 J
Pyrene	360 U	370 U	360 U	380 U	4800 U	45 J
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.3	1.1 U	1.1 U	1.1 U	1.5 U	1.5
Barium	21.8 U	22.7 U	21.9 U	22.9 U	140	23.1 U
Cadmium	0.54 U	0.57 U	0.55 U	0.57 U	31.6	1.7
Chromium	15.7	12.3	10.9	8.8	65.8	8.5
Lead	5.4	5.6	4.1	3.4	604	22.9
Mercury	0.036 U	0.047	0.036 U	0.038 U	0.048 U	0.038 U

TABLE 3
DETECTION SUMMARY
SWMU 261/297
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-1, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU297-IS01-06	SWMU297-IS02-00	SWMU297-IS02-06
DATE SAMPLED	09-13-1997	09-13-1997	09-13-1997
DEPTH	12' - 14'	0' - 2'	12' - 14'
VOLATILES (ug/kg) (8260A)			
1,1,2-Trichloroethane	6.1 U	5.6 U	5.8 U
1,2-Dichloroethene (total)	6.1 U	5.6 U	5.8 U
4-Methyl-2-pentanone	24 U	23 U	23 U
Acetone	45	23 U	31
Bromomethane	12 U	11 U	12 U
Chloroethane	12 U	11 U	12 U
Methylene chloride	6.1 U	5.6 U	5.8 U
Tetrachloroethene	6.1 U	5.6 U	5.8 U
Toluene	6.1 U	5.6 U	5.8 U
Xylenes (total)	6.1 U	5.6 U	5.8 U
VOLATILES (ug/kg) (8020)			
1,2-Dichlorobenzene	1.2 U	1.1 U	1.2 U
1,3-Dichlorobenzene	1.2 U	1.1 U	1.2 U
1,4-Dichlorobenzene	1.2 U	1.1 U	1.2 U
Xylenes (total)	1.2 U	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)			
bis(2-Ethylhexyl) phthalate	93 J	91 J	110 J
Fluoranthene	400 U	370 U	380 U
Phenanthrene	400 U	370 U	380 U
Pyrene	400 U	370 U	380 U
TOTAL METALS (mg/kg) (6010/7410)			
Arsenic	1.2 U	1.1	1.2 U
Barium	24.2 U	22.5 U	23 U
Cadmium	0.61 U	0.56 U	0.58 U
Chromium	4.7	6.8	9.5
Lead	3	4.7	4.8
Mercury	0.052	0.037 U	0.063

TABLE 3
DETECTION SUMMARY
SWMU 261/297
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-1, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
1,1,2-Trichloroethane	5.4 U	73 U	1.4 J	1.4 J	SWMU261-IS02-00	1/9	1.4	1.4
1,2-Dichloroethene (total)	5.4 U	73 U	2.2 J	2.2 J	SWMU261-IS02-00	1/9	2.2	2.2
4-Methyl-2-pentanone	22 U	290 U	4.4 J	4.4 J	SWMU261-IS02-00	1/9	4.4	4.4
Acetone	22 U	290 U	30 J	45	SWMU297-IS01-06	4/9	35	32.5
Bromomethane	11 U	150 U	3.3 J	3.3 J	SWMU261-IS02-00	1/9	3.3	3.3
Chloroethane	11 U	150 U	2.9 J	2.9 J	SWMU261-IS02-00	1/9	2.9	2.9
Methylene chloride	5.4 U	73 U	3.1 J	3.1 J	SWMU261-IS02-00	1/9	3.1	3.1
Tetrachloroethene	5.4 U	73 U	2.1 J	2.1 J	SWMU261-IS02-00	1/9	2.1	2.1
Toluene	5.4 U	73 U	1.4 J	1.4 J	SWMU261-IS02-00	1/9	1.4	1.4
Xylenes (total)	5.4 U	73 U	2.6 J	2.6 J	SWMU261-IS02-00	1/9	2.6	2.6
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	1.1 U	1.2 U	180	180	SWMU261-SS01-00	1/9	180	180
1,3-Dichlorobenzene	1.1 U	1.2 U	220	220	SWMU261-SS01-00	1/9	220	220
1,4-Dichlorobenzene	1.1 U	1.2 U	1.8	210	SWMU261-SS01-00	2/9	105.9	105.9
Xylenes (total)	1.1 U	1.2 U	1.2	210	SWMU261-SS01-00	2/9	105.6	105.6
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	76 J	500 J	SWMU261-SS01-00,SWMU297-IS01-00	9/9	190.89	110
Fluoranthene	360 U	4800 U	79 J	79 J	SWMU297-IS01-00	1/9	79	79
Phenanthrene	360 U	4800 U	71 J	71 J	SWMU297-IS01-00	1/9	71	71
Pyrene	360 U	4800 U	45 J	45 J	SWMU297-IS01-00	1/9	45	45
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1	1.5	1.1	1.5	SWMU261-SS01-00,SWMU297-IS01-00	3/9	1.3	1.3
Barium	21.8 U	24.2 U	140	140	SWMU261-SS01-00	1/9	140	140
Cadmium	0.54 U	0.61 U	1.7	31.6	SWMU261-SS01-00	2/9	16.65	16.65
Chromium	ND	ND	4.7	65.8	SWMU261-SS01-00	9/9	15.89	9.5
Lead	ND	ND	3	604	SWMU261-SS01-00	9/9	73.1	4.8
Mercury	0.036 U	0.048 U	0.047	0.063	SWMU297-IS02-06	3/9	0.05	0.05

TABLE 4
STATISTICAL SUMMARY
SWMU 261~~297~~ and SWMU 297
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-1, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260A)							
1,1,2-Trichloroethane	1.4 J	1.4 J	SWMU261-IS02-00	100000	100000	NE	584
1,2-Dichloroethene (total)	2.2 J	2.2 J	SWMU261-IS02-00	18000000	3600000	NE	NE
4-Methyl-2-pentanone	4.4 J	4.4 J	SWMU261-IS02-00	NE	NE	NE	NE
Acetone	30 J	45	SWMU297-IS01-06	200000000	40000000	2810	NE
Bromomethane	3.3 J	3.3 J	SWMU261-IS02-00	2900000	580000	NE	181000
Chloroethane	2.9 J	2.9 J	SWMU261-IS02-00	2000000	164000000	1.01	NE
Methylene chloride	3.1 J	3.1 J	SWMU261-IS02-00	760000	760000	22.1	17700
Tetrachloroethene	2.1 J	2.1 J	SWMU261-IS02-00	110000	110000	7.4	235
Toluene	1.4 J	1.4 J	SWMU261-IS02-00	410000000	82000000	7275	200
Xylenes (total)	2.6 J	2.6 J	SWMU261-IS02-00	1000000000	200000000	4958	NE
VOLATILES (ug/kg) (8020)							
1,2-Dichlorobenzene	180	180	SWMU261-SS01-00	180000000	36000000	7270	498000
1,3-Dichlorobenzene	220	220	SWMU261-SS01-00	180000000	36000000	23700	248000
1,4-Dichlorobenzene	1.8	210	SWMU261-SS01-00	240000	240000	1240	NE
Xylenes (total)	1.2	210	SWMU261-SS01-00	1000000000	200000000	4958	NE
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	76 J	500 J	SWMU261-SS01-00,SWMU297-IS01-00	410000	410000	6670	32900
Fluoranthene	79 J	79 J	SWMU297-IS01-00	82000000	16400000	276080	131000
Phenanthrene	71 J	71 J	SWMU297-IS01-00	NE	NE	59640	NE
Pyrene	45 J	45 J	SWMU297-IS01-00	61000000	12264000	286440	109000
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.1	1.5	SWMU261-SS01-00,SWMU297-IS01-00	3.8	3.8	26.2	65.5
Barium	140	140	SWMU261-SS01-00	140000	28000	848	NE
Cadmium	1.7	31.6	SWMU261-SS01-00	1000	200	2.72	2.72
Chromium	4.7	65.8	SWMU261-SS01-00	10000	2000	27.2	NE
Lead	3	604	SWMU261-SS01-00	NE	400	270.06	1130
Mercury	0.047	0.063	SWMU297-IS02-06	610	122	0.0154	0.00042

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 4
STATISTICAL SUMMARY
SWMU 261/297
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-1, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count
VOLATILES (ug/kg) (8260A)				
1,1,2-Trichloroethane	0	0	0	0
1,2-Dichloroethene (total)	0	0	0	0
4-Methyl-2-pentanone	0	0	0	0
Acetone	0	0	0	0
Bromomethane	0	0	0	0
Chloroethane	0	0	1	1
Methylene chloride	0	0	0	0
Tetrachloroethene	0	0	0	0
Toluene	0	0	0	0
Xylenes (total)	0	0	0	0
VOLATILES (ug/kg) (8020)				
1,2-Dichlorobenzene	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0
Xylenes (total)	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
Fluoranthene	0	0	0	0
Phenanthrene	0	0	0	0
Pyrene	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Barium	0	0	0	0
Cadmium	0	0	1	1
Chromium	0	0	1	1
Lead	0	1	1	1
Mercury	0	0	3	3

TABLE 5
DETECTION SUMMARY
SWMU 262
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-2, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU262-IS01-00	SWMU262-IS01-06	SWMU262-IS02-00	SWMU262-IS02-08
DATE SAMPLED	09-17-1997	09-15-1997	09-17-1997	09-11-1997
DEPTH	0' - 2'	12' - 14'	0' - 2'	16' - 18'
VOLATILES (ug/kg) (8260A)				
2-Butanone	23 U	4.5 J	23 U	6.7 J
2-Hexanone	23 U	23 U	23 U	4.2 J
Acetone	23 U	110	23 U	40
Methylene chloride	5.8 U	2.8 J	5.8 U	6.2 U
VOLATILES (ug/kg) (8020)				
1,3-Dichlorobenzene	1.2 U	1.1 U	1.2 U	15
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	130 J	72 J	110 J	410 U
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	1.2 U	2.7	1.2 U	1.2 U
Cadmium	0.71	0.57 U	0.58 U	0.62 U
Chromium	14	14.6	9.9	3.1
Lead	5.9	6	5.8	2.6
Selenium	0.58 U	0.78	0.58 U	0.62 U

TABLE 5
DETECTION SUMMARY
SWMU 262
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-2, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
2-Butanone	23 U	23 U	4.5 J	6.7 J	SWMU262-IS02-08	2/5	5.6	5.6
2-Hexanone	23 U	23 U	4.2 J	4.2 J	SWMU262-IS02-08	1/5	4.2	4.2
Acetone	23 U	23 U	40	110	SWMU262-IS01-06	2/5	75	75
Methylene chloride	5.8 U	6.2 U	2.1 J	2.8 J	SWMU262-IS01-06	2/5	2.45	2.45
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1.1 U	1.2 U	15	15	SWMU262-IS02-08	1/5	15	15
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	380 U	410 U	72 J	130 J	SWMU262-IS01-00	3/5	104	110
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	2.7	2.7	SWMU262-IS01-06	1/5	2.7	2.7
Cadmium	0.57 U	0.62 U	0.71	0.71	SWMU262-IS01-00	1/5	0.71	0.71
Chromium	ND	ND	3.1	14.6	SWMU262-IS01-06	5/5	10.64	11.6
Lead	ND	ND	2.6	6	SWMU262-IS01-06	5/5	5.04	5.8
Selenium	0.57 U	0.62 U	0.78	0.78	SWMU262-IS01-06	1/5	0.78	0.78

TABLE 6
STATISTICAL SUMMARY
SWMU 262
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-2, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260A)							
2-Butanone	4.5 J	6.7 J	SWMU262-IS02-08	1000000000	200000000	692	NE
2-Hexanone	4.2 J	4.2 J	SWMU262-IS02-08	82000000	NE	NE	NE
Acetone	40	110	SWMU262-IS01-06	200000000	40000000	2810	NE
Methylene chloride	2.1 J	2.8 J	SWMU262-IS01-06	760000	760000	22.1	17700
VOLATILES (ug/kg) (8020)							
1,3-Dichlorobenzene	15	15	SWMU262-IS02-08	180000000	36000000	23700	248000
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	72 J	130 J	SWMU262-IS01-00	410000	410000	6670	32900
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	2.7	2.7	SWMU262-IS01-06	3.8	3.8	26.2	65.5
Cadmium	0.71	0.71	SWMU262-IS01-00	1000	200	2.72	2.72
Chromium	3.1	14.6	SWMU262-IS01-06	10000	2000	27.2	NE
Lead	2.6	6	SWMU262-IS01-06	NE	400	270.06	1130
Selenium	0.78	0.78	SWMU262-IS01-06	10000	2000	12.2	3.05

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 6
STATISTICAL SUMMARY
SWMU 262
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - UST-2, TRUCK COMPANY, MAINTENANCE, HQ BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count
VOLATILES (ug/kg) (8260A)				
2-Butanone	0	0	0	0
2-Hexanone	0	0	0	0
Acetone	0	0	0	0
Methylene chloride	0	0	0	0
VOLATILES (ug/kg) (8020)				
1,3-Dichlorobenzene	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Cadmium	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0
Selenium	0	0	0	0

TABLE 7
DETECTION SUMMARY
SWMU 298
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-3, TRUCK MAINTENANCE, HQ BN, 2D, MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU298-IS01-00	SWMU298-IS01-06	SWMU298-IS02-00	SWMU298-IS02-04
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-15-1997
DEPTH	0' - 2'	12' - 14'	0' - 2'	8' - 10'
VOLATILES (ug/kg) (8260A)				
Acetone	22 U	30	22 U	49
VOLATILES (ug/kg) (8020)				
1,3-Dichlorobenzene	5.8	15	5.7	5.2
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	130 J	190 J	200 J	110 J
TOTAL METALS (mg/kg) (6010/7410)				
Cadmium	0.55 U	0.58 U	0.57	0.53 U
Chromium	8.9	13.1	11.2	11.2
Lead	8.7	5.6	6.3	1.2

TABLE 7
DETECTION SUMMARY
SWMU 298
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-3, TRUCK MAINTENANCE, HQ BN, 2D, MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	22 U	22 U	30	49	SWMU298-IS02-04	2/4	39.5	39.5
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	ND	ND	5.2	15	SWMU298-IS01-06	4/4	7.93	5.75
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	110 J	200 J	SWMU298-IS02-00	4/4	157.5	160
TOTAL METALS (mg/kg) (6010/7410)								
Cadmium	0.53 U	0.58 U	0.57	0.57	SWMU298-IS02-00	1/4	0.57	0.57
Chromium	ND	ND	8.9	13.1	SWMU298-IS01-06	4/4	11.1	11.2
Lead	ND	ND	1.2	8.7	SWMU298-IS01-00	4/4	5.45	5.95

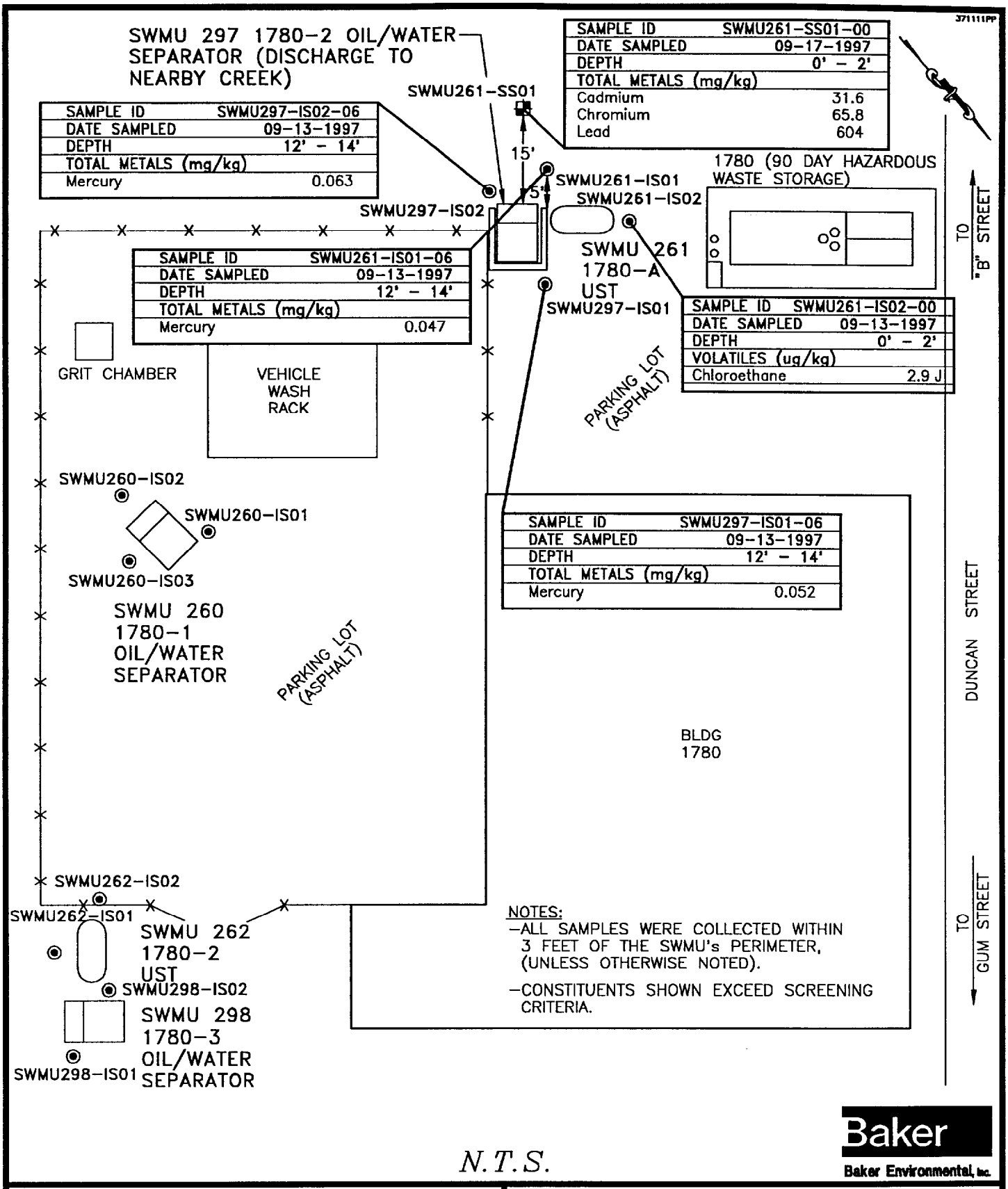
TABLE 8
STATISTICAL SUMMARY
SWMU 298
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-3, TRUCK MAINTENANCE, HQ BN, 2D, MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260A)							
Acetone	30	49	SWMU298-IS02-04	200000000	40000000	2810	NE
VOLATILES (ug/kg) (8020)							
1,3-Dichlorobenzene	5.2	15	SWMU298-IS01-06	180000000	36000000	23700	248000
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	110 J	200 J	SWMU298-IS02-00	410000	410000	6670	32900
TOTAL METALS (mg/kg) (6010/7410)							
Cadmium	0.57	0.57	SWMU298-IS02-00	1000	200	2.72	2.72
Chromium	8.9	13.1	SWMU298-IS01-06	10000	2000	27.2	NE
Lead	1.2	8.7	SWMU298-IS01-00	NE	400	270.06	1130

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 8
STATISTICAL SUMMARY
SWMU 298
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1780 - O/W-3, TRUCK MAINTENANCE, HQ BN, 2D, MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count
VOLATILES (ug/kg) (8260A)				
Acetone	0	0	0	0
VOLATILES (ug/kg) (8020)				
1,3-Dichlorobenzene	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Cadmium	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0



LEGEND

- ◉ SOIL BORING AND SAMPLE LOCATION
- SURFACE SOIL LOCATION
- mg/kg MILLIGRAM/KILOGRAM
- ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMUs 260, 261, 262, 297, AND 298
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.11 SWMU 264 - 2611 Container

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.11.1 SWMU Description and History

SWMU 264 is located south of Buildings 2611 and 2613 in the Paradise Point area of MCB, Camp Lejeune, between the New River and Seth Williams Boulevard. The SWMU consisted of several drums of unknown material and stained pavement when the original site visit was conducted by EnSafe, Inc (Figure 1). However, the SWMU was described as an open asphalt parking lot during the Confirmatory Sampling Investigation conducted in September 1997.

no drums left?

how far to New River? what dirn?

4.11.2 Confirmatory Investigation Activities

The investigation conducted at SWMU 264 was developed to determine if the materials stored within the drums have impacted surface and subsurface soils in the vicinity of the SWMU. As depicted on Figure 1, a single soil boring (SWMU264-IS01) was advanced on September 10, 1997 in the vicinity of an area where EnSafe, Inc. had noted released material. Soil samples were collected from ground surface to 2.0 feet bgs and just above the soil/groundwater interface at a depth of 4.0 to 6.0 feet bgs. Groundwater was encountered at 7.0 feet bgs.

A surface soil sample was collected from a second area where EnSafe, Inc. had observed containers of unknown materials. The sample was collected from the ground surface to one foot bgs and placed in the appropriate sample jars.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270), pesticides (EPA Method 8080) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are included in Appendix D. Equipment rinsate blanks 371ER02B and 371ER08B were collected from a split spoon sampler and a stainless steel sampling spoon used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB05, 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.11.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1, and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

Contaminant concentrations that exceeded the previously listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs.

Acetone and methylene chloride were the only VOCs detected in the soil samples collected at the SWMU. Neither of these compounds were detected at concentrations exceeding the comparison criteria. Both compounds are common laboratory contaminants and are not suspected to be site related.

Pentachlorophenol was detected in the surface soil sample SWMU264-SS01-00 at a concentration of 870J µg/kg. This concentration exceeds North Carolina, Category S-3:G-1 Target Concentration (23.1 µg/kg) by more than one order of magnitude. Pentachlorophenol is used for termite control and a wood preserver among other uses. This compound could be the result of one of two possible sources. The site visit conducted by EnSafe, Inc. noted "tar-like" material in the drums and on the pavement. This is one possible source for the compound. However, a tar-like material would be expected to have many more SVOCs than was detected in the samples collected from the SWMU. The other possible source is the wood chips that were observed during the Baker site visit in October 1996. Wood chips were staged in this parking lot during the cleanup of hurricane Fran and it is possible that the compound may have been sprayed on the wood to rid the material from termite and ant infestation. This scenario does not explain how the compound was able to pass through the asphalt cover and contaminate the soils beneath it.

Only one pesticide was detected at the site in excess of the comparison criteria. Chlordane was detected at a concentration of 510 µg/kg in sample SWMU 264-SS01-00, exceeding the North Carolina, Categories S-3:G-1 and S-3:G-3 Target Concentrations of 27.8 µg/kg and 1.51 µg/kg, respectively. It is suspected the detection of this compound is the result of base wide pest control operations.

Arsenic was detected in excess of the comparison criteria in a single sample collected at the SWMU. Sample number SWMU264-IS01-00 possessed arsenic contamination at a concentration of 5.2 mg/kg exceeding the Region III RBCs and the North Carolina, Category S-2 Target Concentration of 3.8 mg/kg.

4.11.4 Recommendations

Additional investigation activites are recommended for SWMU 264. Three compounds exceeded comparison criteria. The identification of compounds such as pentachlorophenol and chlordane in surface soils indicate that they may be the result of base wide pest control applications and not the result of tar-like material noted in the RFA. Arsenic was detected at a concentration which slightly exceeded the comparison criteria. Soil borings should be performed to better define contamination in surface and subsurface soils. A temporary groundwater monitoring well should be installed in the vicinity of boring SWMU264-SS01 to determine if detected concentrations of SVOCs, pesticides, and metals have impacted the surficial groundwater. Soil and groundwater samples will be analyzed for SVOAs and metals.

TABLE 1
DETECTION SUMMARY
SWMU 264
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2611 - CONTAINER, GUN CLUB, CTO-0371
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU264-IS01-00	SWMU264-IS01-02	SWMU264-SS01-00
DATE SAMPLED	09-10-1997	09-10-1997	09-17-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'
VOLATILES (mg/kg) (8260)			
Acetone	36	26	21 J
Methylene chloride	3.3 J	2.2 J	5.9 U
SEMIVOLATILES (mg/kg) (8270)			
bis(2-Ethylhexyl) phthalate	140 J	85 J	97 J
Pentachlorophenol	2000 U	1800 U	870 J
Pyrene	400 U	370 U	58 J
PESTICIDES (ug/kg) (8080)			
4,4'-DDT	2.1 U	1.9 U	20
Chlordane (technical)	21 U	19 U	510
TOTAL METALS (mg/kg) (6010/7410)			
Arsenic	5.2	2.7	1.3
Barium	28.7	22.7 U	24.3
Chromium	24.9	16.7	9.8
Lead	8.6	5.4	9.5

TABLE 1
DETECTION SUMMARY
SWMU 264
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2611 - CONTAINER, GUN CLUB, CTO-0371
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (mg/kg) (8260)								
Acetone	ND	ND	21 J	36	SWMU264-IS01-00	3/3	27.67	26
Methylene chloride	5.9 U	5.9 U	2.2 J	3.3 J	SWMU264-IS01-00	2/3	2.75	2.75
SEMIVOLATILES (mg/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	85 J	140 J	SWMU264-IS01-00	3/3	107.33	97
Pentachlorophenol	1800 U	2000 U	870 J	870 J	SWMU264-SS01-00	1/3	870	870
Pyrene	370 U	400 U	58 J	58 J	SWMU264-SS01-00	1/3	58	58
PESTICIDES (ug/kg) (8080)								
4,4'-DDT	1.9 U	2.1 U	20	20	SWMU264-SS01-00	1/3	20	20
Chlordane (technical)	19 U	21 U	510	510	SWMU264-SS01-00	1/3	510	510
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	ND	ND	1.3	5.2	SWMU264-IS01-00	3/3	3.07	2.7
Barium	22.7 U	22.7 U	24.3	28.7	SWMU264-IS01-00	2/3	26.5	26.5
Chromium	ND	ND	9.8	24.9	SWMU264-IS01-00	3/3	17.13	16.7
Lead	ND	ND	5.4	9.5	SWMU264-SS01-00	3/3	7.83	8.6

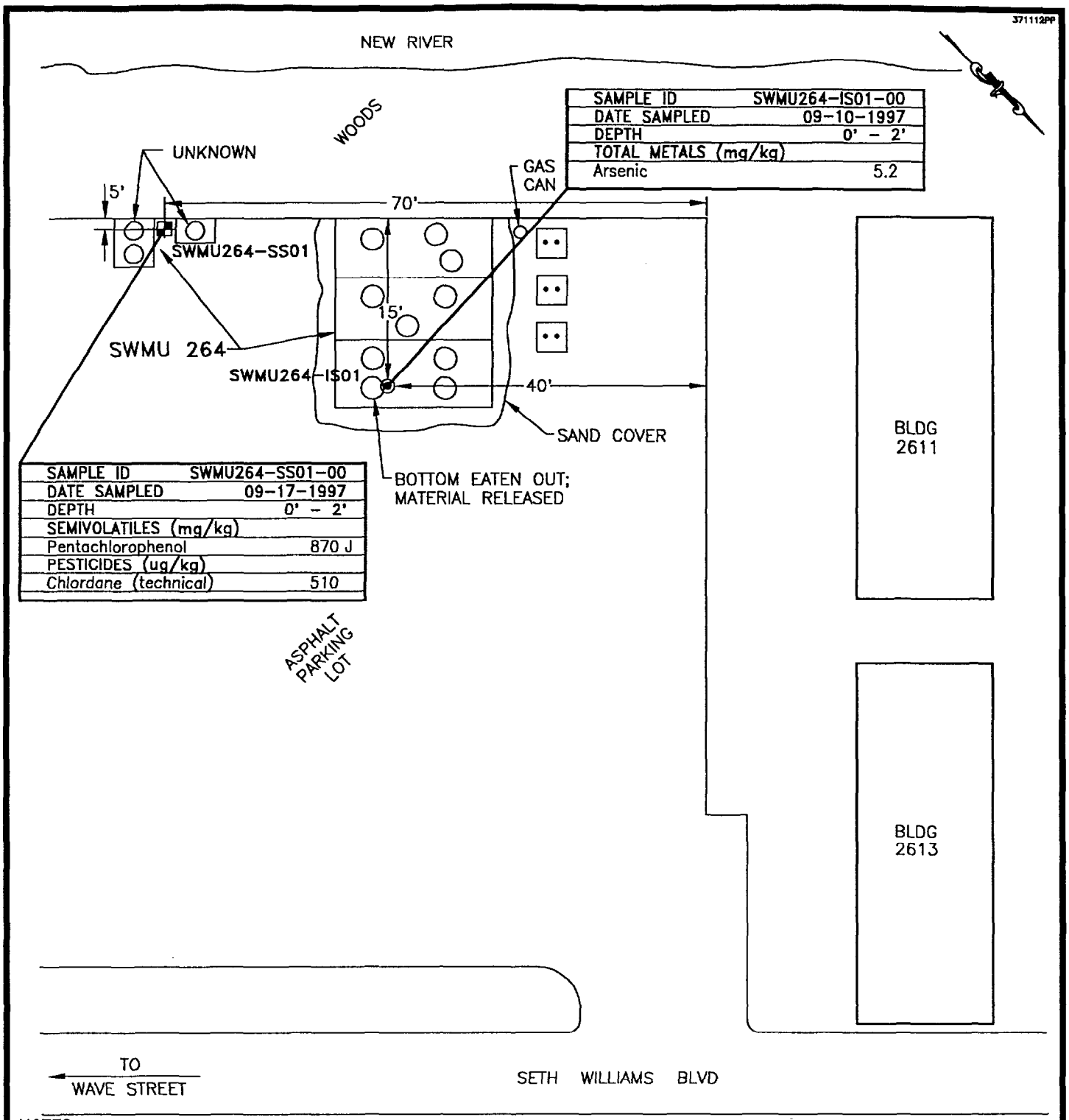
TABLE 2
STATISTICAL SUMMARY
SWMU 264
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2611 - CONTAINER, GUN CLUB, CTO-0371
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (mg/kg) (8260)							
Acetone	21 J	36	SWMU264-IS01-00	200000000	40000000	2810	NE
Methylene chloride	2.2 J	3.3 J	SWMU264-IS01-00	760000	760000	22.1	17700
SEMIVOLATILES (mg/kg) (8270)							
bis(2-Ethylhexyl) phthalate	85 J	140 J	SWMU264-IS01-00	410000	410000	6670	32900
Pentachlorophenol	870 J	870 J	SWMU264-SS01-00	48000	48000	23.1	NE
Pyrene	58 J	58 J	SWMU264-SS01-00	61000000	12264000	286440	109000
PESTICIDES (ug/kg) (8080)							
4,4'-DDT	20	20	SWMU264-SS01-00	17000	17000	NE	NE
Chlordane (technical)	510	510	SWMU264-SS01-00	16000	4400	27.8	1.51
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.3	5.2	SWMU264-IS01-00	3.8	3.8	26.2	65.5
Barium	24.3	28.7	SWMU264-IS01-00	140000	28000	848	NE
Chromium	9.8	24.9	SWMU264-IS01-00	10000	2000	27.2	NE
Lead	5.4	9.5	SWMU264-SS01-00	NE	400	270.06	1130

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 264
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2611 - CONTAINER, GUN CLUB, CTO-0371
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (mg/kg) (8260)				
Acetone	0	0	0	0
Methylene chloride	0	0	0	0
SEMIVOLATILES (mg/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
Pentachlorophenol	0	0	1	0
Pyrene	0	0	0	0
PESTICIDES (ug/kg) (8080)				
4,4'-DDT	0	0	0	0
Chlordane (technical)	0	0	1	1
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	1	1	0	0
Barium	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0



SAMPLE ID	SWMU264-IS01-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Arsenic	5.2

SAMPLE ID	SWMU264-SS01-00
DATE SAMPLED	09-17-1997
DEPTH	0' - 2'
SEMIVOLATILES (mg/kg)	
Pentachlorophenol	870 J
PESTICIDES (ug/kg)	
Chlordane (technical)	510

NOTES:
-DURING THE OCTOBER 1996 VISIT, THE ENTIRE PARKING LOT AT SWMU 264 WAS COVERED WITH WOOD CHIPS AND NO DETAILS WERE VISIBLE. THE DETAILS IN THIS DRAWING WERE NOTED BY ENSAFE, INC. IN NOVEMBER 1993.
-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

- SOIL BORING AND SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- FORMER LOCATIONS OF STEEL DRUM
- FORMER LOCATIONS OF BATTERY

mg/kg MILLIGRAM/KILOGRAM
ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 264
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.12 SWMU 265 - 2615 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.12.1 SWMU Description and History

SWMU 265 is located southeast of Paradise Point adjacent to Building 2613 off Seth Williams Boulevard. SWMU 265 consists of a concrete oil/water separator structure that receives waste water containing No. 6 fuel oil. The SWMU is currently in operation. The area surrounding the SWMU is grass covered. During a site visit, minor fuel staining was observed on the loading ramp adjacent to SWMU 265. Where is surface water body?

4.12.2 Confirmatory Investigation Activities

The Confirmatory Investigation was performed on September 10, 1997 at the SWMU to determine if wastewater introduced into the oil/water separator has impacted the soil around the system. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from four soil borings advanced around the perimeter of the SWMU. Figure 1 shows the locations of the soil borings. The soil borings were advanced to depths of approximately 6.0 feet bgs with groundwater encountered at approximately 4.0 feet bgs.

Four surface soil samples (SWMU265-IS01-00, SWMU265-IS02-00, SWMU265-IS03-00, SWMU265-IS04-00) were collected at depths of 0 to 2.0 feet bgs at all four boring locations. In addition, one subsurface soil sample was collected at all the soil boring locations. The four samples (SWMU265-IS01-01, SWMU265-IS02-01, SWMU265-IS03-01, SWMU265-IS04-01) were collected at the 2.0 to 4.0 feet interval. All soil samples were analyzed for VOAs (EPA Method 8260) and SVOAs (EPA Method 8270). The analytical results for the surface and subsurface soil samples are presented in Appendix D. In addition, a rinsate blank (371ER03A) was collected from a split-spoon and analyzed for the same parameters. The samples were sent to Quanterra laboratories along with trip blank 371TB05. Analytical results for the rinsate sample and the trip blank are presented in Appendix F.

4.12.3 Investigation Findings

Four surface soil and four subsurface soil samples were collected and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

- North Carolina risk Analysis Framework Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

Results of the analysis indicate positive detections of one VOC and 10 SVOCs. As shown on Table 2, no constituents detected at SWMU 265 exceeded the screening criteria.

The detected VOC, methylene chloride, was detected in six of the eight surface and subsurface soil samples but at concentrations below the screening criteria.

SVOCs (primarily all PAHs) were detected within the sample set. All of the SVOC concentrations were below the screening criteria. The PAHs were detected in the surface and subsurface soil samples collected from boring SWMU265-IS01.

4.12.4 Recommendations

Since there were no exceedences of the screening criteria at SWMU 265, no further investigations are recommended for this SWMU.

TABLE 1
DETECTION SUMMARY
SWMU 265
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2615 - O/W, OFFICER'S CLUB
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU265-IS01-00	SWMU265-IS01-01	SWMU265-IS02-00	SWMU265-IS02-01	SWMU265-IS03-00	SWMU265-IS03-01
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)						
Methylene chloride	2.4 J	2.1 J	1.8 J	2.1 J	5.7 U	5.9 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	66 J	56 J	380 U	400 U	380 U	390 U
Benzo(a)pyrene	120 J	86 J	380 U	400 U	380 U	390 U
Benzo(b)fluoranthene	110 J	50 J	380 U	400 U	380 U	390 U
Benzo(ghi)perylene	83 J	50 J	380 U	400 U	380 U	390 U
Benzo(k)fluoranthene	86 J	400 U	380 U	400 U	380 U	390 U
bis(2-Ethylhexyl) phthalate	130 J	160 J	170 J	150 J	160 J	150 J
Chrysene	110 J	100 J	380 U	400 U	380 U	390 U
Fluoranthene	33 J	67 J	380 U	400 U	380 U	390 U
Indeno(1,2,3-cd)pyrene	69 J	400 U	380 U	400 U	380 U	390 U
Pyrene	76 J	130 J	380 U	400 U	380 U	390 U

TABLE 1
DETECTION SUMMARY
SWMU 265
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2615 - O/W, OFFICER'S CLUB
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU265-IS04-00	SWMU265-IS04-01
DATE SAMPLED	09-10-1997	09-10-1997
DEPTH	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)		
Methylene chloride	3 J	3.3 J
SEMIVOLATILES (ug/kg) (8270)		
Benzo(a)anthracene	370 U	390 U
Benzo(a)pyrene	370 U	390 U
Benzo(b)fluoranthene	370 U	390 U
Benzo(ghi)perylene	370 U	390 U
Benzo(k)fluoranthene	370 U	390 U
bis(2-Ethylhexyl) phthalate	110 J	160 J
Chrysene	370 U	390 U
Fluoranthene	370 U	390 U
Indeno(1,2,3-cd)pyrene	370 U	390 U
Pyrene	370 U	390 U

TABLE 1
DETECTION SUMMARY
SWMU 265
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2615 - O/W, OFFICER'S CLUB
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Methylene chloride	5.7 U	5.9 U	1.8 J	3.3 J	SWMU265-IS04-01	6/8	2.45	2.25
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	370 U	400 U	56 J	66 J	SWMU265-IS01-00	2/8	61	61
Benzo(a)pyrene	370 U	400 U	86 J	120 J	SWMU265-IS01-00	2/8	103	103
Benzo(b)fluoranthene	370 U	400 U	50 J	110 J	SWMU265-IS01-00	2/8	80	80
Benzo(ghi)perylene	370 U	400 U	50 J	83 J	SWMU265-IS01-00	2/8	66.5	66.5
Benzo(k)fluoranthene	370 U	400 U	86 J	86 J	SWMU265-IS01-00	1/8	86	86
bis(2-Ethylhexyl) phthalate	ND	ND	110 J	170 J	SWMU265-IS02-00	8/8	148.75	155
Chrysene	370 U	400 U	100 J	110 J	SWMU265-IS01-00	2/8	105	105
Fluoranthene	370 U	400 U	33 J	67 J	SWMU265-IS01-01	2/8	50	50
Indeno(1,2,3-cd)pyrene	370 U	400 U	69 J	69 J	SWMU265-IS01-00	1/8	69	69
Pyrene	370 U	400 U	76 J	130 J	SWMU265-IS01-01	2/8	103	103

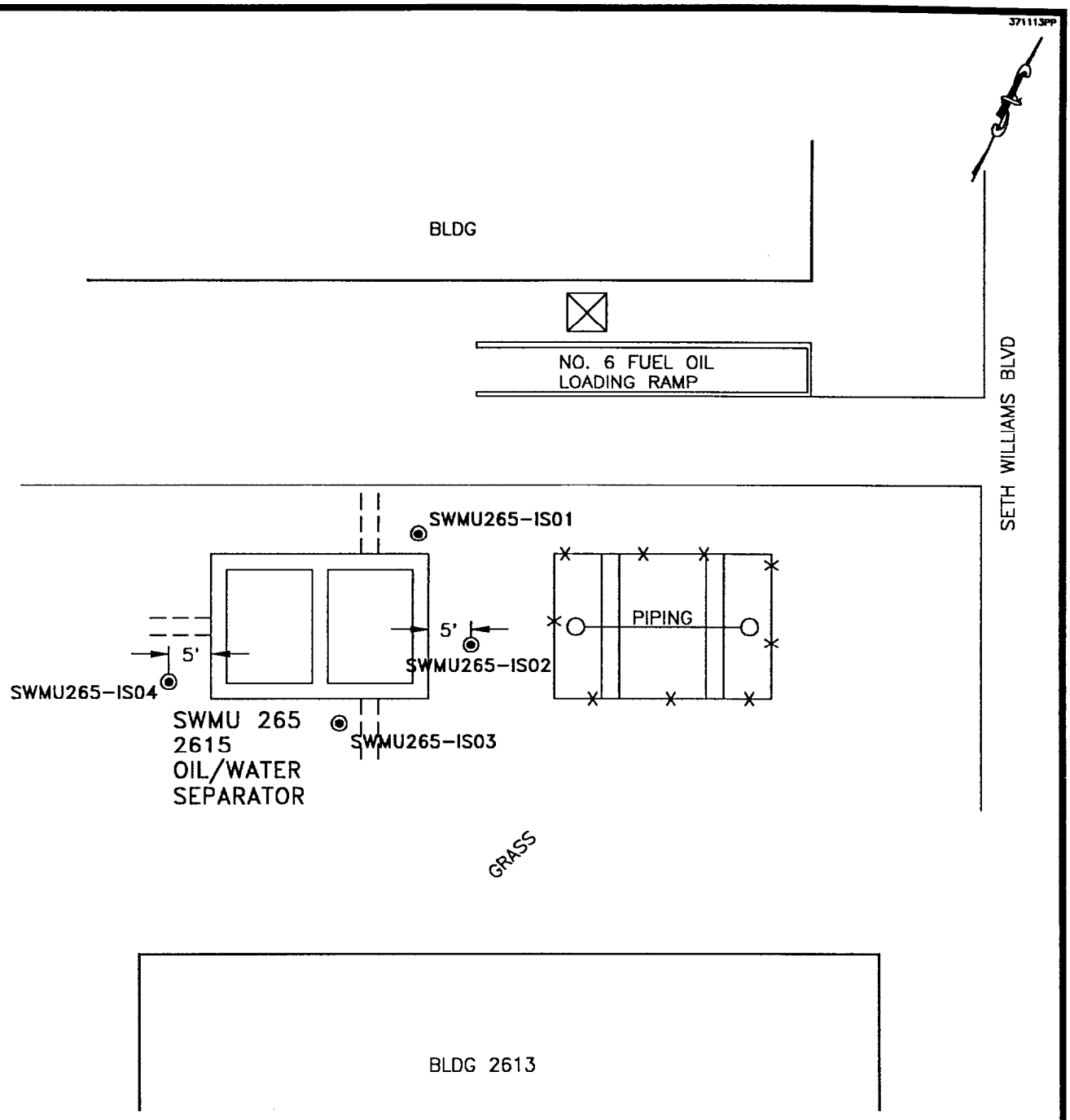
TABLE 2
STATISTICAL SUMMARY
SWMU 265
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2615 - O/W, OFFICER'S CLUB
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260)							
Methylene chloride	1.8 J	3.3 J	SWMU265-IS04-01	760000	760000	22.1	17700
SEMIVOLATILES (ug/kg) (8270)							
Benzo(a)anthracene	56 J	66 J	SWMU265-IS01-00	7800	7800	343	878
Benzo(a)pyrene	86 J	120 J	SWMU265-IS01-00	780	780	NE	NE
Benzo(b)fluoranthene	50 J	110 J	SWMU265-IS01-00	7800	7800	NE	NE
Benzo(ghi)perylene	50 J	83 J	SWMU265-IS01-00	NE	NE	6720000	3920
Benzo(k)fluoranthene	86 J	86 J	SWMU265-IS01-00	78000	78000	NE	NE
bis(2-Ethylhexyl) phthalate	110 J	170 J	SWMU265-IS02-00	410000	410000	6670	32900
Chrysene	100 J	110 J	SWMU265-IS01-00	780000	780000	38150	976
Fluoranthene	33 J	67 J	SWMU265-IS01-01	82000000	16400000	276080	131000
Indeno(1,2,3-cd)pyrene	69 J	69 J	SWMU265-IS01-00	7800	7800	NE	NE
Pyrene	76 J	130 J	SWMU265-IS01-01	61000000	12264000	286440	109000

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 265
SWMU CONFIRMATORY SAMPLING (CTO-0371)
2615 - O/W, OFFICER'S CLUB
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260)				
Methylene chloride	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
Benzo(a)anthracene	0	0	0	0
Benzo(a)pyrene	0	0	0	0
Benzo(b)fluoranthene	0	0	0	0
Benzo(ghi)perylene	0	0	0	0
Benzo(k)fluoranthene	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0
Chrysene	0	0	0	0
Fluoranthene	0	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0	0
Pyrene	0	0	0	0



NOTES:
-ALL SAMPLES WILL BE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).

-NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

Baker
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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 265
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.13 SWMU 268 - 522 Dumpster

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.13.1 SWMU Description and History

SWMU 268 consists of a solid waste dumpster that is located just west of the intersection of Julian C. Smith Boulevard and N Street, in Hadnot point. During the October 1996 site visit, the dumpster could not be located. However, the dumpster was present at the time of this investigation. The dumpster is positioned in a grassy area between the asphalt parking area and Julian C. Smith Boulevard as shown of Figure 1. No evidence of contamination/spills were observed at the SWMU during the investigation. A site plan is presented on Figure 1. surface water body?

4.13.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 268 was developed to determine if any spills had occured around the dumpster which impacted the surrounding surface and subsurface soils.

One boring, SWMU268-IS01 was advanced at the SWMU on September 14, 1997. As depicted on Figure 1, the soil boring was advanced immediately adjacent to the dumpster. Two samples were collected from the boring. The samples were collected from the ground surface to 2.0 feet bgs (SWMU268-IS01-00), and from just above the water table at a depth of 4.0 to 6.0 feet bgs (SWMU268-IS01-02). Groundwater was encountered at a depth of approximately 7.5 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8260), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER06B was collected from a split-spoon sampler used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F. Trip blanks 371TB10 and 371TB11 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.13.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

Two VOCs (acetone and methylene chloride) were detected in the samples collected during the confirmatory sampling investigation. One SVOC (bis[2-ethylhexyl]phthalate) was detected. The presence of these organic compounds is most likely attributable to sampling, decontamination, or analytical procedures. Two metals (chromium and lead) were detected. None of the detected compounds/analytes were present at levels exceeding the aforementioned comparison criteria.

4.13.4 Recommendations

No further action is recommended for SWMU 268. The compounds/analytes detected were present at concentrations significantly below the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 268
SWMU CONFIRMATORY SAMPLING (CTO-0371)
522 DUMPSTER, 2D MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU268-IS01-00	SWMU268-IS01-02
DATE SAMPLED	09-14-1997	09-14-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260)		
Acetone	17 J	51 J
Methylene chloride	2.1 J	2.6 J
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	390 U	120 J
TOTAL METALS (mg/kg) (6010/7410)		
Chromium	4.7	5.6
Lead	4.4	4

TABLE 1
DETECTION SUMMARY
SWMU 268
SWMU CONFIRMATORY SAMPLING (CTO-0371)
522 DUMPSTER, 2D MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	ND	ND	17 J	51 J	SWMU268-IS01-02	2/2	34	34
Methylene chloride	ND	ND	2.1 J	2.6 J	SWMU268-IS01-02	2/2	2.35	2.35
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	390 U	390 U	120 J	120 J	SWMU268-IS01-02	1/2	120	120
TOTAL METALS (mg/kg) (6010/7410)								
Chromium	ND	ND	4.7	5.6	SWMU268-IS01-02	2/2	5.15	5.15
Lead	ND	ND	4	4.4	SWMU268-IS01-00	2/2	4.2	4.2

TABLE 2
STATISTICAL SUMMARY
SWMU 268
SWMU CONFIRMATORY SAMPLING (CTO-0371)
522 DUMPSTER, 2D MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260)							
Acetone	17 J	51 J	SWMU268-IS01-02	200000000	40000000	2810	NE
Methylene chloride	2.1 J	2.6 J	SWMU268-IS01-02	760000	760000	22.1	17700
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	120 J	120 J	SWMU268-IS01-02	410000	410000	6670	32900
TOTAL METALS (mg/kg) (6010/7410)							
Chromium	4.7	5.6	SWMU268-IS01-02	10000	2000	27.2	NE
Lead	4	4.4	SWMU268-IS01-00	NE	400	270.06	1130

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 268
SWMU CONFIRMATORY SAMPLING (CTO-0371)
522 DUMPSTER, 2D MAR DIV
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260)				
Acetone	0	0	0	0
Methylene chloride	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Chromium	0	0	0	0
Lead	0	0	0	0

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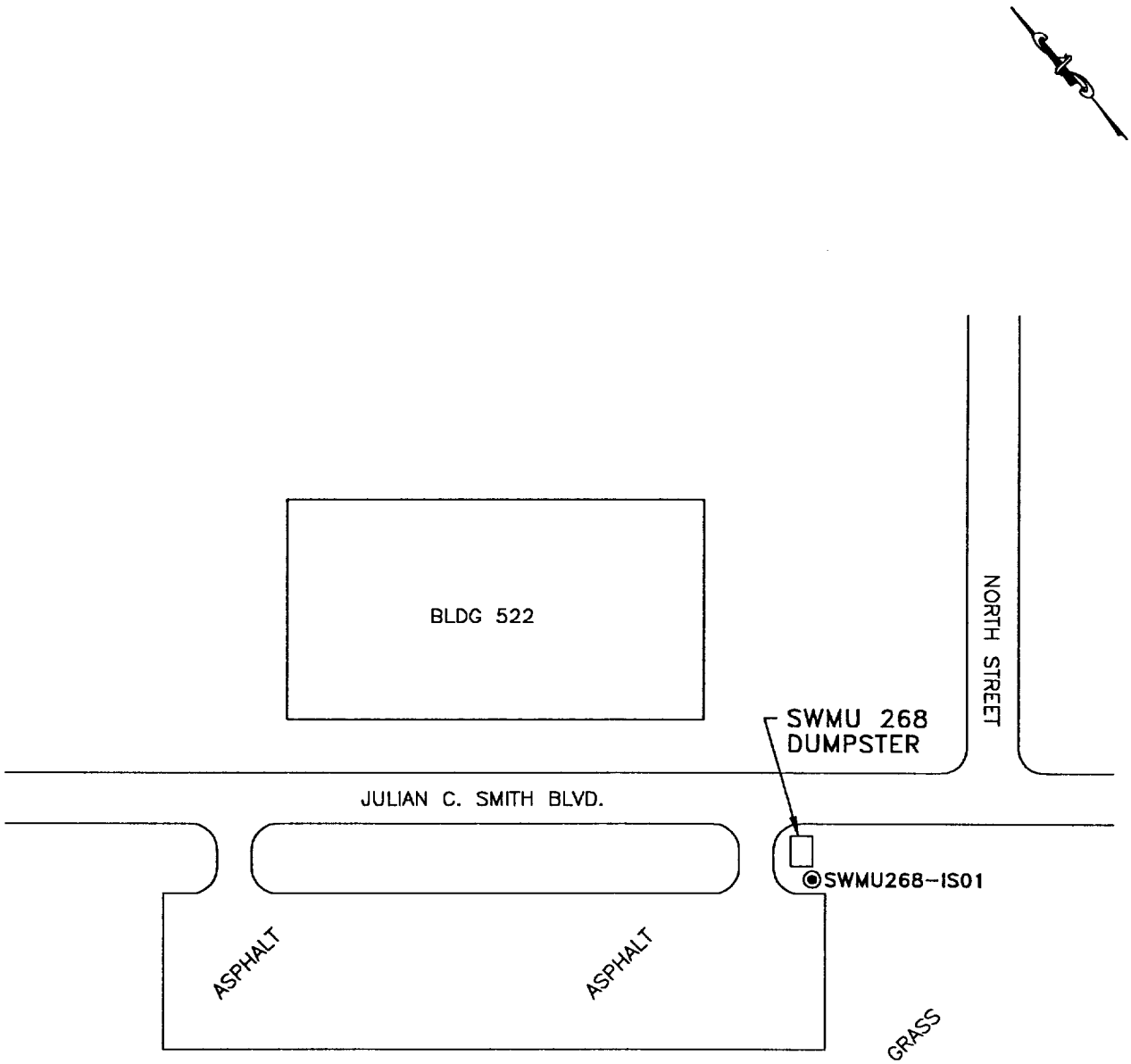


NOTES:

- THE LOCATION OF THIS DUMPSTER COULD NOT BE FOUND DURING THE OCTOBER 1996 SITE VISIT.
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 268
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.14 SWMU 269 - Building 816 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.14.1 SWMU Description and History

SWMU 269 was an oil/water separator associated with a vehicle wash rack located in the vicinity of Hadnot Point industrial area at MCB, Camp Lejeune. The SWMU was located in the vicinity of Buildings GP-19 and 816, near the intersection of Main Service Road and Daly Road. The primary function of the SWMU was to collect water, soap, oil, grease and dirt from the vehicle wash rack, separate the solids from the liquids, and then segregate the oil and grease from the remaining liquids (Figure 1). Since the site visit conducted by EnSafe, Inc., the oil/water separator and associated wash rack have been removed. Baker had observed a disturbed area of soil in the general area of the SWMU during the October 1996 site visit. The clean sand was apparently used for backfill material in the former location of the SWMU.

4.14.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 269 was developed to determine if the operations pertaining to the wash rack and the oil/water separator have impacted surface and subsurface soils surrounding the SWMU.

A total of four soil borings, SWMU269-IS01 through SWMU269-IS04, were advanced during the Confirmatory Sampling Investigation. The borings were advanced on September 13, 1997. As depicted on Figure 1, a soil boring was advanced on all four sides of the oil/water separator's former location. The borings were strategically positioned to determine if contamination resides in the soils surrounding the SWMU. A surface soil sample and a subsurface soil sample were collected from each boring. The surface soil samples were collected from ground surface to 2.0 feet bgs, and the subsurface soil samples were collected from 12.0 to 14.0 feet bgs. Groundwater was encountered at 14.5 feet bgs.

All samples were collected in accordance with procedures outlined in the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are included in Appendix D. A duplicate sample was collected from subsurface soil sample SWMU269-SS04-06 and the results are presented in Appendix E. Equipment rinsate blanks 371ER06A was collected from a stainless steel spatula used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB10 and 371TB11were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.14.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1, and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)

- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3G-1 (protective of non-drinking and drinking water) Target Concentrations

VOCs (1,2-dichlorobenzene, 1,4-dichlorobenzene), SVOCs (bis[2-ethylhexl]phthalate, fluoranthene) and metals (arsenic, chromium, lead) were detected in the sampled set. No contaminants were detected at a concentration which exceeded the previously referenced comparison criteria.

4.14.4 Recommendations

No further action is recommended for this SWMU. The contaminant concentrations were not at levels which exceeded any of the comparison criteria.

TABLE 1
DETECTION SUMMARY
SWMU 269
SWMU CONFIRMATORY SAMPLING (CTO-0371)
816 - O/W, 8th ENGINEER 2D FSSG
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU269-IS01-00	SWMU269-IS01-06	SWMU269-IS02-00	SWMU269-IS02-06	SWMU269-IS03-00	SWMU269-IS03-06
DATE SAMPLED	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997
DEPTH	0' - 2'	12' - 14'	0' - 2'	12' - 14'	0' - 2'	12' - 14'
VOLATILES (ug/kg) (8020)						
1,2-Dichlorobenzene	1.1 U	1.2 U	1.1 U	1.5	1.1 U	1.1 U
1,4-Dichlorobenzene	1.1 U	1.2 U	1.1 U	4.8	21	15
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	94 J	100 J	83 J	140 J	76 J	450 J
Fluoranthene	370 U	410 U	360 U	390 U	47 J	370 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	3.1	2.5	1.1 U	2.1	1.1 U	1.4
Chromium	6.9	14.2	10.1	9	5.5	8.6
Lead	6.2	5.8	10.6	4.4	9.4	8.6

TABLE 1
DETECTION SUMMARY
SWMU 269
SWMU CONFIRMATORY SAMPLING (CTO-0371)
816 - O/W, 8th ENGINEER 2D FSSG
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU269-IS04-00	SWMU269-IS04-06
DATE SAMPLED	09-13-1997	09-13-1997
DEPTH	0' - 2'	12' - 14'
VOLATILES (ug/kg) (8020)		
1,2-Dichlorobenzene	1.2 U	1.1 U
1,4-Dichlorobenzene	39	7.1
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	95 J	83 J
Fluoranthene	47 J	370 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.2 U	1.1 U
Chromium	7.5	5.9
Lead	9	3.1

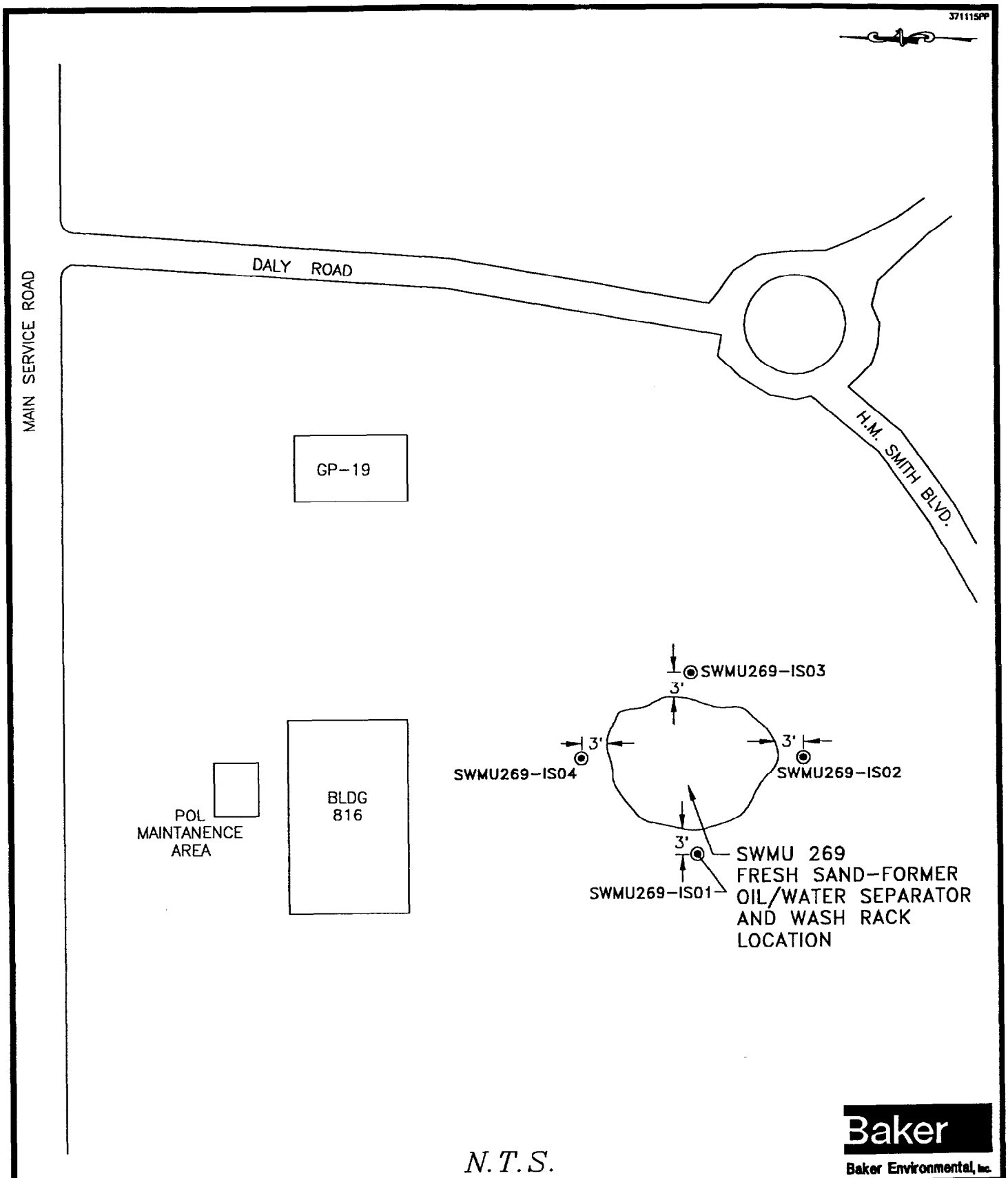
TABLE 1
DETECTION SUMMARY
SWMU 269
SWMU CONFIRMATORY SAMPLING (CTO-0371)
816 - O/W, 8th ENGINEER 2D FSSG
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	1.1 U	1.2 U	1.5	1.5	SWMU269-IS02-06	1/8	1.5	1.5
1,4-Dichlorobenzene	1.1 U	1.2 U	4.8	39	SWMU269-IS04-00	5/8	17.38	15
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	76 J	450 J	SWMU269-IS03-06	8/8	140.13	94.5
Fluoranthene	360 U	410 U	47 J	47 J	SWMU269-IS03-00,SWMU269-IS04-00	2/8	47	47
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.4	3.1	SWMU269-IS01-00	4/8	2.28	2.3
Chromium	ND	ND	5.5	14.2	SWMU269-IS01-06	8/8	8.46	8.05
Lead	ND	ND	3.1	10.6	SWMU269-IS02-00	8/8	7.14	7.4

TABLE 2
STATISTICAL SUMMARY
SWMU 269
SWMU CONFIRMATORY SAMPLING (CTO-0371)
816 - O/W, 8th ENGINEER 2D FSSG
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,2-Dichlorobenzene	1.5	1.5	SWMU269-IS02-06	180000000	36000000	7270	0	0	0
1,4-Dichlorobenzene	4.8	39	SWMU269-IS04-00	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	76 J	450 J	SWMU269-IS03-06	410000	410000	6670	0	0	0
Fluoranthene	47 J	47 J	SWMU269-IS03-00,SWMU269-IS04-00	82000000	16400000	276080	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.4	3.1	SWMU269-IS01-00	3.8	3.8	26.2	0	0	0
Chromium	5.5	14.2	SWMU269-IS01-06	10000	2000	27.2	0	0	0
Lead	3.1	10.6	SWMU269-IS02-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

NOTE: NO SCREENING CRITERIA WERE EXCEEDED.

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 269
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.15 SWMU 272 - AS137 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.15.1 SWMU Description and History

SWMU 272 is a concrete oil/water separator, recently constructed (prior to 1996), and associated with the Campbell Street Fuel Farm. The fuel farm was previously investigated under an underground storage tank (UST) investigative program for soil and groundwater. ASTs are located north of the oil/water separator. Groundwater contamination, if detected in this area, could be from the oil/water separator or from the former USTs at the fuel farm. Water from concrete paved areas within the fuel farm is collected and transported by underground pipelines to the oil/water separator (SWMU 272).

4.15.2 Confirmatory Investigation Activities

The soil investigation at SWMU 272 was developed to determine if the operation of the oil/water separator has impacted surface and/or subsurface soils in the area of the separator.

A total of four soil borings, SWMU272-IS01 through SWMU272-IS04, were installed on September 8, 1997. Figure 1 presents the locations of the soil borings. One surface and one subsurface soil sample was collected from each boring and submitted for analysis. Surface soil samples were collected from ground surface to 2.0 feet bgs and subsurface samples were collected from just above the water table at an approximate depth of 4.0 to 6.0 feet bgs. Groundwater was encountered at a depth of 5.5 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Methods 8020 and 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER01A, associated with September 8th sample collection, was collected from a split spoon sampler used at SWMU 300. Results from the rinsate blank is included in Appendix F of this report. Trip blank 371TB01 was shipped with the VOA fraction of the soil samples. The trip blank results are included in Appendix F.

4.15.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminant concentrations that exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Methylene chloride (SWMU272-IS03-02; 24J µg/kg) and 1,4-dichlorobenzene (SWMU272-IS02-02; 2400 µg/kg) were the only VOCs detected which exceeded a comparison criteria [North Carolina Category S-3:G-1 Target Concentration (22.1 µg/kg)]. Methylene chloride is a common laboratory contaminant and was detected in the trip blank (371TB01) shipped with the SWMU 272 samples; however, the detected concentration in trip blank 371TB01 (1.8J µg/kg) was one order of magnitude less than the concentration which exceeded the North Carolina Category S-3:G-1 Target Concentration.

The SVOCs which exceeded comparison criteria were 2-chlorophenol (SWMU272-IS04-02; 58J µg/kg), naphthalene (SWMU272-IS02-02; 2100J µg/kg) and pentachlorophenol (SWMU272-IS04-02; 440J µg/kg). All of these compounds exceeded their respective North Carolina Category S-3:G-1 Target Concentration of 1.2 µg/kg, 584 µg/kg and 23.1 µg/kg.

Metals which exceeded comparison criteria included arsenic and mercury. Arsenic was detected in samples SWMU272-IS03-02 (7 mg/kg) and SWMU272-IS04-02 (13.4 mg/kg) and both detections exceeded the Region III Industrial RBC (3.8 mg/kg) and North Carolina Category S-2 Target Concentration (3.8 mg/kg). Mercury was detected in SWMU272-IS03-00 (11 mg/kg) and SWMU272-IS04-00 (0.044 mg/kg), exceeding the North Carolina Category S-3:G-1 Target Concentration (0.0154 mg/kg). No metals were detected in the rinsate blank for the day's sampling.

All soil borings, except for SWMU272-IS01 located the farthest distance from the ASTs, exhibited organic and/or inorganic constituents in exceedance of one or more comparison criteria. Refer to Figure 1 for the location of boring SWMU272-IS01.

4.15.4 Recommendations

3 borings, 2 MW's

Additional investigation activities are recommended for SWMU 272. This investigation should consist of soil borings on the north, east and west sides of the oil/water separator (farther out than the Phase I soil borings) to try and better define the extent of contamination. Additionally, a minimum of two temporary groundwater monitoring wells should be installed. One monitoring well would be between the oil/water separator and the existing ASTs and the second well would be east of the oil/water separator, which is the apparent groundwater downgradient direction (towards the New River). Also, the existing groundwater monitoring well located southwest of the separator should be sampled at this time. Soil and groundwater samples collected during this additional investigation would be analyzed for VOAs, SVOAs and metals.

Could MW to east be used for soil boring on east?

TABLE 1
DETECTION SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU272-IS01-00	SWMU272-IS01-02	SWMU272-IS02-00	SWMU272-IS02-02	SWMU272-IS03-00	SWMU272-IS03-02
DATE SAMPLED	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	4' - 6'	0' - 2'	4' - 6'
VOLATILES (ug/kkg) (8260A)						
2-Butanone	22 U	23 U	21 U	17000 U	22 U	170 J
Acetone	51	37	30	17000 U	22 U	320
Methylene chloride	2 J	2.2 J	2.8 J	4300 U	1.9 J	24 J
Tetrachloroethene	5.4 U	5.8 U	5.3 U	4300 U	5.5 U	70 U
Trichloroethene	5.4 U	5.8 U	5.3 U	4300 U	5.5 U	70 U
Xylenes (total)	5.4 U	5.8 U	5.3 U	2600 J	5.5 U	70 U
VOLATILES (ug/kkg) (8020)						
1,2-Dichlorobenzene	1.1 U	1.2 U	12	6000	1.1 U	68
1,3-Dichlorobenzene	1.1 U	1.2 U	4	5100	1.1 U	14 U
1,4-Dichlorobenzene	2.2	1.2 U	10	2400	1.1 U	14 U
Xylenes (total)	1.1 U	1.2 U	1.8	2700	1.1 U	19
SEMIVOLATILES (ug/kg) (8270B)						
2,4-Dinitrotoluene	360 U	380 U	350 U	460 U	360 U	460 U
2-Chlorophenol	360 U	380 U	350 U	460 U	360 U	460 U
2-Methylnaphthalene	360 U	380 U	570	5300 J	360 U	1900
4-Chloro-3-methylphenol	360 U	380 U	350 U	460 U	360 U	460 U
4-Nitrophenol	1700 U	1800 U	1700 U	2200 U	1800 U	2200 U
Acenaphthene	360 U	380 U	350 U	460 U	360 U	460 U
Benzo(a)anthracene	360 U	380 U	350 U	460 U	74 J	460 U
Benzo(a)pyrene	360 U	380 U	350 U	460 U	48 J	98 J
Benzo(b)fluoranthene	360 U	380 U	350 U	460 U	53 J	460 U
Benzo(k)fluoranthene	360 U	380 U	350 U	460 U	45 J	460 U
bis(2-Ethylhexyl) phthalate	360 U	39 J	350 U	51 J	40 J	130 J
Chrysene	360 U	380 U	350 U	460 U	68 J	460 U
Dibenzofuran	360 U	380 U	350 U	160 J	360 U	66 J
Fluoranthene	360 U	380 U	350 U	460 U	120 J	460 U
Naphthalene	360 U	380 U	350 U	2100 J	360 U	360 J
Pentachlorophenol	1700 U	1800 U	1700 U	2200 U	1800 U	2200 U
Phenol	360 U	380 U	350 U	460 U	360 U	460 U
Pyrene	360 U	380 U	350 U	460 U	130 J	460 U

TABLE 1
DETECTION SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU272-IS01-00	SWMU272-IS01-02	SWMU272-IS02-00	SWMU272-IS02-02	SWMU272-IS03-00	SWMU272-IS03-02
DATE SAMPLED	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	4' - 6'	0' - 2'	4' - 6'
TOTAL METALS (mg/kg)(6010/7410)						
Arsenic	1.3	1.2 U	1.1 U	3.4	2.4	7
Barium	21.5 U	23.1 U	21.2 U	27.7 U	21.9 U	30.3
Chromium	5.5	4.5	5.4	18.2	11.4	25.5
Lead	3.8	2.4	3.1	11.6	14.4	15.1
Mercury	0.036 U	0.038 U	0.035 U	0.046 U	0.11	0.046 U
Selenium	0.54 U	0.58 U	0.53 U	0.69	0.63	0.91

TABLE 1
DETECTION SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU272-IS04-00	SWMU272-IS04-02
DATE SAMPLED	09-08-1997	09-08-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kkg) (8260A)		
2-Butanone	22 U	29 U
Acetone	22 U	290
Methylene chloride	2.6 J	3.4 J
Tetrachloroethene	2.8 J	7.2 U
Trichloroethene	2.2 J	7.2 U
Xylenes (total)	5.6 U	7.2 U
VOLATILES (ug/kkg) (8020)		
1,2-Dichlorobenzene	1.1 U	1.4 U
1,3-Dichlorobenzene	1.1 U	1.4 U
1,4-Dichlorobenzene	1.1 U	1.4 U
Xylenes (total)	1.1 U	1.4 U
SEMIVOLATILES (ug/kg) (8270B)		
2,4-Dinitrotoluene	370 U	51 J
2-Chlorophenol	370 U	58 J
2-Methylnaphthalene	370 U	480 U
4-Chloro-3-methylphenol	370 U	90 J
4-Nitrophenol	1800 U	370 J
Acenaphthene	370 U	58 J
Benzo(a)anthracene	370 U	480 U
Benzo(a)pyrene	370 U	480 U
Benzo(b)fluoranthene	370 U	480 U
Benzo(k)fluoranthene	370 U	480 U
bis(2-Ethylhexyl) phthalate	39 J	170 J
Chrysene	370 U	480 U
Dibenzofuran	370 U	480 U
Fluoranthene	370 U	480 U
Naphthalene	370 U	480 U
Pentachlorophenol	1800 U	440 J
Phenol	370 U	63 J
Pyrene	370 U	94 J

TABLE 1
DETECTION SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU272-IS04-00	SWMU272-IS04-02
DATE SAMPLED	09-08-1997	09-08-1997
DEPTH	0' - 2'	4' - 6'
TOTAL METALS (mg/kg)(6010/7410)		
Arsenic	1.4	13.4
Barium	22.4 U	28.9 U
Chromium	7.8	25
Lead	10.9	10.2
Mercury	0.044	0.048 U
Selenium	0.67	1

TABLE 1
DETECTION SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kkg) (8260A)								
2-Butanone	21 U	17000 U	170 J	170 J	SWMU272-IS03-02	1/8	170	170
Acetone	22 U	17000 U	30	320	SWMU272-IS03-02	5/8	145.6	51
Methylene chloride	4300 U	4300 U	1.9 J	24 J	SWMU272-IS03-02	7/8	5.56	2.6
Tetrachloroethene	5.3 U	4300 U	2.8 J	2.8 J	SWMU272-IS04-00	1/8	2.8	2.8
Trichloroethene	5.3 U	4300 U	2.2 J	2.2 J	SWMU272-IS04-00	1/8	2.2	2.2
Xylenes (total)	5.3 U	70 U	2600 J	2600 J	SWMU272-IS02-02	1/8	2600	2600
VOLATILES (ug/kkg) (8020)								
1,2-Dichlorobenzene	1.1 U	1.4 U	12	6000	SWMU272-IS02-02	3/8	2026.67	68
1,3-Dichlorobenzene	1.1 U	14 U	4	5100	SWMU272-IS02-02	2/8	2552	2552
1,4-Dichlorobenzene	1.1 U	14 U	2.2	2400	SWMU272-IS02-02	3/8	804.07	10
Xylenes (total)	1.1 U	1.4 U	1.8	2700	SWMU272-IS02-02	3/8	906.93	19
SEMIVOLATILES (ug/kg) (8270B)								
2,4-Dinitrotoluene	350 U	460 U	51 J	51 J	SWMU272-IS04-02	1/8	51	51
2-Chlorophenol	350 U	460 U	58 J	58 J	SWMU272-IS04-02	1/8	58	58
2-Methylnaphthalene	360 U	480 U	570	5300 J	SWMU272-IS02-02	3/8	2590	1900
4-Chloro-3-methylphenol	350 U	460 U	90 J	90 J	SWMU272-IS04-02	1/8	90	90
4-Nitrophenol	1700 U	2200 U	370 J	370 J	SWMU272-IS04-02	1/8	370	370
Acenaphthene	350 U	460 U	58 J	58 J	SWMU272-IS04-02	1/8	58	58
Benzo(a)anthracene	350 U	480 U	74 J	74 J	SWMU272-IS03-00	1/8	74	74
Benzo(a)pyrene	350 U	480 U	48 J	98 J	SWMU272-IS03-02	2/8	73	73
Benzo(b)fluoranthene	350 U	480 U	53 J	53 J	SWMU272-IS03-00	1/8	53	53
Benzo(k)fluoranthene	350 U	480 U	45 J	45 J	SWMU272-IS03-00	1/8	45	45
bis(2-Ethylhexyl) phthalate	350 U	360 U	39 J	170 J	SWMU272-IS04-02	6/8	78.17	45.5
Chrysene	350 U	480 U	68 J	68 J	SWMU272-IS03-00	1/8	68	68
Dibenzofuran	350 U	480 U	66 J	160 J	SWMU272-IS02-02	2/8	113	113
Fluoranthene	350 U	480 U	120 J	120 J	SWMU272-IS03-00	1/8	120	120
Naphthalene	350 U	480 U	360 J	2100 J	SWMU272-IS02-02	2/8	1230	1230
Pentachlorophenol	1700 U	2200 U	440 J	440 J	SWMU272-IS04-02	1/8	440	440
Phenol	350 U	460 U	63 J	63 J	SWMU272-IS04-02	1/8	63	63
Pyrene	350 U	460 U	94 J	130 J	SWMU272-IS03-00	2/8	112	112

TABLE 1
DETECTION SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
TOTAL METALS (mg/kg)(6010/7410)								
Arsenic	1.1 U	1.2 U	1.3	13.4	SWMU272-IS04-02	6/8	4.82	2.9
Barium	21.2 U	28.9 U	30.3	30.3	SWMU272-IS03-02	1/8	30.3	30.3
Chromium	ND	ND	4.5	25.5	SWMU272-IS03-02	8/8	12.91	9.6
Lead	ND	ND	2.4	15.1	SWMU272-IS03-02	8/8	8.94	10.55
Mercury	0.035 U	0.048 U	0.044	0.11	SWMU272-IS03-00	2/8	0.08	0.08
Selenium	0.53 U	0.58 U	0.63	1	SWMU272-IS04-02	5/8	0.78	0.69

TABLE 2
STATISTICAL SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

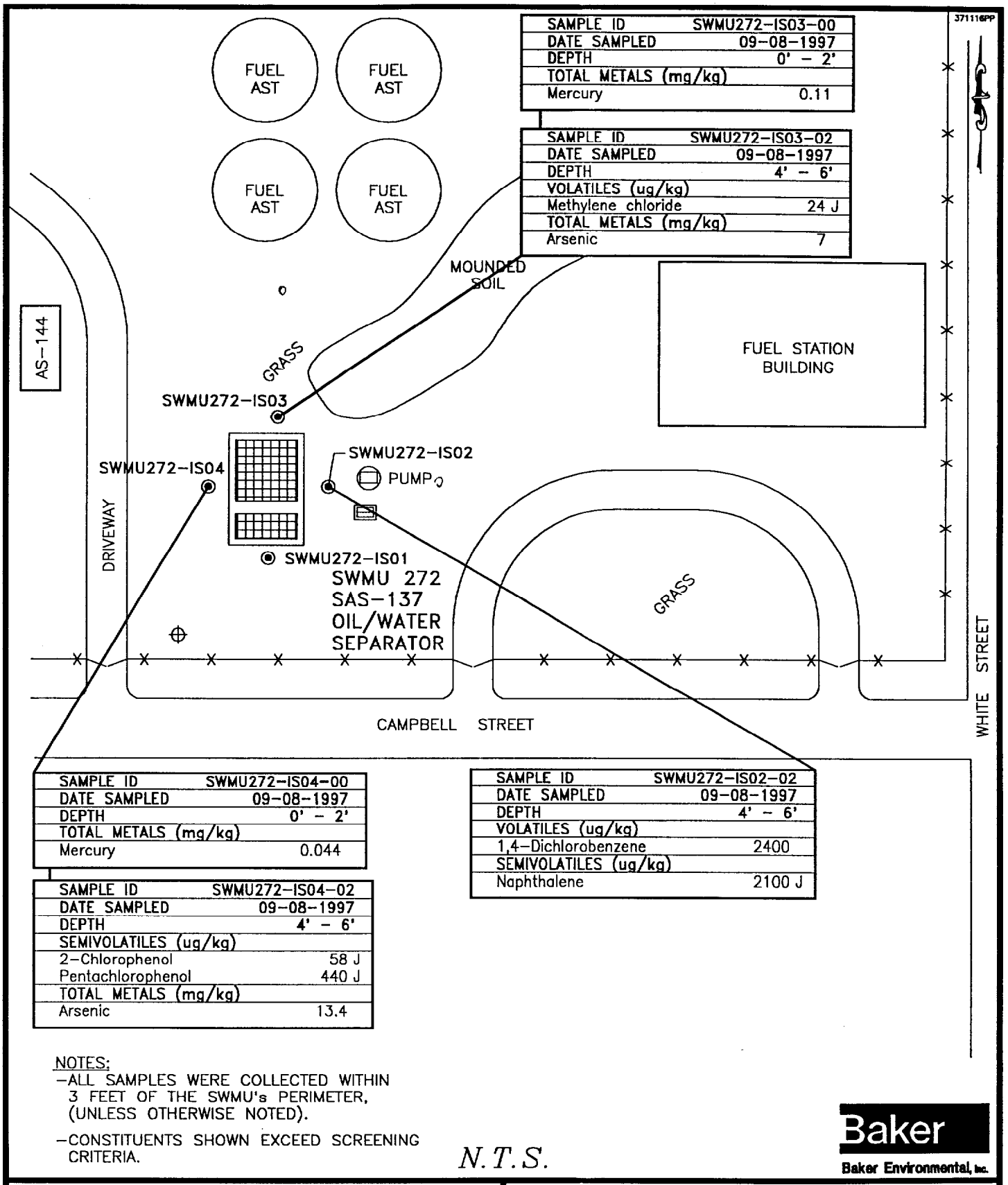
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
2-Butanone	170 J	170 J	SWMU272-IS03-02	1000000000	200000000	692	0	0	0
Acetone	30	320	SWMU272-IS03-02	200000000	40000000	2810	0	0	0
Methylene chloride	1.9 J	24 J	SWMU272-IS03-02	760000	760000	22.1	0	0	1
Tetrachloroethene	2.8 J	2.8 J	SWMU272-IS04-00	110000	110000	7.4	0	0	0
Trichloroethene	2.2 J	2.2 J	SWMU272-IS04-00	520000	520000	18.3	0	0	0
Xylenes (total)	2600 J	2600 J	SWMU272-IS02-02	1000000000	200000000	4958	0	0	0
VOLATILES (ug/kg) (8020)									
1,2-Dichlorobenzene	12	6000	SWMU272-IS02-02	180000000	36000000	7270	0	0	0
1,3-Dichlorobenzene	4	5100	SWMU272-IS02-02	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	2.2	2400	SWMU272-IS02-02	240000	240000	1240	0	0	1
Xylenes (total)	1.8	2700	SWMU272-IS02-02	1000000000	200000000	4958	0	0	0
SEMIVOLATILES (ug/kg) (8270B)									
2,4-Dinitrotoluene	51 J	51 J	SWMU272-IS04-02	4100000	820000	NE	0	0	0
2-Chlorophenol	58 J	58 J	SWMU272-IS04-02	10000000	2000000	1.2	0	0	1
2-Methylnaphthalene	570	5300 J	SWMU272-IS02-02	82000000	NE	NE	0	0	0
4-Chloro-3-methylphenol	90 J	90 J	SWMU272-IS04-02	NE	NE	NE	0	0	0
4-Nitrophenol	370 J	370 J	SWMU272-IS04-02	16000000	26000000	NE	0	0	0
Acenaphthene	58 J	58 J	SWMU272-IS04-02	120000000	24000000	8160	0	0	0
Benzo(a)anthracene	74 J	74 J	SWMU272-IS03-00	7800	7800	343	0	0	0
Benzo(a)pyrene	48 J	98 J	SWMU272-IS03-02	780	780	NE	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 272
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS137 - O/W, MCAS
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (ug/kg) (8270B) (cont)									
Benzo(b)fluoranthene	53 J	53 J	SWMU272-IS03-00	7800	7800	NE	0	0	0
Benzo(k)fluoranthene	45 J	45 J	SWMU272-IS03-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	39 J	170 J	SWMU272-IS04-02	410000	410000	6670	0	0	0
Chrysene	68 J	68 J	SWMU272-IS03-00	780000	780000	38150	0	0	0
Dibenzofuran	66 J	160 J	SWMU272-IS02-02	8200000	1640000	NE	0	0	0
Fluoranthene	120 J	120 J	SWMU272-IS03-00	82000000	16400000	276080	0	0	0
Naphthalene	360 J	2100 J	SWMU272-IS02-02	200000000	16400000	584	0	0	1
Pentachlorophenol	440 J	440 J	SWMU272-IS04-02	48000	48000	23.1	0	0	1
Phenol	63 J	63 J	SWMU272-IS04-02	1000000000	200000000	1746	0	0	0
Pyrene	94 J	130 J	SWMU272-IS03-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg)(6010/7410)									
Arsenic	1.3	13.4	SWMU272-IS04-02	3.8	3.8	26.2	2	2	0
Barium	30.3	30.3	SWMU272-IS03-02	140000	28000	848	0	0	0
Chromium	4.5	25.5	SWMU272-IS03-02	10000	2000	27.2	0	0	0
Lead	2.4	15.1	SWMU272-IS03-02	NE	400	270.06	0	0	0
Mercury	0.044	0.11	SWMU272-IS03-00	610	122	0.0154	0	0	2
Selenium	0.63	1	SWMU272-IS04-02	10000	2000	12.2	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTES:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).

-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

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LEGEND

- ◉ SOIL BORING AND SAMPLE LOCATION
- ⊕ EXISTING GROUNDWATER MONITORING WELL LOCATION
- mg/kg MILLIGRAM/KILOGRAM
- ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 272
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.16 SWMU 273 - BA 128/BA 105 Dumpster

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.16.1 SWMU Description and History

SWMU 273 is a dumpster that was located near Buildings BA-106, BA-122, and BA-102 north of Ocean Drive. It was a 6 feet by 6 feet by 7 feet steel dumpster with a steel cover that functioned as a receptacle for solid waste. It was reportedly in operation from approximately 1960 to the present. According to the 1996 RFA Report, this dumpster was reported to have had a one time release of petroleum or oil products. During the site visit conducted by Baker in 1996, the dumpster could not be located. A hurricane had recently occurred, and significantly affected this beach area. Therefore, it was not surprising that the dumpster could not be found. take approximate distances to SW bodies in waterway / Atlantic Ocean

4.16.2 Confirmatory Investigation Activities

Two soil borings were advanced in the area previously occupied by the dumpster. These borings, SWMU273-IS01 and SWMU273-IS02, were located 30 and 40 feet, respectively, west of the steam/condensate piping leading from Building BA-102. The sample locations are depicted on Figure 1. During advancement of the soil boring, split-spoon samples were collected continuously to a total depth of 4.0 feet bgs. Groundwater was encountered at a depth of 4.0 feet bgs. One surface soil sample and one subsurface soil sample were collected from each of the two borings in accordance with the Project Plans (Baker 1997).

The surface soil samples, SWMU273-IS01-00 and SWMU273-IS02-00, were collected from 0 to 2.0 feet bgs. The subsurface soil samples, SWMU273-IS01-01 and SWMU273-IS02-01, were collected from just above the water table at a depth of 2.0 to 4.0 feet bgs. A duplicate sample, SWMU273-IS01-01D, was also collected from this deeper interval. All soil samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270), and RCRA metals (EPA Method 6010/7410). The analytical data from the surface and subsurface soil samples are presented in Appendix D. Duplicate sample results are presented in Appendix E.

An equipment rinsate blank, 371ER07A, was collected from a split spoon sampler used to collect soil samples from the SWMU. Trip blanks 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results for the rinsate blank and the trip blanks are included in Appendix F. Two field blanks, 371FB01 and 371FB02, were also collected as described in Section 3.5 of this report. The analytical results of the field blanks are presented in Appendix F.

4.16.3 Investigation Findings

A total of four samples were obtained at SWMU 273 and submitted for the analyses previously mentioned. Table 1 presents the positive detection results. Table 2 presents the comparison of the positive detections to a specific set of screening criteria. The criteria include:

- USEPA Region III Industrial Risk-Based Concentrations (RBCs)

- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

Based on the analytical results, two VOCs, one SVOC, and three metals were detected in the sample set. As shown on Table 2, no compounds were detected at levels exceeding the screening criteria.

As presented in Table 1, the two detected VOCs included: acetone and methylene chloride. As shown in Table 2, the detected concentrations of methylene chloride did not exceed the USEPA Region III Industrial RBC or state criteria. Acetone was detected in one subsurface soil sample, SWMU273-IS02-01, at a concentration of 25 µg/kg. Acetone was also detected in field blank 371FB01 and an associated trip blank, 371-TB12, at concentrations of 59 and 280 µg/kg, respectively. The detected concentrations of acetone in the environmental sample did not exceed the detected concentrations in the field or trip blanks. Therefore, acetone is attributed to laboratory contamination and excluded from further evaluation. In addition, as shown in Table 2, the detected concentration of acetone did not exceed USEPA Region III Industrial RBCs or state criteria.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in all soil samples collected. As presented in Table 1, the detected (estimated) concentrations ranged from 63J and 120J µg/kg, respectively. Bis(2-ethylhexyl)phthalate was detected in the rinsate blank (371ER07A) at an estimated concentration of 1.8J µg/kg. It was also detected in field blank 371FB02 at a concentration of 92 µg/kg. Although bis(2-ethylhexyl)phthalate was detected in all soil samples, it was not detected at a level that exceeded ten times the maximum blank concentration. Therefore, bis(2-ethylhexyl)phthalate is attributed to laboratory contamination and excluded from further evaluation. In addition, as shown in Table 2, none of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria.

Three of the eight RCRA metals were detected in the surface and subsurface soil samples collected at SWMU 273. Arsenic, chromium, and lead were detected at location SWMU273-IS01, while chromium and lead were detected at location SWMU273-IS02. As shown in Table 2, none of the detected concentrations of metals exceeded USEPA Region III Industrial RBCs or state criteria. Therefore, no detected contaminants at SWMU 273 exceeded any of the screening criteria.

4.16.4 Recommendations

No further action is recommended at SWMU 273. The VOCs, SVOCs, and metals detected in the samples collected from SWMU 273 did not exceed any of the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 273
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA 128/BA 105 DUMPSTER
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU273-IS01-00	SWMU273-IS01-01	SWMU273-IS02-00	SWMU273-IS02-01
DATE SAMPLED	09-14-1997	09-14-1997	09-14-1997	09-14-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)				
Acetone	24 U	24 U	21 U	25
Methylene chloride	2.1 J	5.9 U	2.6 J	5.6 U
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	74 J	93 J	63 J	120 J
METALS (mg/kg) (6010/7410)				
Arsenic	1.5	3.2	1.1 U	1.1 U
Chromium	4.1	5.5	4.7	4.9
Lead	2.9	1.2	5.6	2.5

TABLE 1
DETECTION SUMMARY
SWMU 273
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA 128/BA 105 DUMPSTER
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	21 U	24 U	25	25	SWMU273-IS02-01	1/4	25	25
Methylene chloride	5.6 U	5.9 U	2.1 J	2.6 J	SWMU273-IS02-00	2/4	2.35	2.35
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	63 J	120 J	SWMU273-IS02-01	4/4	87.5	83.5
METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.1 U	1.5	3.2	SWMU273-IS01-01	2/4	2.35	2.35
Chromium	ND	ND	4.1	5.5	SWMU273-IS01-01	4/4	4.8	4.8
Lead	ND	ND	1.2	5.6	SWMU273-IS02-00	4/4	3.05	2.7

TABLE 2
STATISTICAL SUMMARY
SWMU 273
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA 128/BA 105 DUMPSTER
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260)							
Acetone	25	25	SWMU273-IS02-01	200000000	40000000	2810	NE
Methylene chloride	2.1 J	2.6 J	SWMU273-IS02-00	760000	760000	22.1	17700
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	63 J	120 J	SWMU273-IS02-01	410000	410000	6670	32900
METALS (mg/kg) (6010/7410)							
Arsenic	1.5	3.2	SWMU273-IS01-01	3.8	3.8	26.2	65.5
Chromium	4.1	5.5	SWMU273-IS01-01	10000	2000	27.2	NE
Lead	1.2	5.6	SWMU273-IS02-00	NE	400	270.06	1130

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 273
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA 128/BA 105 DUMPSTER
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260)				
Acetone	0	0	0	0
Methylene chloride	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

NOTE: NO SCREENING CRITERIA WERE EXCEEDED.

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 273
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.17 SWMU 275 - BB48 Dumpster, Construction Shop

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.17.1 SWMU Description and History

SWMU 275 is a dumpster located adjacent to the BB-48 Construction Shop building along Grace Lane. The SWMU is a 6 feet by 6 feet by 7 feet steel dumpster with a steel cover that functions as a receptacle for solid waste. The years of operation are unknown. There is a storm drain located adjacent to the dumpster. There was reported evidence of a past spill at this dumpster. During the site visit conducted by Baker in 1996, evidence of a spill or release was not observed.

4.17.2 Confirmatory Investigation Activities

A single soil boring was advanced in the area previously occupied by the dumpster. The sample location is depicted on Figure 1. During advancement of the soil boring, split-spoon samples were collected continuously to a total depth of 8.0 feet bgs. Groundwater was encountered at a depth of 6.0 feet bgs. One surface soil sample and one subsurface soil sample were collected in accordance with the Project Plans (Baker, 1997). The surface soil sample, SWMU275-IS01-00, was collected from 0 to 2.0 feet bgs. A duplicate sample, SWMU275-IS01-00D, was also collected from this interval. Duplicate sample results are presented in Appendix E. The subsurface soil sample, SWMU275-IS01-01, was collected from 2.0 to 4.0 feet bgs. The soil samples were analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270), polychlorinated biphenyls (PCBs) (EPA Method 8080), and RCRA metals (EPA Method 6010/7410). The analytical data from the surface and subsurface soil samples are presented in Appendix D.

An equipment rinsate blank 371ER07A was collected from a split spoon sampler used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB12 and 371TB13 were shipped with the volatile fractions of the soil samples. The results are included in Appendix F. Two field blanks, 371FB01 and 371FB02, were also collected as described in Section 3.5 of this report. The analytical results of the field blanks are presented in Appendix F.

4.17.3 Investigation Findings

A total of two samples were obtained at SWMU 275 and submitted for the analyses previously mentioned. Table 1 presents the positive detection results. Table 2 presents the comparison of the positive detections to a specific set of screening criteria. The criteria include:

- USEPA Region III Industrial Risk-Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

As presented in Table 1, two VOCs were detected in the surface soil sample submitted for laboratory analysis. Acetone and methylene chloride were each detected at concentrations 74 and 2.1J µg/kg, respectively. One VOC, acetone, was detected in the subsurface soil sample at a concentration of 21J µg/kg. As shown in Table 2, the detected concentrations of acetone and methylene chloride did not exceed USEPA Region III Industrial RBCs or state criteria.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in both the surface and subsurface soil samples at estimated concentrations of 110J and 89J µg/kg, respectively. As shown in Table 2, neither of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria.

Both the surface and subsurface soil samples collected at SWMU 275 were analyzed for PCBs. There were no PCBs detected in either of the soil samples.

Two of the eight RCRA metals were detected in the surface and subsurface soil samples collected at SWMU 275. Table 1 provides a summary of the concentrations of chromium and lead found within the soil samples. However, as shown in Table 2, none of the detected concentrations of metals exceeded USEPA Region III Industrial RBCs or state criteria.

4.17.4 Recommendations

No further action is recommended for SWMU 275. The VOCs, SVOCs, and metals detected in the samples collected from SWMU 275 did not exceed any of the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 275
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-48 DUMPSTER, CONSTRUCTION SHOP
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU275-IS01-00	SWMU275-IS01-02
DATE SAMPLED	09-14-1997	09-14-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260)		
Acetone	74	21 J
Methylene chloride	2.1 J	5.5 U
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	110 J	89 J
PCBS (ug/kg) (8080)	ND	ND
TOTAL METALS (mg/kg) (6010/7410)		
Chromium	4.1	2.7
Lead	6.1	1.5

TABLE 1
DETECTION SUMMARY
SWMU 275
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-48 DUMPSTER, CONSTRUCTION SHOP
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	ND	ND	21 J	74	SWMU275-IS01-00	2/2	47.5	47.5
Methylene chloride	5.5 U	5.5 U	2.1 J	2.1 J	SWMU275-IS01-00	1/2	2.1	2.1
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	89 J	110 J	SWMU275-IS01-00	2/2	99.5	99.5
PCBS (ug/kg) (8080)	ND	ND	ND	ND		0/2	ND	ND
TOTAL METALS (mg/kg) (6010/7410)								
Chromium	ND	ND	2.7	4.1	SWMU275-IS01-00	2/2	3.4	3.4
Lead	ND	ND	1.5	6.1	SWMU275-IS01-00	2/2	3.8	3.8

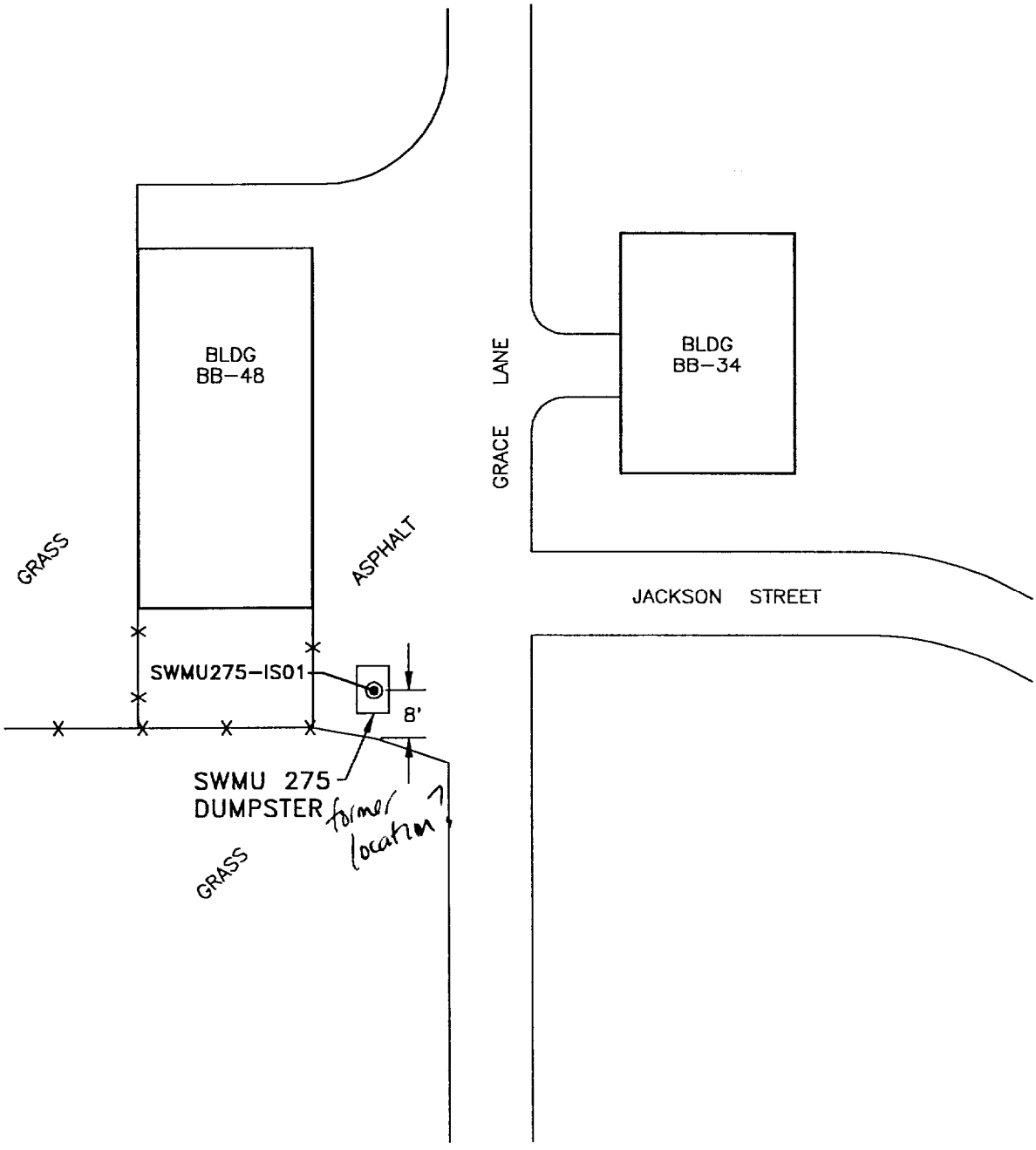
TABLE 2
STATISTICAL SUMMARY
SWMU 275
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-48 DUMPSTER, CONSTRUCTION SHOP
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260)							
Acetone	21 J	74	SWMU275-IS01-00	200000000	40000000	2810	NE
Methylene chloride	2.1 J	2.1 J	SWMU275-IS01-00	760000	760000	22.1	17700
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	89 J	110 J	SWMU275-IS01-00	410000	410000	6670	32900
TOTAL METALS (mg/kg) (6010/7410)							
Chromium	2.7	4.1	SWMU275-IS01-00	10000	2000	27.2	NE
Lead	1.5	6.1	SWMU275-IS01-00	NE	400	270.06	1130

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 275
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-48 DUMPSTER, CONSTRUCTION SHOP
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260)				
Acetone	0	0	0	0
Methylene chloride	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Chromium	0	0	0	0
Lead	0	0	0	0



N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

NOTE: NO SCREENING CRITERIA WERE EXCEEDED.

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 275
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.18 SWMU 276 - BB-49 Dumpster

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.18.1 SWMU Description and History

SWMU 276 is a dumpster located in between the BB-49 Base Maintenance building and Jackson Street. It is a 8 feet by 8 feet by 8 feet open steel dumpster is a receptacle for solid waste and has been in operation since 1960. There is a storm drain located adjacent to the dumpster. According to the 1996 RFA Report, this dumpster contained evidence of a petroleum or oil type spill. During the site visit conducted by Baker in 1996, evidence of a spill or release was not observed.

4.18.2 Confirmatory Investigation Activities

A single soil boring was advanced in the vicinity of the dumpster. The sample location is depicted on Figure 1. During advancement of the soil boring, split-spoon samples were collected continuously to a total depth of 8.0 feet bgs. Groundwater was encountered at a depth of 4.0 feet bgs. One surface soil sample and one subsurface soil sample were collected in accordance with the Final Project Plans submitted in August, 1997. The surface soil sample, SWMU276-IS01-00, was collected from 0 to 2.0 feet bgs. A duplicate sample, SWMU276-IS01-00D, was also collected from this interval. Duplicate sample results are presented in Appendix E. The subsurface soil sample, SWMU276-IS01-01, was collected from just above the water table at a depth of 2.0 to 4.0 feet bgs. Both samples were analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270), PCBs (EPA Method 8080), and RCRA metals (EPA Method 6010/7410).

Equipment rinsate blank 371ER07A was collected from a split spoon sampler used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB12 and 371TB13 were shipped with the volatile fractions of the soil samples. The results are included in Appendix F. Two field blanks, 371FB01 and 371FB02, were also collected as described in Section 3.5 of this report. The analytical results of the field blanks are presented in Appendix F.

4.18.3 Investigation Findings

A total of two samples were obtained at SWMU 276 and submitted for the analyses previously mentioned. Table 1 presents the positive detection results. Table 2 presents the comparison of the positive detections to a specific set of screening criteria. The criteria include:

- USEPA Region III Industrial Risk-Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrated to surface water) Target Concentrations

As presented in Table 1, three VOCs were detected in the surface soil sample submitted for laboratory analysis. 2-Butanone, acetone, and methylene chloride were each detected at concentrations 22J, 57, and 1.9J µg/kg, respectively. One VOC, acetone, was detected in the subsurface soil sample at a concentration of 20J µg/kg. As shown in Table 2, none of the detected VOC concentrations exceeded USEPA Region III Industrial RBCs or state standards.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in both the surface and subsurface soil samples at estimated concentrations of 130J and 52J µg/kg, respectively. Neither of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded its USEPA Region III Industrial RBC or state standard.

Both the surface and subsurface soil samples collected at SWMU 276 were analyzed for PCBs. There were no PCBs detected in either of the soil samples.

Two of the eight RCRA metals were detected in the surface and subsurface soil samples. Table 1 provides a summary of the concentrations of chromium and lead found within the soil samples. However, as shown in Table 2, none of the detected concentrations of metals exceeded USEPA Region III Industrial RBCs or state standards.

4.18.4 Recommendations

No further action is recommended for SWMU 276. The VOCs, SVOCs, and metals detected in the samples collected from SWMU 276 did not exceed any of the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 276
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-49 DUMPSTER, BASE MSINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU276-IS01-00	SWMU276-IS01-01
DATE SAMPLED	09-14-1997	09-14-1997
DEPTH	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)		
2-Butanone	22 J	22 U
Acetone	57	20 J
Methylene chloride	1.9 J	5.6 U
SEMIVOLATILES (8270) (ug/kg)		
bis(2-Ethylhexyl) phthalate	130 J	52 J
PCBs (ug/kg) (8080)	ND	ND
TOTAL METALS (mg/kg) (6010/7410)		
Chromium	3.7	2.5
Lead	2.9	2.5

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 276
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-49 DUMPSTER, BASE MSINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
2-Butanone	22 U	22 U	22 J	22 J	SWMU276-IS01-00	1/2	22	22
Acetone	ND	ND	20 J	57	SWMU276-IS01-00	2/2	38.5	38.5
Methylene chloride	5.6 U	5.6 U	1.9 J	1.9 J	SWMU276-IS01-00	1/2	1.9	1.9
SEMIVOLATILES (8270) (ug/kg)								
bis(2-Ethylhexyl) phthalate	ND	ND	52 J	130 J	SWMU276-IS01-00	2/2	91	91
PCBs (ug/kg) (8080)	ND	ND	ND	ND		0/2	ND	ND
TOTAL METALS (mg/kg) (6010/7410)								
Chromium	ND	ND	2.5	3.7	SWMU276-IS01-00	2/2	3.1	3.1
Lead	ND	ND	2.5	2.9	SWMU276-IS01-00	2/2	2.7	2.7

Notes:
ND = Compound analyzed but not detected.

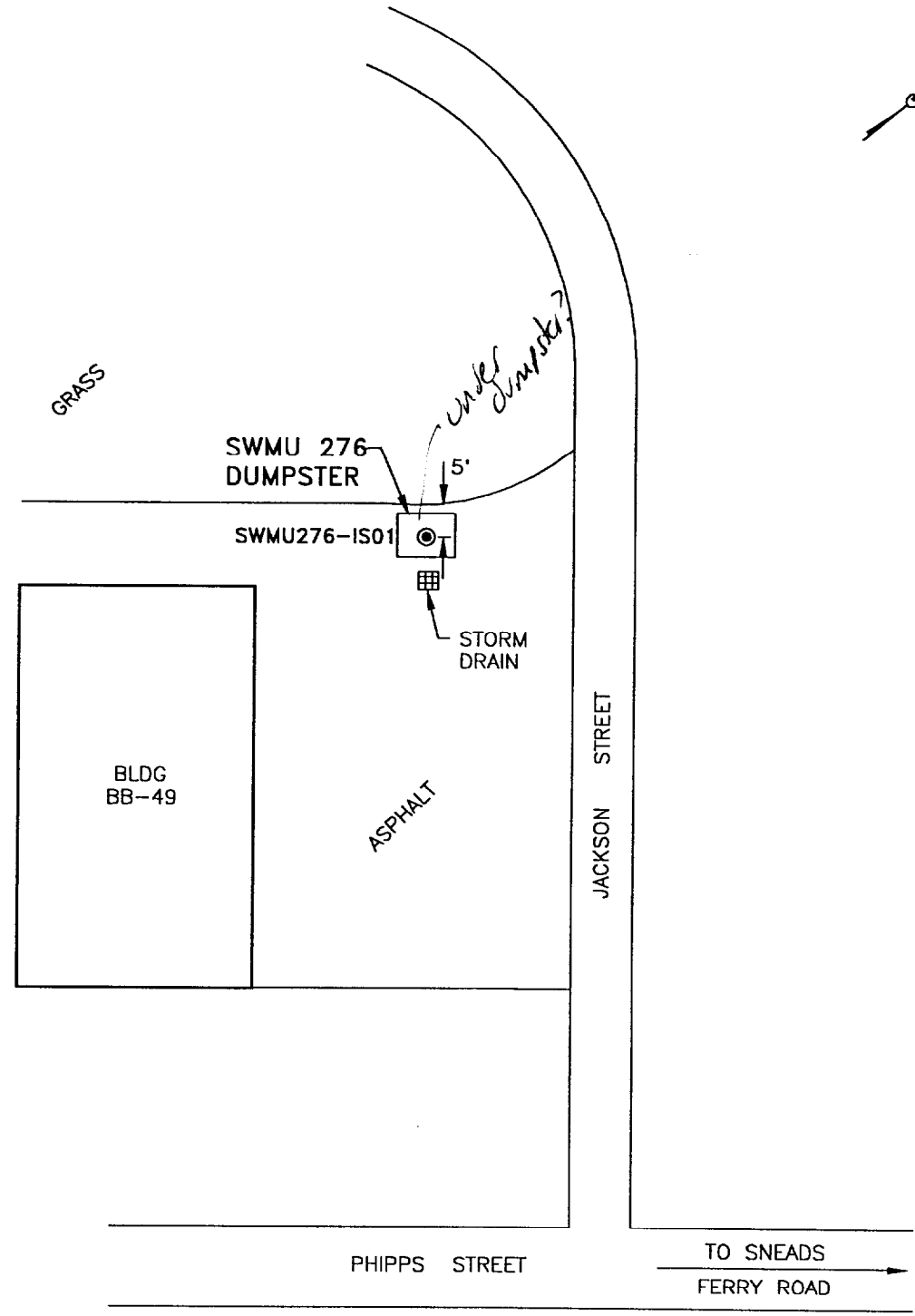
TABLE 2
STATISTICAL SUMMARY
SWMU 276
OSWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-49 DUMPSTER, BASE MSINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260)							
2-Butanone	22 J	22 J	SWMU276-IS01-00	1000000000	200000000	692	NE
Acetone	20 J	57	SWMU276-IS01-00	200000000	40000000	2810	NE
Methylene chloride	1.9 J	1.9 J	SWMU276-IS01-00	760000	760000	22.1	17700
SEMIVOLATILES (8270) (ug/kg)							
bis(2-Ethylhexyl) phthalate	52 J	130 J	SWMU276-IS01-00	410000	410000	6670	32900
TOTAL METALS (mg/kg) (6010/7410)							
Chromium	2.5	3.7	SWMU276-IS01-00	10000	2000	27.2	NE
Lead	2.5	2.9	SWMU276-IS01-00	NE	400	270.06	1130

NOTES:
J = Estimated value
NE = Not established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 276
OSWMU CONFIRMATORY SAMPLING (CTO-0371)
BB-49 DUMPSTER, BASE MSINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260)				
2-Butanone	0	0	0	0
Acetone	0	0	0	0
Methylene chloride	0	0	0	0
SEMIVOLATILES (8270) (ug/kg)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Chromium	0	0	0	0
Lead	0	0	0	0



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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

NOTE: NO SCREENING CRITERIA WERE EXCEEDED.

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 276
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.19 SWMU 277 - FC120 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.19.1 SWMU Description and History

SWMU 277 is a concrete oil/water separator located north of Building FC-1203 and a 90-Day Hazardous Waste Unit. Water from a wash rack, located southwest of the oil/water separator and west of Building FC-120, is transported to the oil/water separator (SWMU 277) by underground pipelines. This area was originally a grassy area as observed during the Baker site visit (October 1996). Since that visit, the area has been paved with concrete. No evidence of stains, spills or releases were observed during Baker's 1996 site visit.

4.19.2 Confirmatory Investigation Activities

The soil investigation at SWMU 277 was developed to determine if the operation of the oil/water separator has impacted the surface and subsurface soils in the area of the oil/water separator (SWMU 277).

A total of three soil borings, SWMU277-IS01 through SWMU277-IS03, were installed on September 12, 1997. Figure 1 presents the locations of the soil borings. One surface soil and one subsurface soil sample were collected from each boring and submitted for analysis. Surface soil samples were collected from ground surface to 2.0 feet bgs. The subsurface soil samples were collected from just above the water table at a depth of 12.0 to 14.0 feet bgs. Groundwater was encountered at a depth of 14.0 feet bgs. An obstruction (possible pipe from the oil/water separator) was encountered at a depth of 4.0 feet bgs in soil boring SWMU277-IS03. Boring location SWMU277-IS03 was relocated east onto the asphalt paving.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8060), SVOAs (EPA Method 8070), and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER05A, associated with September 9th sample collection, was collected from a split spoon sampler. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB10 and 371TB11 were shipped with the VOC fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.19.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

One VOC was detected in the sample set: acetone. The detected VOC concentrations were below the screening criteria.

Two SVOCs (bis[2-ethylhexyl]phthalate and fluoranthene) were detected in the sample set. The detected concentrations were below the screening criteria.

Two metals (chromium and lead) were detected in the sample set, but at concentrations below the screening criteria.

4.19.4 Recommendations

No further action is recommended at SWMU 277 since no detected compounds were at levels above the screening criteria.

TABLE 1
DETECTION SUMMARY
SWMU 277
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC 120 - O/W, 2nd FSSG, COMBAT ENGINEER BN
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU277-IS01-00	SWMU277-IS01-06	SWMU277-IS02-00	SWMU277-IS02-06	SWMU277-IS03-00	SWMU277-IS03-06
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	12' - 14'	0' - 2'	12' - 14'	0' - 2'	12' - 14'
VOLATILES (ug/kg) (8260)						
Acetone	23 U	23 J	85	28	23 U	370
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	620 J	97 J	96 J	110 J	160 J	290 J
Fluoranthene	390 U	390 U	48 J	390 U	380 U	360 U
TOTAL METALS (mg/kg) (6010/7410)						
Chromium	17.8	3	10	5.3	8.3	3.6
Lead	3.5	2.1	5.3	2.7	8.5	2.7

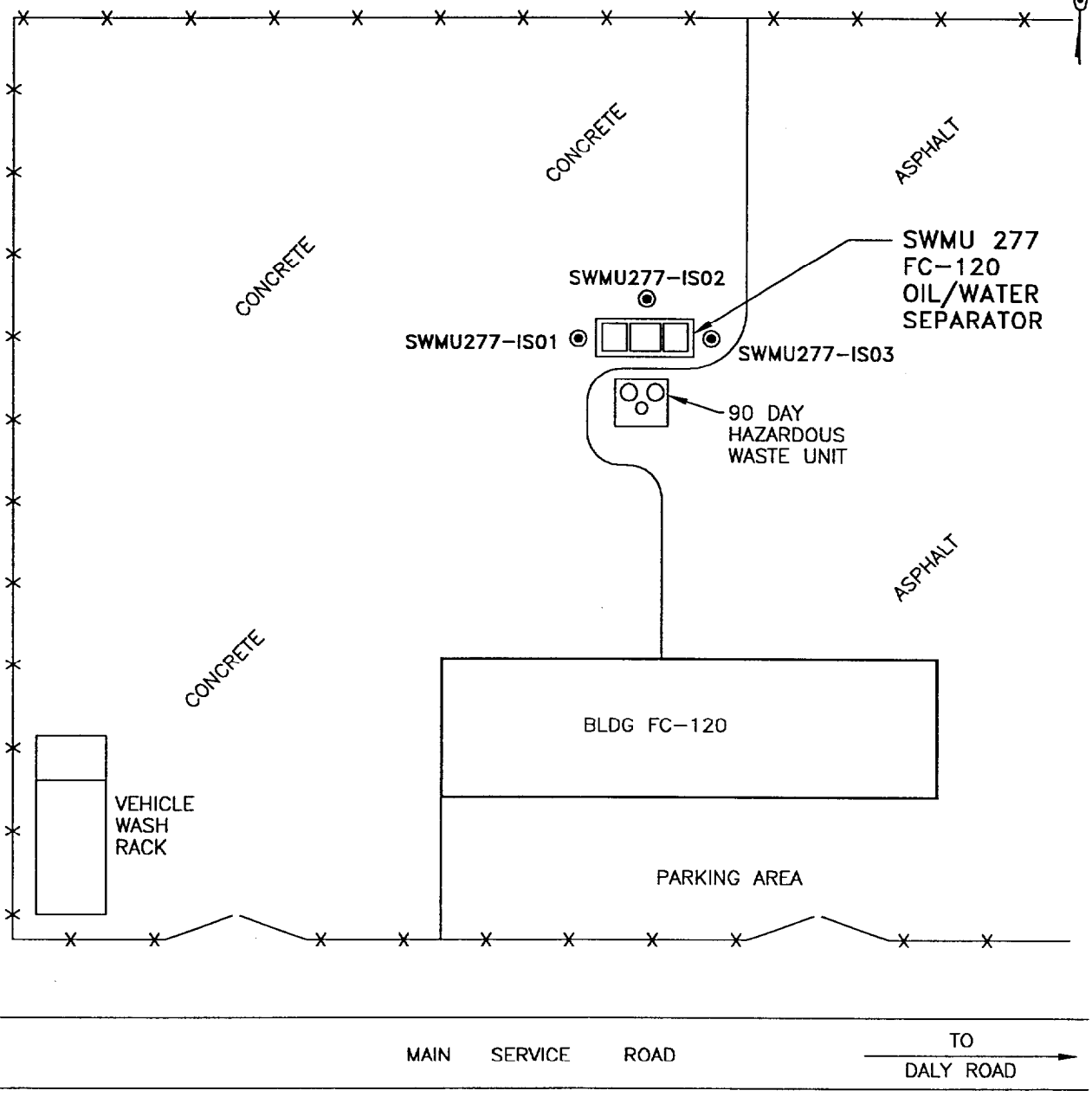
TABLE 1
DETECTION SUMMARY
SWMU 277
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC 120 - O/W, 2nd FSSG, COMBAT ENGINEER BN
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	23 U	23 U	23 J	370	SWMU277-IS03-06	4/6	126.5	56.5
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	96 J	620 J	SWMU277-IS01-00	6/6	228.83	135
Fluoranthene	360 U	390 U	48 J	48 J	SWMU277-IS02-00	1/6	48	48
TOTAL METALS (mg/kg) (6010/7410)								
Chromium	ND	ND	3	17.8	SWMU277-IS01-00	6/6	8	6.8
Lead	ND	ND	2.1	8.5	SWMU277-IS03-00	6/6	4.13	3.1

TABLE 2
STATISTICAL SUMMARY
SWMU 277
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC 120 - O/W, 2nd FSSG, COMBAT ENGINEER BN
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Acetone	23 J	370	SWMU277-IS03-06	200000000	40000000	2810	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	96 J	620 J	SWMU277-IS01-00	410000	410000	6670	0	0	0
Fluoranthene	48 J	48 J	SWMU277-IS02-00	82000000	16400000	276080	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Chromium	3	17.8	SWMU277-IS01-00	10000	2000	27.2	0	0	0
Lead	2.1	8.5	SWMU277-IS03-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTES:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 277
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.20 SWMU 279 - FC200 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.20.1 SWMU Description and History

SWMU 279 consists of an oil/water separator that is associated with a vehicle wash rack. The SWMU is located in the Hadnot Point Industrial Area, north of Main Service Road, behind Building FC-200. During the October 1996 site visit, a large erosional area in the vicinity of the SWMU was noted. The SWMU area is not paved or vegetated. During rain events, soil would be washed away from the area via surface water runoff. Subsequent to the site visit, the erosion problem was mitigated by re-grading the area. At the time of the Confirmatory Investigation, there was no evidence of significant erosion. An existing monitoring well is present immediately to the west of the SWMU. This well is damaged; it was apparently run over by heavy equipment. No visual signs of contamination were noted on the separator which is an in-ground concrete structure. The separator was installed in 1973 and is still in use.

4.20.2 Confirmatory Investigation Activities

The soil investigation for SWMU 279 was developed to determine if the presence of the oil/water separator and wash rack impacted surface and subsurface soils in the vicinity of the SWMU.

Three borings, SWMU279-IS01, SWMU279-IS02, and SWMU279-IS03 were advanced at the SWMU on September 12, 1997, at the locations depicted on Figure 1. Two samples were collected from each boring. One surface soil sample was collected from each soil boring at a depth of 0 to 2.0 feet bgs (SWMU279-IS01-00, SWMU279-IS02-00, and SWMU279-IS03-00). One subsurface soil sample was collected from just above the water table, at a depth of 6.0 to 8.0 feet bgs from the three borings (SWMU279-IS01-03, SWMU279-IS02-03, and SWMU279-IS03-03). Groundwater was encountered at a depth of approximately 9.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8260), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER04B was collected from a stainless-steel sampling spatula which was used for soil sample collection at the SWMU. Trip blanks 371TB06, 371TB07, 371TB08, and 371TB09 were shipped with the volatile fraction of the soil samples. The analytical results for the rinsate blank and the trip blanks are included in Appendix F.

4.20.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analysis indicate positive detections of one VOC , three SVOCs, and four metals. As shown on Table 2, no constituents detected at SWMU 279 exceeded the screening criteria.

Acetone was the only VOC detected in the samples collected during the Confirmatory Sampling Investigation, but at levels below the screening criteria. The three detected SVOCs were benzo(a)pyrene; bis(2-ethylhexyl)phthalate; and pyrene. The SVOC concentrations were below screening criteria. Four metals (arsenic, cadmium, chromium, and lead) were detected but at concentrations below the screening levels.

4.20.4 Recommendations

No further action is recommended at SWMU 279. The concentrations of the detected compounds were all below the screening criteria listed on Table 2.

Suggest abandonment of well

TABLE 1
DETECTION SUMMARY
SWMU 279
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC200 - O/W, 8th ENGINEERING 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU279-IS01-00	SWMU279-IS01-03	SWMU279-IS02-00	SWMU279-IS02-03	SWMU279-IS03-00	SWMU279-IS03-03
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	6' - 8'	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8260)						
Acetone	22 U	330	22 U	680	2000 J	120
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)pyrene	360 U	380 U	360 U	370 U	370 U	93 J
bis(2-Ethylhexyl) phthalate	85 J	91 J	120 J	220 J	140 J	120 J
Pyrene	360 U	380 U	360 U	44 J	370 U	370 U
TOTAL METALS (ug/kg) (6010/7410)						
Arsenic	1.1 U	1.2 U	1.1	1.1 U	1.1 U	1.1 U
Cadmium	0.54 U	0.58 U	0.55 U	0.56 U	1	0.56 U
Chromium	3.6	4.2	6.8	8.9	9.3	3
Lead	8.5	2.8	11.6	6.6	22.1	4.8

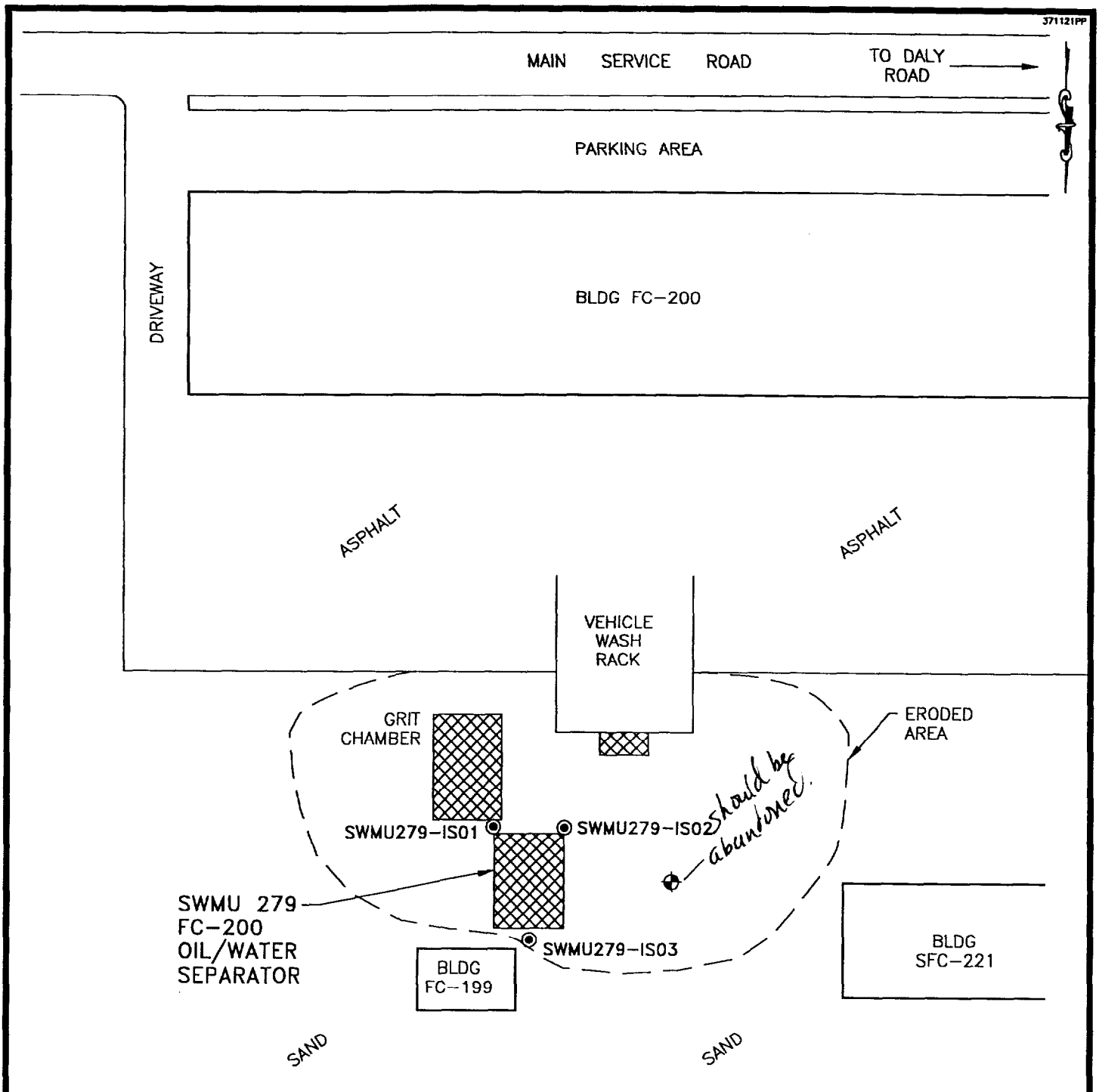
TABLE 1
DETECTION SUMMARY
SWMU 279
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC200 - O/W, 8th ENGINEERING 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	22 U	22 U	120	2000 J	SWMU279-IS03-00	4/6	782.5	505
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)pyrene	360 U	380 U	93 J	93 J	SWMU279-IS03-03	1/6	93	93
bis(2-Ethylhexyl) phthalate	ND	ND	85 J	220 J	SWMU279-IS02-03	6/6	129.33	120
Pyrene	360 U	380 U	44 J	44 J	SWMU279-IS02-03	1/6	44	44
TOTAL METALS (ug/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.1	1.1	SWMU279-IS02-00	1/6	1.1	1.1
Cadmium	0.54 U	0.58 U	1	1	SWMU279-IS03-00	1/6	1	1
Chromium	ND	ND	3	9.3	SWMU279-IS03-00	6/6	5.97	5.5
Lead	ND	ND	2.8	22.1	SWMU279-IS03-00	6/6	9.4	7.55

TABLE 2
STATISTICAL SUMMARY
SWMU 279
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC200 - O/W, 8th ENGINEERING 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Acetone	120	2000 J	SWMU279-IS03-00	200000000	40000000	2810	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Benzo(a)pyrene	93 J	93 J	SWMU279-IS03-03	780	780	NE	0	0	0
bis(2-Ethylhexyl) phthalate	85 J	220 J	SWMU279-IS02-03	410000	410000	6670	0	0	0
Pyrene	44 J	44 J	SWMU279-IS02-03	61000000	12264000	286440	0	0	0
TOTAL METALS (ug/kg) (6010/7410)									
Arsenic	1.1	1.1	SWMU279-IS02-00	3.8	3.8	26.2	0	0	0
Cadmium	1	1	SWMU279-IS03-00	1000	200	2.72	0	0	0
Chromium	3	9.3	SWMU279-IS03-00	10000	2000	27.2	0	0	0
Lead	2.8	22.1	SWMU279-IS03-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTES:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).

-NO SCREENING CRITERIA WERE EXCEEDED.

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LEGEND

- ◉ SOIL BORING AND SAMPLE LOCATION
- ⊕ EXISTING MONITORING WELL LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 279
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.21 SWMU 280 - FC285 Above Ground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.21.1 SWMU Description and History

SWMU 280 consists of the former location of an AST of unknown capacity. The SWMU is located in the Hadnot Point Industrial Area, in a fenced-in, paved compound, west of Gonzales Boulevard, and north of Main Service Road. The AST, which previously stored waste oil, was located outside of Building FC-285. The AST was not present during the 1996 site visit. The date of tank removal is unknown. Minor staining was observed in the vicinity of the former tank location.

4.21.2 Confirmatory Investigation Activities

The soil investigation for SWMU 280 was developed to determine if the presence of the former AST (e.g., spills, overfills, leaks, etc.) impacted surface and subsurface soils in the vicinity of the SWMU.

One boring, SWMU280-IS01 was advanced at the SWMU on September 15, 1997, at the location depicted on Figure 1. The presence of the overhang along the face of Building FC-285 precluded drill rig access to the exact location of the former AST. The boring was advanced approximately 10.0 feet away from the former AST location. Two samples were collected from the boring. The samples were collected from the ground surface to 2.0 feet bgs (SWMU280-IS01-00), and from just above the water table at a depth of 4.0 to 6.0 feet bgs (SWMU280-IS01-02). Groundwater was encountered at a depth of approximately 6.5 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8260), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. An equipment rinsate blank 371ER07B was collected from a stainless steel sampling spatula used to collect soil samples from the SWMU. Trip blanks 371TB10 and 371TB11 were shipped with the volatile fraction of the soil samples. The results of the rinsate blank and the trip blanks are included in Appendix F.

4.21.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminant concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Two VOCs (acetone and methylene chloride) were detected in the samples collected during the Confirmatory Sampling Investigation. The detected VOC concentrations were below all screening criteria. One SVOC (bis[2-ethylhexyl]phthalate) was detected in the sample set but at levels below the aforementioned screening criteria.

Four metals (arsenic, chromium, lead, and selenium) were detected. The concentration of arsenic (8.6 mg/kg) in one sample (SWMU280-IS01-02) exceeded the USEPA Region III RBC (3.8 mg/kg) and the North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target concentration (3.8 mg/kg). No other criteria for metals were exceeded in either of the samples.

4.21.4 Recommendations

No further action is recommended for SWMU 280. Although two of the screening criteria for arsenic were exceeded, the concentration was significantly below the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water), Target Concentration of 26.2 mg/kg. Further, no source of arsenic contamination is known or expected to have been present at the SWMU.

In addition, the sample loc is covered by asphalt plus it was a subsurface sample

TABLE 1
DETECTION SUMMARY
SWMU 280
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC285 - AST, MAINTENANCE BATTALION, 2D FSSG
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU280-IS01-00	SWMU280-IS01-02
DATE SAMPLED	09-15-1997	09-15-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260)		
Acetone	21 J	200
Methylene chloride	7.5 J	2.8 J
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	110 J	130 J
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.3 U	8.6
Chromium	19	23
Lead	7.4	9.9
Selenium	0.66 U	0.99

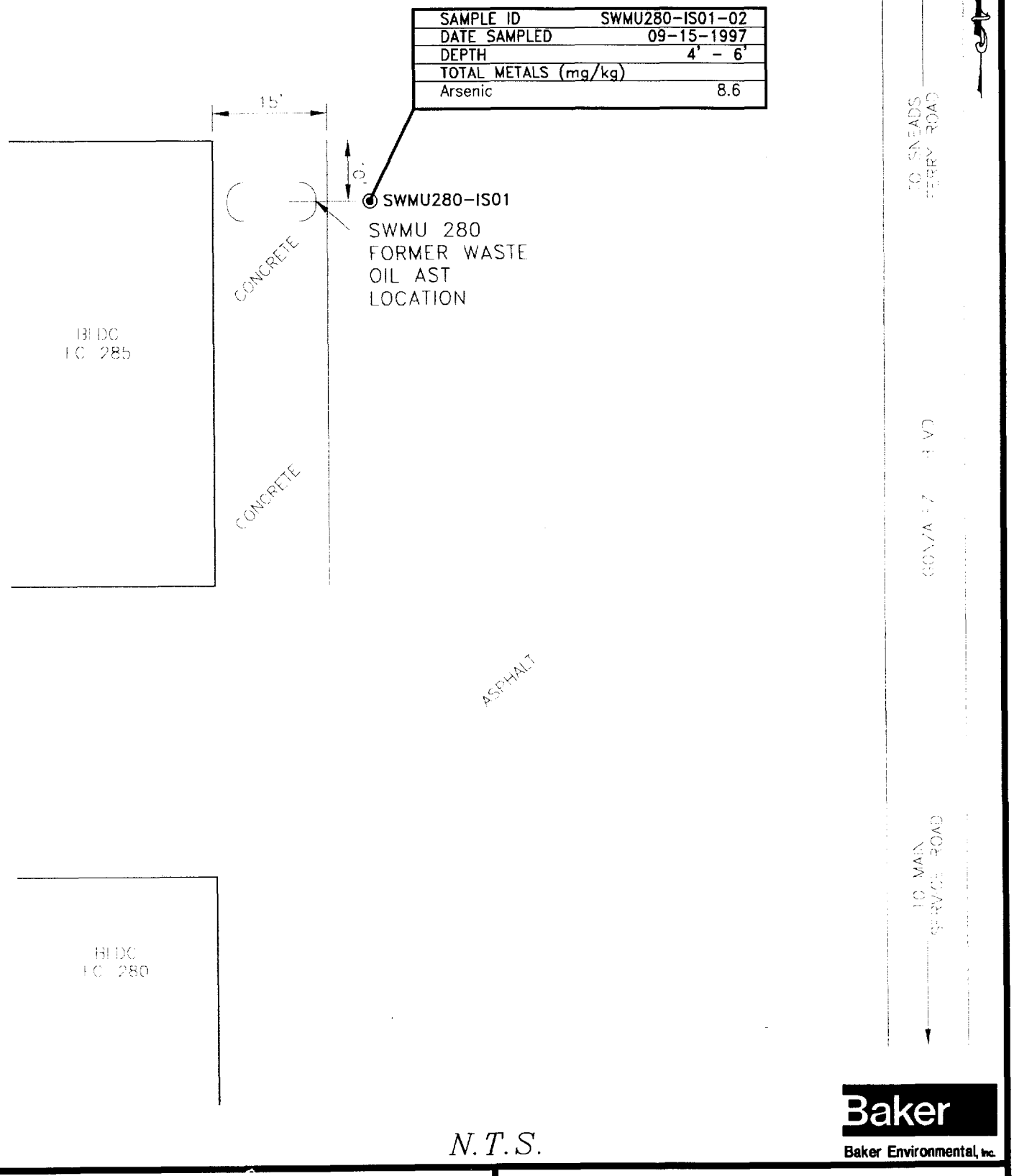
TABLE 1
DETECTION SUMMARY
SWMU 280
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC285 - AST, MAINTENANCE BATTALION, 2D FSSG
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	ND	ND	21 J	200	SWMU280-IS01-02	2/2	110.5	110.5
Methylene chloride	ND	ND	2.8 J	7.5 J	SWMU280-IS01-00	2/2	5.15	5.15
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	110 J	130 J	SWMU280-IS01-02	2/2	120	120
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.3 U	1.3 U	8.6	8.6	SWMU280-IS01-02	1/2	8.6	8.6
Chromium	ND	ND	19	23	SWMU280-IS01-02	2/2	21	21
Lead	ND	ND	7.4	9.9	SWMU280-IS01-02	2/2	8.65	8.65
Selenium	0.66 U	0.66 U	0.99	0.99	SWMU280-IS01-02	1/2	0.99	0.99

TABLE 2
STATISTICAL SUMMARY
SWMU 280
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC285 - AST, MAINTENANCE BATTALION, 2D FSSG
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Acetone	21 J	200	SWMU280-IS01-02	200000000	40000000	2810	0	0	0
Methylene chloride	2.8 J	7.5 J	SWMU280-IS01-00	760000	760000	22.1	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	110 J	130 J	SWMU280-IS01-02	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	8.6	8.6	SWMU280-IS01-02	3.8	3.8	26.2	1	1	0
Chromium	19	23	SWMU280-IS01-02	10000	2000	27.2	0	0	0
Lead	7.4	9.9	SWMU280-IS01-02	NE	400	270.06	0	0	0
Selenium	0.99	0.99	SWMU280-IS01-02	10000	2000	12.2	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



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◉ SOIL BORING AND SAMPLE LOCATION

mg/kg MILLIGRAM/KILOGRAM

NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 280
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.22 SWMU 283 - FC 279 Release

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.22.1 SWMU Description and History

SWMU 283 consists of a small (approximately 20 feet by 5 feet) area adjacent to a materials storage area in which stressed vegetation was observed. The materials storage area, which is well maintained, is used to store items such as batteries, asbestos, oil, and drums. The SWMU is located in the Hadnot Point Industrial Area, north of Main Service Road, behind Building FC-270. The SWMU is not paved or vegetated, and the distressed vegetation is suspected to be related to a previous spill. It is not known when the spill may have occurred or when the storage area was established.

4.22.2 Confirmatory Investigation Activities

The soil investigation for SWMU 283 was developed to determine if the surface and subsurface soils in the vicinity of the SWMU have been impacted by past spills.

Two borings, SWMU283-IS01 and SWMU283-IS02 were advanced at the SWMU on September 12, 1997, at the locations depicted on Figure 1. Two samples were collected from each boring. One sample from each boring was collected from the ground surface to 2.0 bgs (SWMU283-IS01-00 and SWMU283-IS02-00) and from just above the water table, at a depth of 8.0 to 10.0 feet bgs (SWMU283-IS01-04 and SWMU283-IS02-04). Groundwater was encountered at a depth of approximately 11.0 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Methods 8020 and 8260A), SVOAs (USEPA Method 8270B), pesticides/PCBs (USEPA Method 8080) and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. One duplicate sample (SWMU283-IS01-04D) was collected from the SWMU. Equipment rinsate blank 371ER04B was collected from a stainless-steel sampling spatula which was used for soil sample collection at the SWMU. Trip blanks 371TB06, 371TB07, 371TB08, and 371TB09 were shipped with the volatile fraction of the soil samples. The analytical results for the field duplicate are included in Appendix E. The analytical results for the rinsate and trip blanks are presented in Appendix F.

4.22.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

No organic compounds were detected in any of the soil samples collected during the confirmatory sampling investigation. Three metals (cadmium, chromium, and lead) were detected. None of the detected metals were present at levels exceeding the aforementioned screening criteria.

4.22.4 Recommendations

No further action is recommended for SWMU 283. No organic compounds were detected and the metals that were detected in the samples collected from SWMU 283 did not exceed any of the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 283
SWMU CONFIRMATORY SAMPLING (CTO-0371)
RELEASE (FC279), 8th MOTOR TRANSPORT 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU283-IS01-00	SWMU283-IS01-04	SWMU283-IS02-00	SWMU283-IS02-04
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	8' - 10'	0' - 2'	8' - 10'
VOLATILES (ug/kg) (8260A)	ND	ND	ND	ND
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND
SEMIVOLATILES (ug/kg) (8270B)	ND	ND	ND	ND
PESTICIDES/PCBS (ug/kg) (8080)	ND	ND	ND	ND
TOTAL METALS (mg/kg) (6010/7410)				
Cadmium	0.69	0.55 U	0.56 U	0.55 U
Chromium	9.7	6.4	6.7	7.5
Lead	4.8	3.5	2.6	2.9

Notes:

ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 283
SWMU CONFIRMATORY SAMPLING (CTO-0371)
RELEASE (FC279), 8th MOTOR TRANSPORT 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)	ND	ND	ND	ND		0/4	ND	ND
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/4	ND	ND
SEMIVOLATILES (ug/kg) (8270B)	ND	ND	ND	ND		0/4	ND	ND
PESTICIDES/PCBS (ug/kg) (8080)	ND	ND	ND	ND		0/4	ND	ND
TOTAL METALS (mg/kg) (6010/7410)								
Cadmium	0.55 U	0.56 U	0.69	0.69	SWMU283-IS01-00	1/4	0.69	0.69
Chromium	ND	ND	6.4	9.7	SWMU283-IS01-00	4/4	7.58	7.1
Lead	ND	ND	2.6	4.8	SWMU283-IS01-00	4/4	3.45	3.2

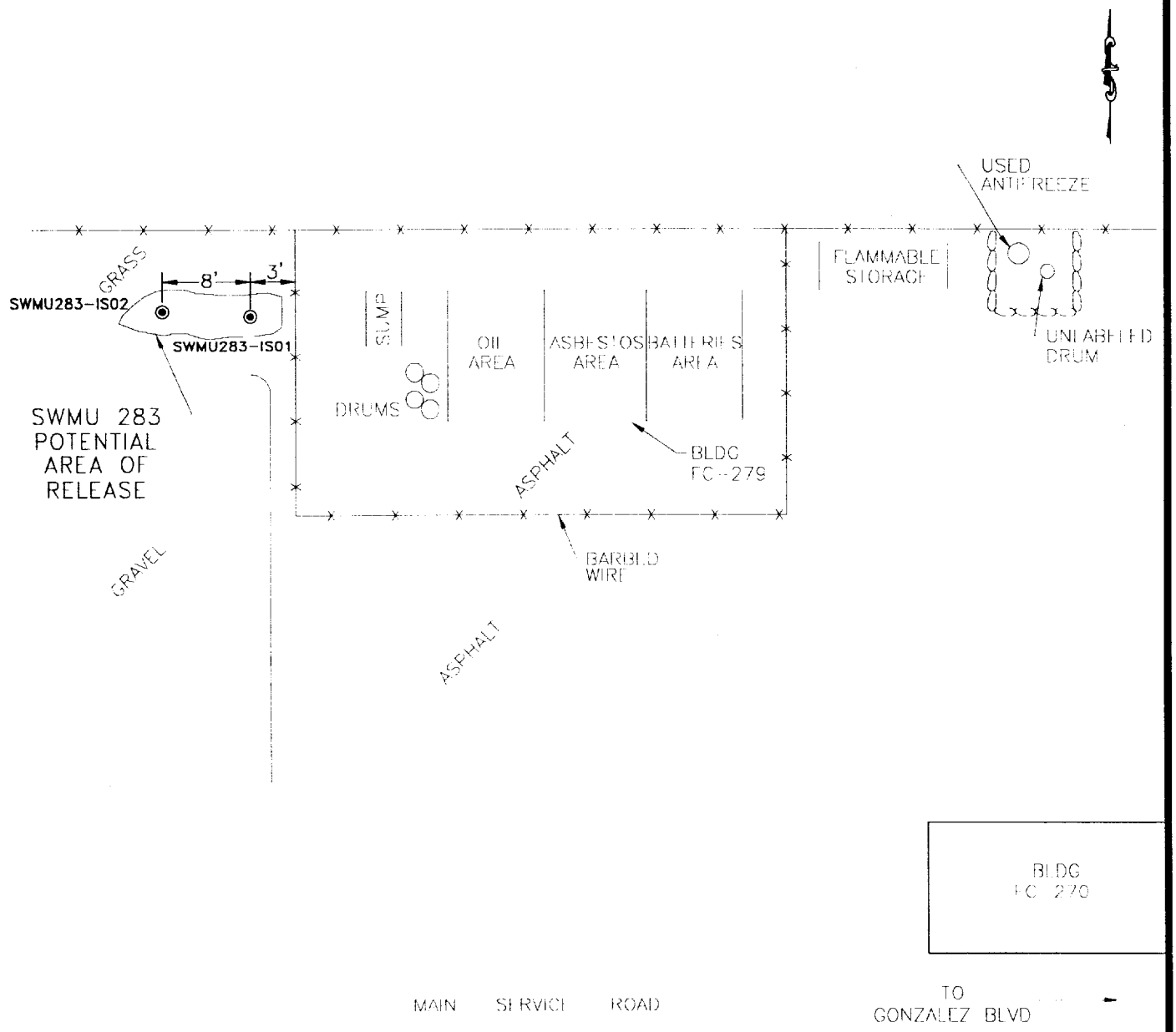
Notes:

ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 283
SWMU CONFIRMATORY SAMPLING (CTO-0371)
RELEASE (FC279), 8th MOTOR TRANSPORT 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
TOTAL METALS (mg/kg) (6010/7410)									
Cadmium	0.69	0.69	SWMU283-IS01-00	1000	200	2.72	0	0	0
Chromium	6.4	9.7	SWMU283-IS01-00	10000	2000	27.2	0	0	0
Lead	2.6	4.8	SWMU283-IS01-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
mg/kg = milligrams per kilograms



NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 283
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.23 SWMU 284 (S947 Container), SWMU 285 (S947 Oil/Water Separator), SWMU 286 (S947 Waste Pile)

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.23.1 SWMU Description and History

SWMUs 284 and 286 were identified in the RFA Report (EnSafe, 1996) as a container and waste pile, respectively. During Baker's site visit in October 1996, the area where these SWMUs were located is now a paved parking lot for the Recycling Center.

SWMU 285 is an active oil/water separator north of Building S-960 (covered storage area). Water from concrete paved areas and the oil/water skimmings from the aboveground storage tanks (ASTs), located east of the separator, is transported to the oil/water separator by underground pipelines.

4.23.2 Confirmatory Investigation Activities

The soil investigation at SWMUs 284, 285, and 286 was developed to determine the condition of the surface and subsurface soils within the Recycling Center.

One soil boring, SWMU284-IS01, was installed on September 13, 1997 to investigate the areas of SWMUs 284 and 286. Figure 1 presents the location of this soil boring. Four soil borings, SWMU285-IS01 through SWMU285-IS04, were installed on September 13, 1997 to investigate the area of SWMU 285. Surface soil samples were collected from the ground surface to a depth of 2.0 feet bgs at each of the five borings. One subsurface soil sample was collected from each of the five soil borings and submitted for analysis. A duplicate subsurface soil sample was also collected from boring SWMU285-IS02. The subsurface soil samples were collected from just above the water table at a depth of 6.0 to 8.0 feet bgs. Groundwater was encountered to depths of 8.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Methods 8020 and 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER06A, associated with September 13th sample collection, was collected from a split spoon sampler used at SWMU 306. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB10 and 371TB11 were shipped with the VOA fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.23.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 (SWMUs 284/286) and Table (SWMU 285) and compared to a specific set of screening criteria in Table 2 (SWMUs 284/286) and Table 4 (SWMU 285). The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

4.23.3.1 SWMUs 284 and 286

As shown on Tables 1 and 2, VOCs or SVOCs were not detected above comparison criteria.

Mercury was detected in sample SWMU284-IS01-00 above the North Carolina Category S-3:G-1 Target Concentration (0.0154 mg/kg). No metals were detected in the rinsate blank for this day's sampling.

Therefore, soil boring SWMU284-IS01, located south of Building S-960, exhibited one constituent in exceedence of comparison criteria. Refer to Figure 1 for the location of the soil boring.

4.23.3.2 SWMU 285

As shown on Tables 3 and 4, methylene chloride (SWMU285-IS03-02; 25J µg/kg) was the only VOC detected which exceeded a comparison criteria [North Carolina Category S-3:G-1 Target Concentration (22.1 µg/kg)]. Methylene chloride is a common laboratory contaminant, but was not detected in the trip blank (371TB06A) shipped with the SWMU 285 samples.

The SVOCs which exceeded comparison criteria were benzo(a)anthracene (SWMU285-IS03-00; 2,600 µg/kg) and benzo(a)pyrene (SWMU285-IS03-00; 2,700 µg/kg). Benzo(a)anthracene exceeded the North Carolina Category S-3:G-1 Target Concentration of 343 µg/kg. Benzo(a)pyrene exceeded the Region III Industrial RBC (780 µg/kg) and the North Carolina Category S-2 Target Concentration (780 µg/kg). These compounds were not detected in the rinsate blank for the day's sampling.

Arsenic exceeded comparison criteria in sample SWMU285-IS04-00 for the Region III Industrial RBC (3.8 mg/kg) and the North Carolina Category S-2 Target Concentration (3.8 mg/kg). No metals were detected in the rinsate blank for this day's sampling.

Therefore, as shown on Figure 1, samples from two of the four soil borings associated with SWMU 285 contained constituents at concentrations exceeding the screening criteria. Soil boring SWMU285-IS03, located southwest of the oil/water separator, and soil boring SWMU285-IS04, located west of boring SWMU285-IS03, exhibited organic and/or metal constituents in exceedence of one or more comparison criteria.

4.23.4 Recommendations

Based on the analytical results, no further action is recommended for SWMUs 284 and 286. The mercury detections are not considered to be site-related. Further investigation activities are recommended for SWMU 285 due to the PAH contamination identified at boring SWMU285-IS03. At a minimum, additional borings should be drilled and soil samples collected from the borings. These additional soil samples should confirm the presence of PAHs in the soil near the SWMU. In addition, temporary groundwater wells should be installed to determine if the groundwater has been

impacted by the PAHs in the soil. The soil and groundwater samples would be analyzed for SVOAs. To confirm the presence of arsenic near boring SWMU285-IS04, soil samples would be collected from an additional soil boring. These soil samples would be analyzed for metals.

nec. to analyze for all metals or just arsenic.

nec. to sample for arsenic at all?
det @ 4.1 mg/kg
NC criteria @ 3.8 mg/kg

TABLE 1
DETECTION SUMMARY
SWMU 284 and SWMU 286
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - CONTAINER, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU284-IS01-00	SWMU284-IS01-03
DATE SAMPLED	09-13-1997	09-13-1997
DEPTH	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8020)	ND	ND
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	81 J	300 J
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.2	1.4
Chromium	5.2	5.9
Lead	3.1	2.8
Mercury	0.042	0.037 U

Notes:

ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 284 and SWMU 286
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - CONTAINER, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/2	0/2	0/2
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	81 J	300 J	SWMU284-IS01-03	2/2	190.5	190.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	ND	ND	1.2	1.4	SWMU284-IS01-03	2/2	1.3	1.3
Chromium	ND	ND	5.2	5.9	SWMU284-IS01-03	2/2	5.55	5.55
Lead	ND	ND	2.8	3.1	SWMU284-IS01-00	2/2	2.95	2.95
Mercury	0.037 U	0.037 U	0.042	0.042	SWMU284-IS01-00	1/2	0.04	0.04

Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 284 and SWMU 286
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - CONTAINER, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	81 J	300 J	SWMU284-IS01-03	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.2	1.4	SWMU284-IS01-03	3.8	3.8	26.2	0	0	0
Chromium	5.2	5.9	SWMU284-IS01-03	10000	2000	27.2	0	0	0
Lead	2.8	3.1	SWMU284-IS01-00	NE	400	270.06	0	0	0
Mercury	0.042	0.042	SWMU284-IS01-00	610	122	0.0154	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 3
DETECTION SUMMARY
SWMU 285
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - O/W, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU285-IS01-00	SWMU285-IS01-03	SWMU285-IS02-00	SWMU285-IS02-03	SWMU285-IS03-00	SWMU285-IS03-03
DATE SAMPLED	09-13-1997	09-12-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	6' - 8'	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8260A)						
Acetone	9.7 J	44 J	23 J	22 J	680 J	57 J
Methylene chloride	4.6 J	6.1 U	3.3 J	3 J	25 J	3 J
Tetrachloroethene	4.3 J	6.1 U	5.5 U	5.9 U	18 U	6.1 U
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	1.1 U	1.2 U	1.1 U	1.2 U	1.7	1.2 U
1,4-Dichlorobenzene	1.7	1.2 U	1.1 U	1.2 U	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270B)						
Acenaphthylene	370 U	400 U	360 U	390 U	74 J	400 U
Anthracene	370 U	400 U	360 U	390 U	140 J	400 U
Benzo(a)anthracene	42 J	400 U	360 U	390 U	2600	400 U
Benzo(a)pyrene	58 J	400 U	38 J	390 U	2700	400 U
Benzo(b)fluoranthene	65 J	400 U	360 U	390 U	2300	400 U
Benzo(ghi)perylene	48 J	400 U	360 U	390 U	1100	400 U
Benzo(k)fluoranthene	57 J	400 U	360 U	390 U	2500	400 U
bis(2-Ethylhexyl) phthalate	92 J	120 J	110 J	86 J	88 J	130 J
Carbazole	370 U	400 U	360 U	390 U	100 J	400 U
Chrysene	66 J	400 U	360 U	390 U	2500	400 U
Dibenz(a,h)anthracene	370 U	400 U	360 U	390 U	660	400 U
Fluoranthene	73 J	400 U	360 U	390 U	3100	400 U
Indeno(1,2,3-cd)pyrene	40 J	400 U	360 U	390 U	1200	400 U
Phenanthrene	38 J	400 U	360 U	390 U	140 J	400 U
Pyrene	67 J	400 U	360 U	390 U	3100	400 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.6	1.2 U	1.6	1.2 U	1.1 U	1.2 U
Barium	22.2 U	24.3 U	22 U	23.8 U	22.1 U	24.3 U
Cadmium	0.55 U	0.61 U	0.55 U	0.59 U	0.55 U	0.61 U
Chromium	9.1	8.9	11	7.5	9.7	8.7
Lead	25.6	3.3	18	3.2	18.7	4.1

TABLE 3
DETECTION SUMMARY
SWMU 285
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - O/W, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU285-IS04-00	SWMU285-IS04-03
DATE SAMPLED	09-13-1997	09-13-1997
DEPTH	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8260A)		
Acetone	140 J	21 J
Methylene chloride	9.1 J	3 J
Tetrachloroethene	5.4 U	5.8 U
VOLATILES (ug/kg) (8020)		
1,3-Dichlorobenzene	1.1 U	1.2 U
1,4-Dichlorobenzene	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270B)		
Acenaphthylene	360 U	380 U
Anthracene	360 U	380 U
Benzo(a)anthracene	27 J	380 U
Benzo(a)pyrene	360 U	380 U
Benzo(b)fluoranthene	360 U	380 U
Benzo(ghi)perylene	360 U	380 U
Benzo(k)fluoranthene	360 U	380 U
bis(2-Ethylhexyl) phthalate	140 J	250 J
Carbazole	360 U	380 U
Chrysene	43 J	380 U
Dibenz(a,h)anthracene	360 U	380 U
Fluoranthene	360 U	380 U
Indeno(1,2,3-cd)pyrene	360 U	380 U
Phenanthrene	36 J	380 U
Pyrene	360 U	380 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	4.1	1.2 U
Barium	41.3	23.3 U
Cadmium	0.54	0.58 U
Chromium	14.2	10.9
Lead	65.6	4.4

TABLE 3
DETECTION SUMMARY
SWMU 285
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - O/W, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	ND	ND	9.7 J	680 J	SWMU285-IS03-00	8/8	124.59	33.5
Methylene chloride	6.1 U	6.1 U	3 J	25 J	SWMU285-IS03-00	7/8	7.29	3.3
Tetrachloroethene	5.4 U	18 U	4.3 J	4.3 J	SWMU285-IS01-00	1/8	4.3	4.3
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1.1 U	1.2 U	1.7	1.7	SWMU285-IS03-00	1/8	1.7	1.7
1,4-Dichlorobenzene	1.1 U	1.2 U	1.7	1.7	SWMU285-IS01-00	1/8	1.7	1.7
SEMIVOLATILES (ug/kg) (8270B)								
Acenaphthylene	360 U	400 U	74 J	74 J	SWMU285-IS03-00	1/8	74	74
Anthracene	360 U	400 U	140 J	140 J	SWMU285-IS03-00	1/8	140	140
Benzo(a)anthracene	360 U	400 U	27 J	2600	SWMU285-IS03-00	3/8	889.67	42
Benzo(a)pyrene	360 U	400 U	38 J	2700	SWMU285-IS03-00	3/8	932	58
Benzo(b)fluoranthene	360 U	400 U	65 J	2300	SWMU285-IS03-00	2/8	1182.5	1182.5
Benzo(ghi)perylene	360 U	400 U	48 J	1100	SWMU285-IS03-00	2/8	574	574
Benzo(k)fluoranthene	360 U	400 U	57 J	2500	SWMU285-IS03-00	2/8	1278.5	1278.5
bis(2-Ethylhexyl) phthalate	ND	ND	86 J	250 J	SWMU285-IS04-03	8/8	127	115
Carbazole	360 U	400 U	100 J	100 J	SWMU285-IS03-00	1/8	100	100
Chrysene	360 U	400 U	43 J	2500	SWMU285-IS03-00	3/8	869.67	66
Dibenz(a,h)anthracene	360 U	400 U	660	660	SWMU285-IS03-00	1/8	660	660
Fluoranthene	360 U	400 U	73 J	3100	SWMU285-IS03-00	2/8	1586.5	1586.5
Indeno(1,2,3-cd)pyrene	360 U	400 U	40 J	1200	SWMU285-IS03-00	2/8	620	620
Phenanthrene	360 U	400 U	36 J	140 J	SWMU285-IS03-00	3/8	71.33	38
Pyrene	360 U	400 U	67 J	3100	SWMU285-IS03-00	2/8	1583.5	1583.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.6	4.1	SWMU285-IS04-00	3/8	2.43	1.6
Barium	22 U	24.3 U	41.3	41.3	SWMU285-IS04-00	1/8	41.3	41.3
Cadmium	0.55 U	0.61 U	0.54	0.54	SWMU285-IS04-00	1/8	0.54	0.54
Chromium	ND	ND	7.5	14.2	SWMU285-IS04-00	8/8	10	9.4
Lead	ND	ND	3.2	65.6	SWMU285-IS04-00	8/8	17.86	11.2

TABLE 4
STATISTICAL SUMMARY
SWMU 285
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - O/W, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJEUNE, NORTH CAROLINA

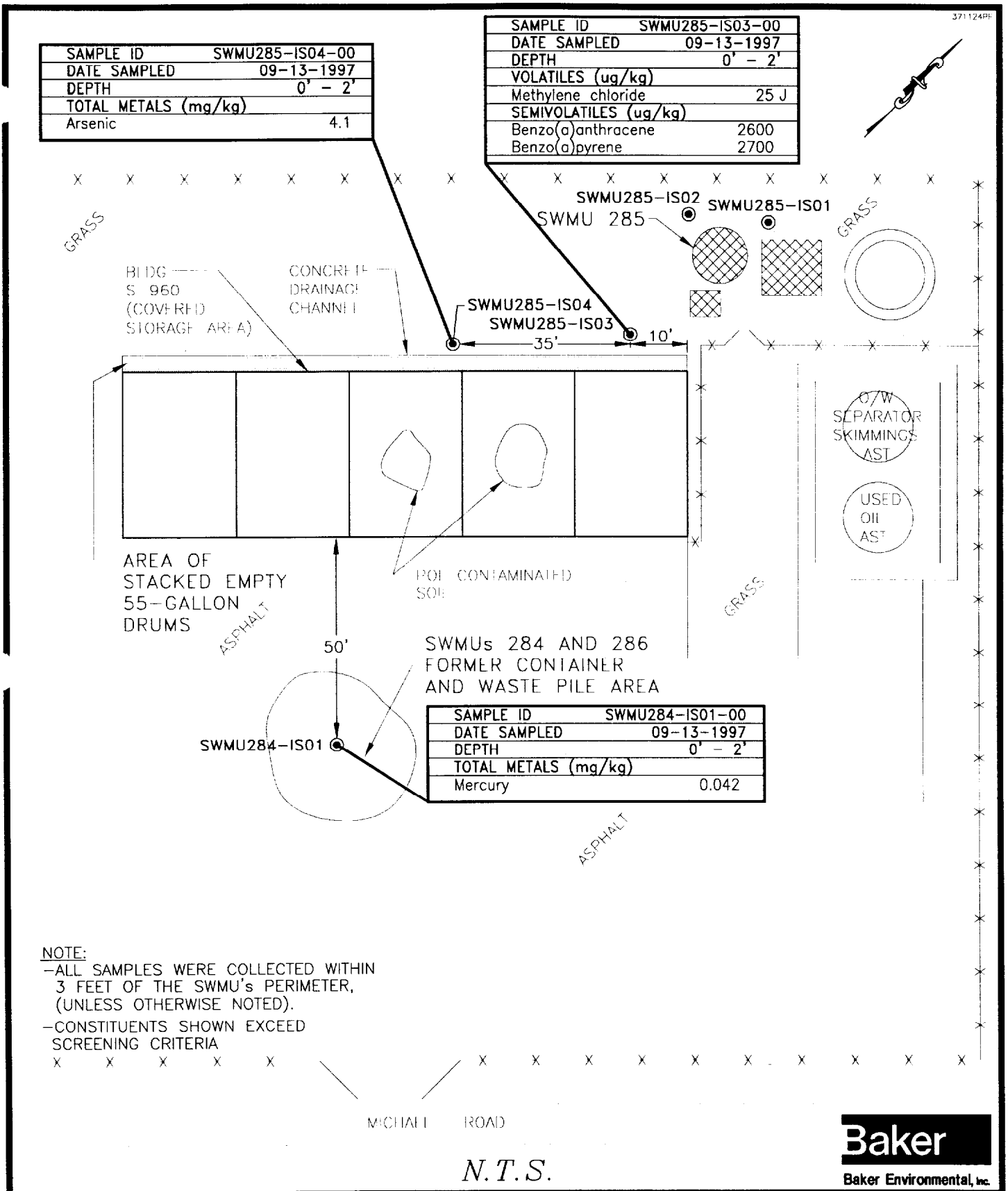
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
Acetone	9.7 J	680 J	SWMU285-IS03-00	200000000	40000000	2810	0	0	0
Methylene chloride	3 J	25 J	SWMU285-IS03-00	760000	760000	22.1	0	0	1
Tetrachloroethene	4.3 J	4.3 J	SWMU285-IS01-00	110000	110000	7.4	0	0	0
VOLATILES (ug/kg) (8020)									
1,3-Dichlorobenzene	1.7	1.7	SWMU285-IS03-00	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	1.7	1.7	SWMU285-IS01-00	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270B)									
Acenaphthylene	74 J	74 J	SWMU285-IS03-00	NE	NE	11360	0	0	0
Anthracene	140 J	140 J	SWMU285-IS03-00	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	27 J	2600	SWMU285-IS03-00	7800	7800	343	0	0	1
Benzo(a)pyrene	38 J	2700	SWMU285-IS03-00	780	780	NE	1	1	0
Benzo(b)fluoranthene	65 J	2300	SWMU285-IS03-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	48 J	1100	SWMU285-IS03-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	57 J	2500	SWMU285-IS03-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	86 J	250 J	SWMU285-IS04-03	410000	410000	6670	0	0	0
Carbazole	100 J	100 J	SWMU285-IS03-00	290000	290000	NE	0	0	0
Chrysene	43 J	2500	SWMU285-IS03-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	660	660	SWMU285-IS03-00	780	780	NE	0	0	0
Fluoranthene	73 J	3100	SWMU285-IS03-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	40 J	1200	SWMU285-IS03-00	7800	7800	NE	0	0	0
Phenanthrene	36 J	140 J	SWMU285-IS03-00	NE	NE	59640	0	0	0
Pyrene	67 J	3100	SWMU285-IS03-00	61000000	12264000	286440	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 4
STATISTICAL SUMMARY
SWMU 285
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S947 - O/W, ENVIRONMENTAL MANAGEMENT DIVISION
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.6	4.1	SWMU285-IS04-00	3.8	3.8	26.2	1	1	0
Barium	41.3	41.3	SWMU285-IS04-00	140000	28000	848	0	0	0
Cadmium	0.54	0.54	SWMU285-IS04-00	1000	200	2.72	0	0	0
Chromium	7.5	14.2	SWMU285-IS04-00	10000	2000	27.2	0	0	0
Lead	3.2	65.6	SWMU285-IS04-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA

N.T.S.

Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

ug/kg – MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMUs 284, 285 AND 286
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.24 SWMU 291 - 034 Ditch

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.24.1 SWMU Description and History

SWMU 291 is located in the Hadnot Point Industrial Area behind Building 1450 located on Dogwood Street. The SWMU is a stormwater drainage ditch which historically received runoff from Building 1450 and associated oil/water separator. During the Confirmatory Sampling Investigation, Baker personnel had noted that a portion of the original ditch had been backfilled during recent construction activities. The new construction at the site had resulted in the removal and re-distribution of soils surrounding the SWMU. The area around the SWMU is covered with grass and trees. The portion of the ditch that had been backfilled was still bare soil with evidence of erosion.

SW body?

4.24.2 Confirmatory Investigation Activities

The investigation conducted at SWMU 291 was developed to determine if the soils in the vicinity of the SWMU had been impacted by the runoff from Building 1450 and its associated oil/water separator. In addition, the investigation was developed to determine if the water and soils within the ditch have been contaminated by the historic runoff from the building.

As depicted on Figure 1, two soil borings (SWMU291-IS01 and SWMU291-IS02) were advanced between the parking lot for Building 1450 and the SWMU on September 13, 1997. Soil samples were collected from ground surface to 2.0 feet bgs and just above the soil/groundwater interface at a depth of 8.0 to 10.0 feet bgs. Groundwater was encountered at 11.0 feet bgs.

Surface water and sediment samples were also collected at the SWMU (see Figure 1). The samples were collected from the portion of the ditch that had not been backfilled by construction activities. A single surface water sample and two sediment samples were collected in the ditch. Sediments were only collected from the zero to six inch interval because plant roots, tree branches and miscellaneous debris within the small portion of the ditch still containing water inhibited sampling from the six to twelve inch interval.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Methods 8020 and 8260), SVOAs (EPA Method 8270), pesticides (EPA Method 8080), PCBs (EPA Method 8080) and RCRA metals (EPA Method SW846 6010/7410). A duplicate sample was collected from soil boring SMWU291-IS01 (surface soil sample) and the results are presented in Appendix E. Equipment rinsate blanks 371ER05B and 371ER08B were collected from a split spoon sampler and a stainless steel sampling spoon used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB06, 371TB07, 371TB08, 371TB09, 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.24.3 Investigation Findings

The detected analytical results and the comparison of the results to a specific set of screening criteria are presented on Tables 1 through 6. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs) (soil)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations (soil)
- North Carolina Risk Analysis Framework, Method I, Category S-3G-1 (protective of non-drinking and drinking water) Target Concentrations (soil)
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of surface water within 250 feet) Target Concentrations (soil)
- North Carolina Water Quality Standards (surface water)
- Camp Lejeune Reference Station Results for Webb Creek (surface water)
- USEPA Region IV Sediment Effects, Effects-Range Low (ER-L) Screening Values (sediment)
- USEPA Region IV Sediment Effects, Effects-Range Medium (ER-M) Screening Values (sediment).

The contaminants whose concentrations exceeded the previously-listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs with respect to sampled media.

4.24.3.1 Soil Results

As shown on Table 1, soil samples from borings SWMU291-IS01 and SWMU291-IS02 contained detectable concentrations of VOCs, SVOCs, pesticides and metals. VOCs, namely acetone, 1,4-dichlorobenzene and tetrachloroethene, were detected but at concentrations that do not exceed the comparison criteria (Table 2).

SVOCs detected in the soil samples collected at the SWMU included: benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene and pyrene. Concentrations of these contaminants did not exceed the comparison criteria (Table 2).

Pesticides detected at the SWMU (4,4'-DDD, 4,4'-DDE and 4,4'-DDT) did not exceed the screening criteria.

As shown on Table 2, arsenic and chromium were detected in soil samples at concentrations that did exceed the screening criteria for the SWMU. Arsenic was detected in soil sample SWMU291-IS01-04 at a concentration of 11.3 mg/kg exceeding the Region III RBC and the North Carolina, Category S-2 Target Concentration. Chromium was detected at a concentration of 43.3 mg/kg in sample SWMU 291-IS01-04, exceeding the North Carolina, Category S-3:G-1 Target Concentration for this compound.

4.24.3.2 Surface Water Results

Sample SWMU291-SW01-00 was collected from the surface water within the SWMU. As shown on Table 3, the sample had detectable concentrations of tetrachloroethene,

bis(2-ethylhexyl)phthalate, chromium and lead. Tetrachloroethene was detected at a concentration of 8.4 µg/L . This concentration exceeded the North Carolina Water Quality Standard (NCWQS) of 0.7 µg/L.

Bis(2-ethylhexyl)phthalate was detected but at concentrations below the NCWQS.

Chromium and lead were detected in the sample set but at concentrations below the NCWQS (Table 4).

4.24.3.3 Sediment Results

Sediment samples collected from the SWMU contained detectable concentrations of VOCs, SVOCs, pesticides and metals (Table 5). Methylene chloride and 1,4-dichlorobenzene were the only VOCs detected in the sediments collected from the SWMU. As shown on Table 6, the concentrations did not exceed the USEPA Region IV Sediment ER-Ls or the USEPA Region IV Sediment ER-Ms.

A total of 13 SVOCs were detected in the sediment samples collected at the site. The only SVOC that was detected at concentrations exceeding the ER-L was acenaphthene. The compound was detected in sample SMWU291-SD02-00 at a concentration of 56 J µg/kg exceeding the ER-L of 16 µg/kg.

The only pesticide that were detected at a concentration exceeding the ER-L was 4,4'-DDE. The ER-L for this compound is 2.2 µg/kg and the concentration detected in the sample was 3.1 µg/kg.

Cadmium and mercury were detected in the sediments collected at the SWMU. The concentrations were just above the ER-L screening values.

4.24.4 Recommendations

Based on the analytical results, an additional investigation is recommended for SWMU 291. An additional soil boring in the vicinity of boring SWMU291-IS01 would be installed. Surface and subsurface soil samples would be collected from this new boring to confirm the presence of arsenic and chromium. The soil samples would be analyzed for metals. Additional surface water and sediment samples would be collected in the SWMU ditch to confirm and define the VOC, SVOC, pesticide, and metal contamination. The surface water and sediment samples would be analyzed for VOAs, SVOAs, pesticides and metals.

TABLE 1
DETECTION SUMMARY
SWMU 291 - SOIL
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU291-IS01-00	SWMU291-IS01-04	SWMU291-IS02-00	SWMU291-IS02-04
DATE SAMPLED	09-13-1997	09-13-1997	09-13-1997	09-13-1997
DEPTH	0' - 2'	8' - 10'	0' - 2'	8' - 10'
VOLATILES (ug/kg) (8260A)				
Acetone	22 U	180	23 U	71
Tetrachloroethene	1.7 J	7 U	5.8 U	5.9 U
VOLATILES (ug/kg) (8020)				
1,4-Dichlorobenzene	1.1 U	1.8	1.2 U	1.2 U
SEMIVOLATILES (8270) (ug/kg)				
Benzo(a)anthracene	360 U	460 U	23 J	390 U
Benzo(a)pyrene	360 U	460 U	25 J	390 U
bis(2-Ethylhexyl) phthalate	90 J	100 J	95 J	100 J
Chrysene	360 U	460 U	29 J	390 U
Fluoranthene	360 U	460 U	41 J	390 U
Pyrene	360 U	460 U	37 J	390 U
PESTICIDES/PCBS (ug/kg) (8080)				
4,4'-DDD	11	2.4 U	46	2 U
4,4'-DDE	40	2.4 U	29	2 U
4,4'-DDT	35	2.4 U	100	2 U
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	1.1 U	11.3	1.2 U	2.7
Barium	23.8	37.3	23 U	23.4 U
Chromium	7.1	43.3	6.4	11.2
Lead	17.6	11.3	13.7	4.7
Selenium	0.54 U	0.95	0.58 U	0.59 U

TABLE 1
DETECTION SUMMARY
SWMU 291 - SOIL
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	22 U	23 U	71	180	SWMU291-IS01-04	2/4	125.5	125.5
Tetrachloroethene	5.8 U	7 U	1.7 J	1.7 J	SWMU291-IS01-00	1/4	1.7	1.7
VOLATILES (ug/kg) (8020)								
1,4-Dichlorobenzene	1.1 U	1.2 U	1.8	1.8	SWMU291-IS01-04	1/4	1.8	1.8
SEMIVOLATILES (8270) (ug/kg)								
Benzo(a)anthracene	360 U	460 U	23 J	23 J	SWMU291-IS02-00	1/4	23	23
Benzo(a)pyrene	360 U	460 U	25 J	25 J	SWMU291-IS02-00	1/4	25	25
bis(2-Ethylhexyl) phthalate	ND	ND	90 J	100 J	SWMU291-IS01-04,SWMU291-IS02-04	4/4	96.25	97.5
Chrysene	360 U	460 U	29 J	29 J	SWMU291-IS02-00	1/4	29	29
Fluoranthene	360 U	460 U	41 J	41 J	SWMU291-IS02-00	1/4	41	41
Pyrene	360 U	460 U	37 J	37 J	SWMU291-IS02-00	1/4	37	37
PESTICIDES/PCBS (ug/kg) (8080)								
4,4'-DDD	2 U	2.4 U	11	46	SWMU291-IS02-00	2/4	28.5	28.5
4,4'-DDE	2 U	2.4 U	29	40	SWMU291-IS01-00	2/4	34.5	34.5
4,4'-DDT	2 U	2.4 U	35	100	SWMU291-IS02-00	2/4	67.5	67.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	2.7	11.3	SWMU291-IS01-04	2/4	7	7
Barium	23 U	23.4 U	23.8	37.3	SWMU291-IS01-04	2/4	30.55	30.55
Chromium	ND	ND	6.4	43.3	SWMU291-IS01-04	4/4	17	9.15
Lead	ND	ND	4.7	17.6	SWMU291-IS01-00	4/4	11.83	12.5
Selenium	0.54 U	0.59 U	0.95	0.95	SWMU291-IS01-04	1/4	0.95	0.95

TABLE 2
STATISTICAL SUMMARY
SWMU 291 - SOIL
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260A)							
Acetone	71	180	SWMU291-IS01-04	200000000	40000000	2810	NE
Tetrachloroethene	1.7 J	1.7 J	SWMU291-IS01-00	110000	110000	7.4	235
VOLATILES (ug/kg) (8020)							
1,4-Dichlorobenzene	1.8	1.8	SWMU291-IS01-04	240000	240000	1240	NE
SEMIVOLATILES (8270) (ug/kg)							
Benzo(a)anthracene	23 J	23 J	SWMU291-IS02-00	7800	7800	343	878
Benzo(a)pyrene	25 J	25 J	SWMU291-IS02-00	780	780	NE	NE
bis(2-Ethylhexyl) phthalate	90 J	100 J	SWMU291-IS01-04,SWMU291-IS02-04	410000	410000	6670	32900
Chrysene	29 J	29 J	SWMU291-IS02-00	780000	780000	38150	976
Fluoranthene	41 J	41 J	SWMU291-IS02-00	82000000	16400000	276080	131000
Pyrene	37 J	37 J	SWMU291-IS02-00	61000000	12264000	286440	109000
PESTICIDES/PCBS (ug/kg) (8080)							
4,4'-DDD	11	46	SWMU291-IS02-00	24000	24000	NE	NE
4,4'-DDE	29	40	SWMU291-IS01-00	17000	17000	NE	NE
4,4'-DDT	35	100	SWMU291-IS02-00	17000	17000	NE	NE
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	2.7	11.3	SWMU291-IS01-04	3.8	3.8	26.2	65.5
Barium	23.8	37.3	SWMU291-IS01-04	140000	28000	848	NE
Chromium	6.4	43.3	SWMU291-IS01-04	10000	2000	27.2	NE
Lead	4.7	17.6	SWMU291-IS01-00	NE	400	270.06	1130
Selenium	0.95	0.95	SWMU291-IS01-04	10000	2000	12.2	3.05

NOTES:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 291 - SOIL
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260A)				
Acetone	0	0	0	0
Tetrachloroethene	0	0	0	0
VOLATILES (ug/kg) (8020)				
1,4-Dichlorobenzene	0	0	0	0
SEMIVOLATILES (8270) (ug/kg)				
Benzo(a)anthracene	0	0	0	0
Benzo(a)pyrene	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0
Chrysene	0	0	0	0
Fluoranthene	0	0	0	0
Pyrene	0	0	0	0
PESTICIDES/PCBS (ug/kg) (8080)				
4,4'-DDD	0	0	0	0
4,4'-DDE	0	0	0	0
4,4'-DDT	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	1	1	0	0
Barium	0	0	0	0
Chromium	0	0	1	0
Lead	0	0	0	0
Selenium	0	0	0	0

TABLE 3
DETECTION SUMMARY
SWMU 291 - SURFACE WATER
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU291-SW01-00
DATE SAMPLED	09-18-1997
DEPTH	0' - 2'
VOLATILES (ug/L) (8260A)	
Tetrachloroethene	8.4
VOLATILES (ug/L) (8020)	ND
SEMIVOLATILES (ug/L) (8270)	
bis(2-Ethylhexyl) phthalate	2 J
PESTICIDES/PCBS (ug/L) (8080)	ND
TOTAL METALS (mg/L) (6010/7410)	
Chromium	0.021
Lead	0.0097

Notes:
ND = Compound analyzed but not detected.

TABLE 3
DETECTION SUMMARY
SWMU 291 - SURFACE WATER
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/L) (8260A)								
Tetrachloroethene	ND	ND	8.4	8.4	SWMU291-SW01-00	1/1	8.4	8.4
VOLATILES (ug/L) (8020)	ND	ND	ND	ND		0/1	ND	ND
SEMIVOLATILES (ug/L) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	2 J	2 J	SWMU291-SW01-00	1/1	2	2
PESTICIDES/PCBS (ug/L) (8080)	ND	ND	ND	ND		0/1	ND	ND
TOTAL METALS (mg/L) (6010/7410)								
Chromium	ND	ND	0.021	0.021	SWMU291-SW01-00	1/1	0.02	0.02
Lead	ND	ND	0.0097	0.0097	SWMU291-SW01-00	1/1	0.01	0.01

Notes:
ND = Compound analyzed but not detected.

TABLE 4
STATISTICAL SUMMARY
SWMU 291 - SURFACE WATER
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Detected	Maximum Detected	Location of Maximum Detect	North Carolina Water Quality Standards (ug/L)	Camp Lejeune Refence Station Results - Webb Creek Arithmetic Average	North Carolina Water Quality Standards (ug/L) Exceedance Count	Camp Lejeune Refence Station Results - Webb Creek Arithmetic Average Exceedance Count
VOLATILES (ug/L) (8260A)							
Tetrachloroethene	8.4	8.4	SWMU291-SW01-00	0.7	0	1	1
SEMIVOLATILES (ug/L) (8270)							
bis(2-Ethylhexyl) phthalate	2 J	2 J	SWMU291-SW01-00	3	0	0	1
TOTAL METALS (mg/L) (6010/7410)							
Chromium	0.021	0.021	SWMU291-SW01-00	50	52.25	0	0
Lead	0.0097	0.0097	SWMU291-SW01-00	15	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/l = micrograms per liter
mg/l = milligrams per liter

TABLE 5
DETECTION SUMMARY
SWMU 291 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU291-SD01-00	SWMU291-SD02-00
DATE SAMPLED	09-18-1997	09-18-1997
DEPTH	0 - 6"	0 - 6"
VOLATILES (ug/kg) (8260A)		
Methylene chloride	3.9 J	6.1 U
VOLATILES (ug/kg) (8020)		
1,4-Dichlorobenzene	27	13
SEMIVOLATILES (ug/kg) (8270)		
Acenaphthene	560 U	56 J
Anthracene	560 U	46 J
Benzo(a)anthracene	49 J	160 J
Benzo(a)pyrene	58 J	87 J
Benzo(b)fluoranthene	81 J	140 J
Benzo(ghi)perylene	57 J	68 J
Benzo(k)fluoranthene	560 U	110 J
bis(2-Ethylhexyl) phthalate	210 J	120 J
Chrysene	65 J	180 J
Fluoranthene	100 J	410
Indeno(1,2,3-cd)pyrene	45 J	70 J
Phenanthrene	560 U	280 J
Pyrene	88 J	320 J
PESTICIDES/PCBS (ug/kg) (8080)		
4,4'-DDD	16	2.7
4,4'-DDE	3.1	2.1 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	4.9	1.2 U
Barium	68.3	24.4 U
Cadmium	1.2	0.61 U
Chromium	40	3.2
Lead	26.3	3
Mercury	0.33	0.04 U

TABLE 5
DETECTION SUMMARY
SWMU 291 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Methylene chloride	6.1 U	6.1 U	3.9 J	3.9 J	SWMU291-SD01-00	1/2	3.9	3.9
VOLATILES (ug/kg) (8020)								
1,4-Dichlorobenzene	ND	ND	13	27	SWMU291-SD01-00	2/2	20	20
SEMIVOLATILES (ug/kg) (8270)								
Acenaphthene	560 U	560 U	56 J	56 J	SWMU291-SD02-00	1/2	56	56
Anthracene	560 U	560 U	46 J	46 J	SWMU291-SD02-00	1/2	46	46
Benzo(a)anthracene	ND	ND	49 J	160 J	SWMU291-SD02-00	2/2	104.5	104.5
Benzo(a)pyrene	ND	ND	58 J	87 J	SWMU291-SD02-00	2/2	72.5	72.5
Benzo(b)fluoranthene	ND	ND	81 J	140 J	SWMU291-SD02-00	2/2	110.5	110.5
Benzo(ghi)perylene	ND	ND	57 J	68 J	SWMU291-SD02-00	2/2	62.5	62.5
Benzo(k)fluoranthene	560 U	560 U	110 J	110 J	SWMU291-SD02-00	1/2	110	110
bis(2-Ethylhexyl) phthalate	ND	ND	120 J	210 J	SWMU291-SD01-00	2/2	165	165
Chrysene	ND	ND	65 J	180 J	SWMU291-SD02-00	2/2	122.5	122.5
Fluoranthene	ND	ND	100 J	410	SWMU291-SD02-00	2/2	255	255
Indeno(1,2,3-cd)pyrene	ND	ND	45 J	70 J	SWMU291-SD02-00	2/2	57.5	57.5
Phenanthrene	560 U	560 U	280 J	280 J	SWMU291-SD02-00	1/2	280	280
Pyrene	ND	ND	88 J	320 J	SWMU291-SD02-00	2/2	204	204
PESTICIDES/PCBS (ug/kg) (8080)								
4,4'-DDD	ND	ND	2.7	16	SWMU291-SD01-00	2/2	9.35	9.35
4,4'-DDE	2.1 U	2.1 U	3.1	3.1	SWMU291-SD01-00	1/2	3.1	3.1
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.2 U	1.2 U	4.9	4.9	SWMU291-SD01-00	1/2	4.9	4.9
Barium	24.4 U	24.4 U	68.3	68.3	SWMU291-SD01-00	1/2	68.3	68.3
Cadmium	0.61 U	0.61 U	1.2	1.2	SWMU291-SD01-00	1/2	1.2	1.2
Chromium	ND	ND	3.2	40	SWMU291-SD01-00	2/2	21.6	21.6
Lead	ND	ND	3	26.3	SWMU291-SD01-00	2/2	14.65	14.65
Mercury	0.04 U	0.04 U	0.33	0.33	SWMU291-SD01-00	1/2	0.33	0.33

TABLE 6
STATISTICAL SUMMARY
SWMU 291 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

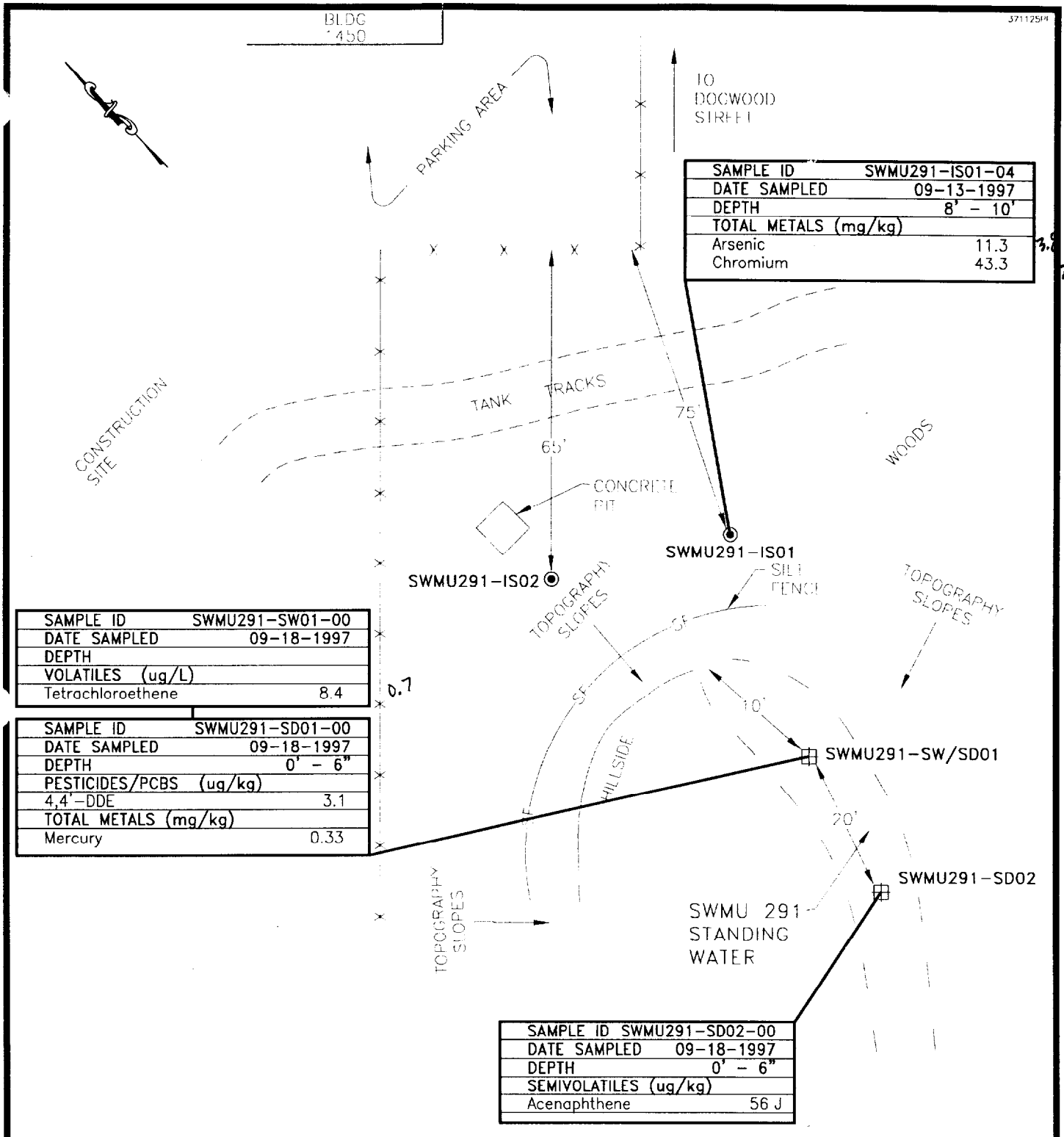
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values Exceedance Count	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values Exceedance Count
VOLATILES (ug/kg) (8260A)							
Methylene chloride	3.9 J	3.9 J	SWMU291-SD01-00	NE	NE	0	0
VOLATILES (ug/kg) (8020)							
1,4-Dichlorobenzene	13	27	SWMU291-SD01-00	NE	NE	0	0
SEMIVOLATILES (ug/kg) (8270)							
Acenaphthene	56 J	56 J	SWMU291-SD02-00	16	500	1	0
Anthracene	46 J	46 J	SWMU291-SD02-00	85.3	1100	0	0
Benzo(a)anthracene	49 J	160 J	SWMU291-SD02-00	261	1600	0	0
Benzo(a)pyrene	58 J	87 J	SWMU291-SD02-00	430	1600	0	0
Benzo(b)fluoranthene	81 J	140 J	SWMU291-SD02-00	NE	NE	0	0
Benzo(ghi)perylene	57 J	68 J	SWMU291-SD02-00	NE	NE	0	0
Benzo(k)fluoranthene	110 J	110 J	SWMU291-SD02-00	NE	NE	0	0
bis(2-Ethylhexyl) phthalate	120 J	210 J	SWMU291-SD01-00	NE	NE	0	0
Chrysene	65 J	180 J	SWMU291-SD02-00	384	2800	0	0
Fluoranthene	100 J	410	SWMU291-SD02-00	600	5100	0	0
Indeno(1,2,3-cd)pyrene	45 J	70 J	SWMU291-SD02-00	NE	NE	0	0
Phenanthrene	280 J	280 J	SWMU291-SD02-00	NE	NE	0	0
Pyrene	88 J	320 J	SWMU291-SD02-00	665	2600	0	0
PESTICIDES/PCBS (ug/kg) (8080)							
4,4'-DDD	2.7	16	SWMU291-SD01-00	NE	NE	0	0
4,4'-DDE	3.1	3.1	SWMU291-SD01-00	2.2	27	1	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 6
STATISTICAL SUMMARY
SWMU 291 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
034 DITCH, 5th BN, 10th MARINES, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values Exceedance Count	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values Exceedance Count
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	4.9	4.9	SWMU291-SD01-00	8.2	70	0	0
Barium	68.3	68.3	SWMU291-SD01-00	NE	NE	0	0
Cadmium	1.2	1.2	SWMU291-SD01-00	1.2	9.6	1	0
Chromium	3.2	40	SWMU291-SD01-00	81	370	0	0
Lead	3	26.3	SWMU291-SD01-00	46.7	218	0	0
Mercury	0.33	0.33	SWMU291-SD01-00	0.15	0.71	1	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA

N.T.S.

Baker Environmental, Inc.

LEGEND

- ◉ SOIL BORING AND SAMPLE LOCATION
- ⊞ SURFACE SOIL SAMPLE LOCATION
- ug/L – MICROGRAM/LITER
- ug/kg – MICROGRAM/KILOGRAM
- mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 291
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.25 SWMU 292 (1106/1107 Aboveground Storage Tank) and SWMU 293 (1106/1107 Oil/Water Separator)

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.25.1 SWMU Description and History

SWMU 292 is a 500-gallon aboveground storage tank (AST) that contains waste oil and antifreeze from the auto repair/hobby shop located along Michael Road. SWMU 293 is a poured concrete in-ground oil/water separator (Oil/Water) with baffles. The outlet for the Oil/Water is connected to the wastewater treatment plant. Both the AST and Oil/Water have been in operation since 1980. The Oil/Water contains oil filters, waste oil, antifreeze, and possibly solvents. During the site visit conducted by Baker in 1996, spills/stains were noted on the concrete flooring of the open-bay garage structure housing the AST at SWMU 292. Also, the Oil/Water at SWMU 293 had oil in the grit chambers, and the wash pad was stained and cracked. It is suspected that solvents used for degreasing may have been disposed through the Oil/Water.

4.25.2 Confirmatory Investigation Activities

The soil investigation for SWMUs 292 and 293 was developed to determine if waste oil and other products associated with vehicle maintenance were mishandled and contaminated the soils in the vicinity of the site. A total of four soil borings were advanced in the area of the two SWMUs. A single soil boring (SWMU292-IS01) was advanced on the east side of the garage housing SWMU 292. Three soil borings (SWMU293-IS01 through SWMU293-IS03) were advanced in the vicinity of SWMU 293: one in between the grit chambers and one on either side of the Oil/Water. The sample locations are depicted on Figure 1.

During advancement of the soil borings, split-spoon samples were collected continuously to a total depth of 12.0 feet bgs. Groundwater was encountered at a depth of 9.0 feet bgs. One surface soil sample and one subsurface soil sample were collected from each boring in accordance with the Project Plans (Baker, 1997). The surface soil samples (SWMU292-IS01-00 and SWMU293-IS01 through SWMU293-IS03) were collected from 0 to 2.0 feet bgs. The subsurface soil sample, SWMU293-IS03-02, was collected from 4.0 to 6.0 feet bgs. The subsurface soil samples, SWMU292-IS01-03, SWMU293-IS01-03, and SWMU293-IS02-03 were collected from just above the water table at a depth of 6.0 to 8.0 feet bgs. A duplicate sample, SWMU293-IS01-03D, was also collected from this interval. Duplicate sample results are presented in Appendix E. All soil samples were analyzed for VOAs (EPA Methods 8260 and 8020), SVOAs (EPA Method 8270), and RCRA metals (EPA Method 6010/7410). The analytical data from the surface and subsurface soil samples are presented in Appendix D.

Equipment rinsate blanks 371ER06B and 371ER07B were collected from a split spoon sampler and a spatula, respectively, used to collect soil samples from the SWMUs. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB10 and 371TB11 were shipped with the volatile fractions of the soil samples. The results are included in Appendix F. Two field blanks, 371FB01 and 371FB02, were also collected as described in Section 3.5 of this report. The analytical results of the field blanks are presented in Appendix F.

4.25.3 Investigation Findings

A total of eight samples were obtained at SWMUs 292 and 293 and submitted for the analyses previously mentioned. Table 1 presents the positive detection results. Table 2 presents the comparison of the positive detections to a specific set of screening criteria. The criteria include:

- USEPA Region III Industrial Risk-Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

As presented in Table 1, three VOCs were detected in the soil samples submitted for laboratory analysis under EPA Method 8260: acetone, methylene chloride, and tetrachloroethene. Acetone was detected in five out of eight soil samples with concentrations ranging from 42J to 860 µg/kg. As shown in Table 2, the detected concentrations of acetone did not exceed USEPA Region III Industrial RBCs or state criteria. Methylene chloride was detected in every soil sample with estimated concentrations ranging from 1.9J to 8.1J µg/kg. As shown in Table 2, the detected concentrations of methylene chloride did not exceed USEPA Region III Industrial RBCs or state criteria. Tetrachloroethene was detected in one out of eight samples (SWMU293-IS02-00) at 6.2 µg/kg. As shown in Table 2, the detected concentrations of tetrachloroethene did not exceed USEPA Region III Industrial RBCs or state criteria.

As presented in Table 1, three VOCs were detected in the soil samples submitted for laboratory analysis under EPA Method 8020: 1,3-dichlorobenzene, 1,4-dichlorobenzene, and toluene. 1,3-Dichlorobenzene was detected in one out of eight soil samples (SWMU293-IS02-00) at a concentration of 4.1 µg/kg. 1,4-Dichlorobenzene was detected in one out of eight soil samples (SWMU293-IS01-00) at a concentration of 3.9 µg/kg. Toluene was detected in one out of eight soil samples (SWMU293-IS01-00) at a concentration of 1.1 µg/kg. As shown in Table 2, the detected concentrations of 1,3-dichlorobenzene, 1,4-dichlorobenzene, and toluene did not exceed USEPA Region III Industrial RBCs or state criteria.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in every soil sample with estimated concentrations ranging from 39J and 160J µg/kg. As shown in Table 2, the detected concentrations of bis(2-ethylhexyl)phthalate did not exceed the USEPA Region III Industrial RBC or state criteria.

Five of the eight RCRA metals (barium, chromium, lead, mercury, and selenium) were detected in the surface and subsurface soil samples collected at SWMUs 292 and 293. As shown in Table 1, lead was detected in every sample with concentrations ranging from 2.2 to 295 mg/kg. The maximum detected concentration of lead was found in the surface soil sample, SWMU293-IS02-00. As shown in Table 2, this concentration exceeded the Method I, Category S-3:G-1 Target Concentration for lead. Also, mercury was detected in every surface soil sample with concentrations ranging from 0.04 to 0.071 mg/kg. As shown in Table 2, all four concentrations exceeded the Method I, Category S-3:G-1 Target Concentration for mercury. Barium, chromium, and selenium were detected at maximum concentrations that did not exceed USEPA Region III Industrial RBCs or state criteria.

4.25.4 Recommendations

Based on the analytical results, no further action is recommended for SWMU 292. The mercury detection is not considered to be site-related. Additional investigation activities are recommended for SWMU 293 due to the lead contamination identified at boring SWMU293-IS02. One additional soil boring is recommended at this SWMU to confirm the presence of the lead contamination. Surface and subsurface soil samples would be collected from this boring and analyzed for lead.

TABLE 1
DETECTION SUMMARY
SWMU 292~~/293~~ and SWMU 293
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1106/1107 - O/W, MOTOR T - AUTO HOBBY SHOP MWR
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU292-IS01-00	SWMU292-IS01-03	SWMU293-IS01-00	SWMU293-IS01-03	SWMU293-IS02-00	SWMU293-IS02-03
DATE SAMPLED	09-15-1997	09-15-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	6' - 8'	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8260A)						
Acetone	860	22 U	42 J	160	22 U	47
Methylene chloride	6.1	2 J	8.1 J	1.9 J	3.5 J	2.2 J
Tetrachloroethene	5.8 U	5.5 U	5.3 U	5.3 U	6.2	5.5 U
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	1.2 U	1.1 U	1.1 U	1.1 U	4.1	1.1 U
1,4-Dichlorobenzene	1.2 U	1.1 U	3.9	1.1 U	1.1 U	1.1 U
Toluene	1.2 U	1.1 U	1.1	1.1 U	1.1 U	1.1 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	120 J	120 J	160 J	55 J	80 J	39 J
TOTAL METALS (mg/kg) (6010/7410)						
Barium	23.3 U	22 U	21.3 U	21.1 U	41.5	21.9 U
Chromium	6.2	4.1	12	4.5	10.6	3.2
Lead	4	2.2	66	6.6	295	2.7
Mercury	0.071	0.036 U	0.043	0.035 U	0.045	0.036 U
Selenium	0.64	0.55 U	0.53 U	0.53 U	0.56 U	0.55 U

TABLE 1
DETECTION SUMMARY
SWMU 292/293
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1106/1107 - O/W, MOTOR T - AUTO HOBBY SHOP MWR
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU293-IS03-00	SWMU293-IS03-02
DATE SAMPLED	09-14-1997	09-14-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)		
Acetone	23 U	140
Methylene chloride	1.9 J	2 J
Tetrachloroethene	5.8 U	5.7 U
VOLATILES (ug/kg) (8020)		
1,3-Dichlorobenzene	1.2 U	1.1 U
1,4-Dichlorobenzene	1.2 U	1.1 U
Toluene	1.2 U	1.1 U
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	75 J	100 J
TOTAL METALS (mg/kg) (6010/7410)		
Barium	23.1 U	23 U
Chromium	9.1	9.4
Lead	26.2	20.8
Mercury	0.04	0.038 U
Selenium	0.58 U	0.57 U

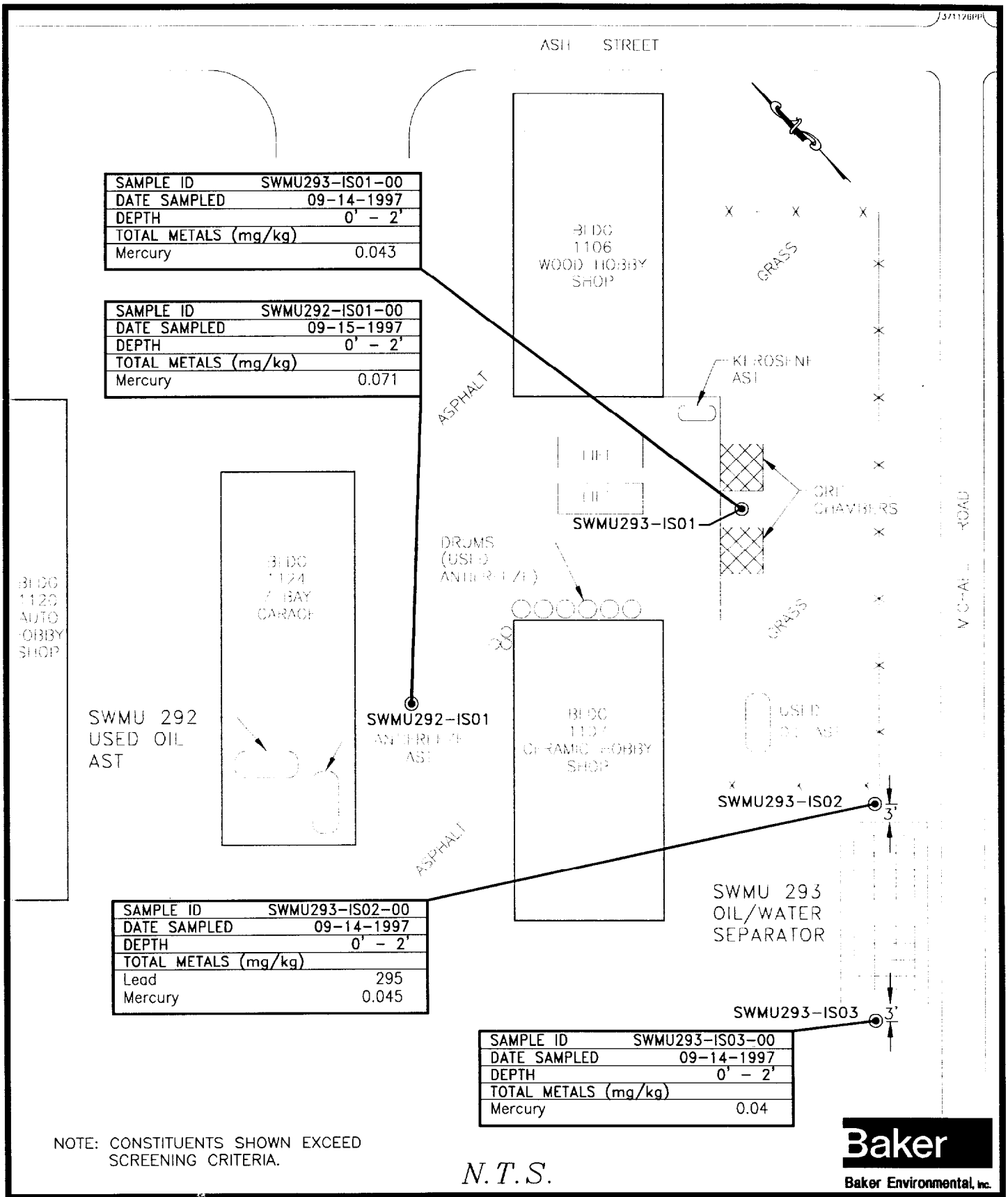
TABLE 1
DETECTION SUMMARY
SWMU 292/293
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1106/1107 - O/W, MOTOR T - AUTO HOBBY SHOP MWR
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	22 U	23 U	42 J	860	SWMU292-IS01-00	5/8	249.8	140
Methylene chloride	ND	ND	1.9 J	8.1 J	SWMU293-IS01-00	8/8	3.46	2.1
Tetrachloroethene	5.3 U	5.8 U	6.2	6.2	SWMU293-IS02-00	1/8	6.2	6.2
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1.1 U	1.2 U	4.1	4.1	SWMU293-IS02-00	1/8	4.1	4.1
1,4-Dichlorobenzene	1.1 U	1.2 U	3.9	3.9	SWMU293-IS01-00	1/8	3.9	3.9
Toluene	1.1 U	1.2 U	1.1	1.1	SWMU293-IS01-00	1/8	1.1	1.1
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	39 J	160 J	SWMU293-IS01-00	8/8	93.63	90
TOTAL METALS (mg/kg) (6010/7410)								
Barium	21.1 U	23.3 U	41.5	41.5	SWMU293-IS02-00	1/8	41.5	41.5
Chromium	ND	ND	3.2	12	SWMU293-IS01-00	8/8	7.39	7.65
Lead	ND	ND	2.2	295	SWMU293-IS02-00	8/8	52.94	13.7
Mercury	0.035 U	0.038 U	0.04	0.071	SWMU292-IS01-00	4/8	0.05	0.04
Selenium	0.53 U	0.58 U	0.64	0.64	SWMU292-IS01-00	1/8	0.64	0.64

TABLE 2
STATISTICAL SUMMARY
SWMU 292~~/293~~ and SWMU 293
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1106/1107 - O/W, MOTOR T - AUTO HOBBY SHOP MWR
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
Acetone	42 J	860	SWMU292-IS01-00	200000000	40000000	2810	0	0	0
Methylene chloride	1.9 J	8.1 J	SWMU293-IS01-00	760000	760000	22.1	0	0	0
Tetrachloroethene	6.2	6.2	SWMU293-IS02-00	110000	110000	7.4	0	0	0
VOLATILES (ug/kg) (8020)									
1,3-Dichlorobenzene	4.1	4.1	SWMU293-IS02-00	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	3.9	3.9	SWMU293-IS01-00	240000	240000	1240	0	0	0
Toluene	1.1	1.1	SWMU293-IS01-00	410000000	82000000	7275	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	39 J	160 J	SWMU293-IS01-00	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Barium	41.5	41.5	SWMU293-IS02-00	140000	28000	848	0	0	0
Chromium	3.2	12	SWMU293-IS01-00	10000	2000	27.2	0	0	0
Lead	2.2	295	SWMU293-IS02-00	NE	400	270.06	0	0	1
Mercury	0.04	0.071	SWMU292-IS01-00	610	122	0.0154	0	0	4
Selenium	0.64	0.64	SWMU292-IS01-00	10000	2000	12.2	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms


ASH STREET
SAMPLE ID SWMU293-IS01-00
DATE SAMPLED 09-14-1997
DEPTH 0' - 2'
TOTAL METALS (mg/kg)
Mercury 0.043
SAMPLE ID SWMU292-IS01-00
DATE SAMPLED 09-15-1997
DEPTH 0' - 2'
TOTAL METALS (mg/kg)
Mercury 0.071
BLDG 1106 WOOD HOBBY SHOP
GRASS
ASPHALT
KEROSENE AST
OIL
OIL
ORF CHAMBERS
SWMU293-IS01
DRUMS (USED ANTIFREEZE)
BLDG 1124 2 BAY GARAGE
BLDG 1120 AUTO HOBBY SHOP
SWMU 292 USED OIL AST
SWMU292-IS01
ANTIFREEZE AST
BLDG 1107 CERAMIC HOBBY SHOP
USED OIL AST
SWMU293-IS02
3'
ASPHALT
SWMU 293 OIL/WATER SEPARATOR
SAMPLE ID SWMU293-IS02-00
DATE SAMPLED 09-14-1997
DEPTH 0' - 2'
TOTAL METALS (mg/kg)
Lead 295
Mercury 0.045
SWMU293-IS03
3'
SAMPLE ID SWMU293-IS03-00
DATE SAMPLED 09-14-1997
DEPTH 0' - 2'
TOTAL METALS (mg/kg)
Mercury 0.04
NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.
N.T.S.
Baker
Baker Environmental, Inc.
LEGEND
SOIL BORING AND SAMPLE LOCATION
mg/kg – MILLIGRAM/KILOGRAM
FIGURE 1
SWMU INVESTIGATION PLAN
SWMUs 292 AND 293
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.26 SWMU 294 -1203 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.26.1 SWMU Description and History

SWMU 294 is a concrete oil/water separator and grit chamber located in the Hadnot Point industrial area, south of Hammond Road between Birch and Cedar Streets. The primary function of the SWMU is to collect water, soap, oil, grease and dirt from the vehicle wash rack located between Buildings 1203 and 1204. The liquids are channeled to a collection basin and then transported to the grit chamber via underground piping. After passing over a series of baffles, the liquids are transported to the oil/water separator and segregated (Figure 1). The vehicle wash area is covered with concrete, however the area surrounding the SWMU is covered with grass.

4.26.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 294 was developed to determine if the operations pertaining to the wash area and the oil/water separator have impacted surface and subsurface soils surrounding the SWMU.

A total of six soil borings, SWMU294-IS01 through SWMU294-IS06, were advanced on September 12, 1997 in the vicinity of the SWMU. As depicted on Figure 1, a soil boring was advanced on three of the four sides of the grit chamber, one boring was positioned between the grit chamber and the oil/water separator, and borings were advanced on two sides of the oil/water separator. The borings were strategically positioned to determine if contamination resides in the soils surrounding the SWMU. Two samples were collected from each boring. The samples were collected from ground surface to 2.0 feet bgs and from just above the water table at a depth of 6.0 to 8.0 feet bgs. Groundwater was encountered at 9.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are included in Appendix D. Duplicate samples were collected from soil borings SWMU294-IS01 (subsurface sample) and SWMU294-IS04 (surface sample) and the results are presented in Appendix E. Equipment rinsate blanks 371ER04B and 371ER08B were collected from a stainless steel spatula and a stainless steel sampling spoon used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB06, 371TB07, 371TB08, 371TB09, 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.26.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1, and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)

- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the previously listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs.

Three VOCs were detected in the samples from SWMU 294. 1,3-Dichlorobenzene, 1,4-dichlorobenzene and xylene were detected in samples SWMU294-IS03-03, SWMU294-IS05-00 and SWMU294-IS05-03 at concentrations which did not exceed comparison criteria.

No SVOCs were detected in excess of the comparison criteria, however several compounds were detected at relatively low levels in samples SWMU294-IS02-00, SWMU294-IS04-00 and SWMU294-IS06-00. The compounds detected include: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, bis (2-ethylhexyl)phthalate, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene and pyrene.

The only contaminant that was detected in the soil samples at concentrations exceeding any of the comparison criteria was mercury. It was detected in the surface soil samples collected from each of the six borings in excess of the North Carolina, Category S-3:G-1 Target Concentrations. The concentrations of mercury detected in the samples were relatively low (less than 1 mg/kg).

4.26.4 Recommendations

No further action is recommended to be taken at this SWMU. The only contaminant which exceeded any of the comparison criteria was mercury and the concentrations detected in the soils were less than 1 mg/kg. Subsurface samples did not contain detectable levels of mercury therefore indicating that the contamination only resides in the surface soil at the SWMU.

Expand on justification.

TABLE 1
DETECTION SUMMARY
SWMU 294
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1203 - O/W, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU294-IS01-00	SWMU294-IS01-03	SWMU294-IS02-00	SWMU294-IS02-03	SWMU294-IS03-00	SWMU294-IS03-03
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	6' - 8'	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	1.2 U	1.1 U	1.2 U	1.1 U	1 U	1.2 U
1,4-Dichlorobenzene	1.2 U	1.1 U	1.2 U	1.1 U	1 U	1.2 U
Xylenes (total)	1.2 U	1.1 U	1.2 U	1.1 U	1 U	2.1
SEMIVOLATILES (ug/kg) (8270B)						
Benzo(a)anthracene	380 U	1900 U	380 U	380 U	350 U	380 U
Benzo(a)pyrene	380 U	1900 U	380 U	380 U	350 U	380 U
Benzo(b)fluoranthene	380 U	1900 U	380 U	380 U	350 U	380 U
Benzo(ghi)perylene	380 U	1900 U	380 U	380 U	350 U	380 U
Benzo(k)fluoranthene	380 U	1900 U	380 U	380 U	350 U	380 U
bis(2-Ethylhexyl) phthalate	380 U	1900 U	250 J	380 U	350 U	380 U
Chrysene	380 U	1900 U	380 U	380 U	350 U	380 U
Fluoranthene	380 U	1900 U	380 U	380 U	350 U	380 U
Indeno(1,2,3-cd)pyrene	380 U	1900 U	380 U	380 U	350 U	380 U
Phenanthrene	380 U	1900 U	380 U	380 U	350 U	380 U
Pyrene	380 U	1900 U	380 U	380 U	350 U	380 U
TOTAL METALS (mg/kg) (6010/7410)						
Barium	23.1 U	22.7 U	25.7	22.7 U	21 U	23.3 U
Cadmium	0.58 U	0.57 U	0.58 U	0.57 U	0.52 U	0.58 U
Chromium	5.4	4.4	10.5	4.3	5.4	5
Lead	12.8	2.6	36.1	2.4	33.7	3.2
Mercury	0.059	0.037 U	0.16	0.038 U	0.036	0.038 U

TABLE 1
DETECTION SUMMARY
SWMU 294
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1203 - O/W, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU294-IS04-00	SWMU294-IS04-03	SWMU294-IS05-00	SWMU294-IS05-03	SWMU294-IS06-00	SWMU294-IS06-03
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	6' - 8'	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	1 U	1.1 U	1.1 U	26	1.1 U	1.1 U
1,4-Dichlorobenzene	1 U	1.1 U	1.5	1.1 U	1.1 U	1.1 U
Xylenes (total)	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
SEMIVOLATILES (ug/kg) (8270B)						
Benzo(a)anthracene	340 U	360 U	350 U	1100 U	350 U	350 U
Benzo(a)pyrene	340 U	360 U	350 U	1100 U	350 U	350 U
Benzo(b)fluoranthene	340 U	360 U	350 U	1100 U	350 U	350 U
Benzo(ghi)perylene	340 U	360 U	350 U	1100 U	350 U	350 U
Benzo(k)fluoranthene	340 U	360 U	350 U	1100 U	350 U	350 U
bis(2-Ethylhexyl) phthalate	340 U	360 U	350 U	1100 U	350 U	350 U
Chrysene	340 U	360 U	350 U	1100 U	350 U	350 U
Fluoranthene	46 J	360 U	350 U	1100 U	350 U	350 U
Indeno(1,2,3-cd)pyrene	340 U	360 U	350 U	1100 U	350 U	350 U
Phenanthrene	340 U	360 U	350 U	1100 U	350 U	350 U
Pyrene	340 U	360 U	350 U	1100 U	350 U	350 U
TOTAL METALS (mg/kg) (6010/7410)						
Barium	22.3	21.8 U	21.5 U	22.5 U	21.1 U	21.5 U
Cadmium	0.53	0.55 U	0.54 U	0.56 U	0.53 U	0.54 U
Chromium	11.3	4.1	6.5	5.7	7.4	5.8
Lead	89.9	2.3	33.3	4.1	8.6	3.4
Mercury	0.068	0.036 U	0.045	0.037 U	0.037	0.035 U

TABLE 1
DETECTION SUMMARY
SWMU 294
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1203 - O/W, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU294-IS06-00
DATE SAMPLED	09-17-1997
DEPTH	0' - 2'
VOLATILES (ug/kg) (8020)	
1,3-Dichlorobenzene	1.1 U
1,4-Dichlorobenzene	1.1 U
Xylenes (total)	1.1 U
SEMIVOLATILES (ug/kg) (8270B)	
Benzo(a)anthracene	72 J
Benzo(a)pyrene	71 J
Benzo(b)fluoranthene	93 J
Benzo(ghi)perylene	51 J
Benzo(k)fluoranthene	68 J
bis(2-Ethylhexyl) phthalate	120 J
Chrysene	94 J
Fluoranthene	180 J
Indeno(1,2,3-cd)pyrene	49 J
Phenanthrene	68 J
Pyrene	140 J
TOTAL METALS (mg/kg) (6010/7410)	
Barium	22.4 U
Cadmium	0.56 U
Chromium	9.6
Lead	41.4
Mercury	0.21

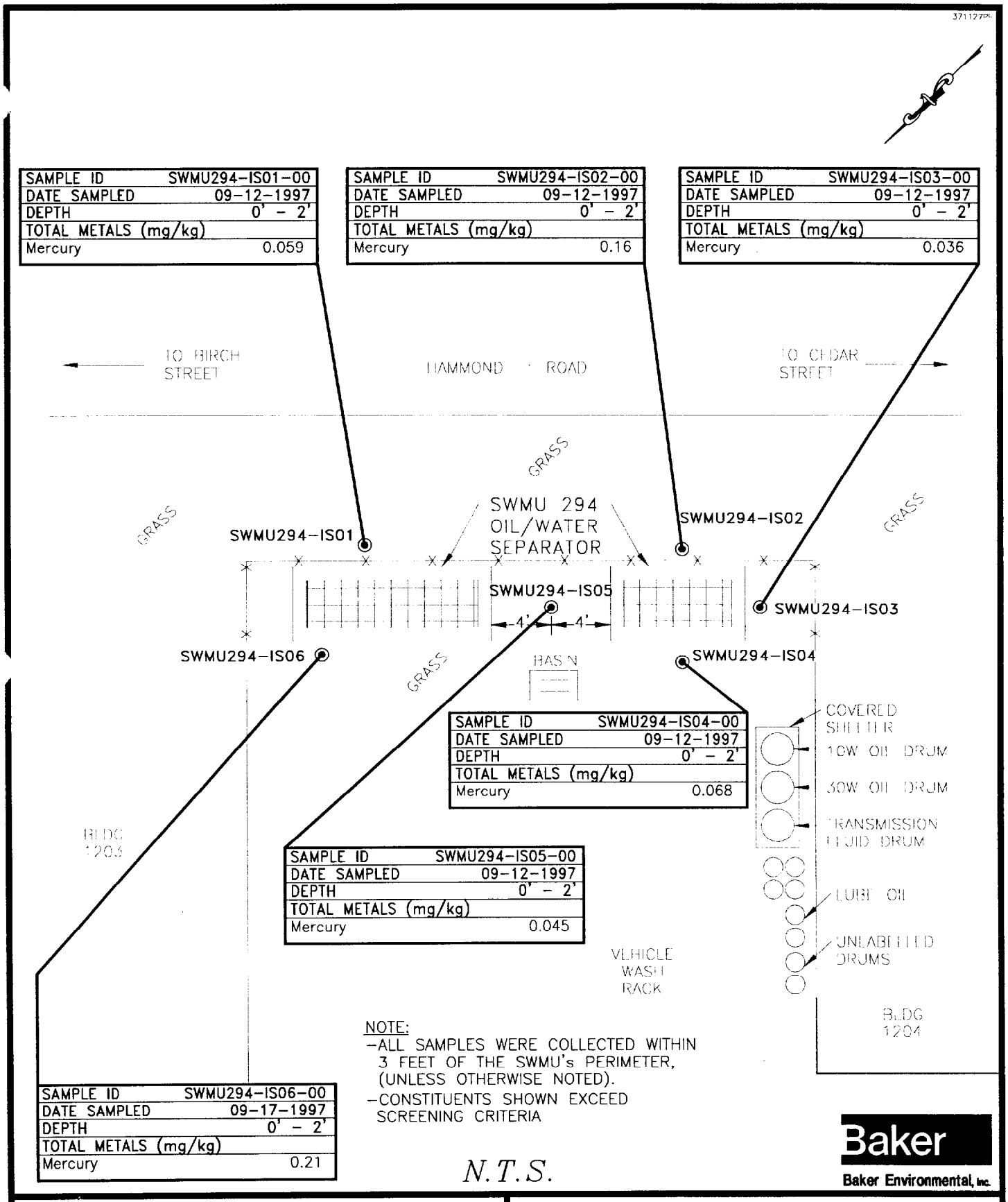
TABLE 1
DETECTION SUMMARY
SWMU 294
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1203 - O/W, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1 U	1.2 U	26	26	SWMU294-IS05-03	1/13	26	26
1,4-Dichlorobenzene	1 U	1.2 U	1.5	1.5	SWMU294-IS05-00	1/13	1.5	1.5
Xylenes (total)	1 U	1.2 U	2.1	2.1	SWMU294-IS03-03	1/13	2.1	2.1
SEMIVOLATILES (ug/kg) (8270B)								
Benzo(a)anthracene	340 U	1900 U	72 J	72 J	SWMU294-IS06-00	1/13	72	72
Benzo(a)pyrene	340 U	1900 U	71 J	71 J	SWMU294-IS06-00	1/13	71	71
Benzo(b)fluoranthene	340 U	1900 U	93 J	93 J	SWMU294-IS06-00	1/13	93	93
Benzo(ghi)perylene	340 U	1900 U	51 J	51 J	SWMU294-IS06-00	1/13	51	51
Benzo(k)fluoranthene	340 U	1900 U	68 J	68 J	SWMU294-IS06-00	1/13	68	68
bis(2-Ethylhexyl) phthalate	340 U	1900 U	120 J	250 J	SWMU294-IS02-00	2/13	185	185
Chrysene	340 U	1900 U	94 J	94 J	SWMU294-IS06-00	1/13	94	94
Fluoranthene	350 U	1900 U	46 J	180 J	SWMU294-IS06-00	2/13	113	113
Indeno(1,2,3-cd)pyrene	340 U	1900 U	49 J	49 J	SWMU294-IS06-00	1/13	49	49
Phenanthrene	340 U	1900 U	68 J	68 J	SWMU294-IS06-00	1/13	68	68
Pyrene	340 U	1900 U	140 J	140 J	SWMU294-IS06-00	1/13	140	140
TOTAL METALS (mg/kg) (6010/7410)								
Barium	21 U	23.3 U	22.3	25.7	SWMU294-IS02-00	2/13	24	24
Cadmium	0.52 U	0.58 U	0.53	0.53	SWMU294-IS04-00	1/13	0.53	0.53
Chromium	ND	ND	4.1	11.3	SWMU294-IS04-00	13/13	6.57	5.7
Lead	ND	ND	2.3	89.9	SWMU294-IS04-00	13/13	21.06	8.6
Mercury	0.035 U	0.038 U	0.036	0.21	SWMU294-IS06-00	7/13	0.09	0.06

TABLE 2
STATISTICAL SUMMARY
SWMU 294
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1203 - O/W, BASE MAINTENANCE
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,3-Dichlorobenzene	26	26	SWMU294-IS05-03	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	1.5	1.5	SWMU294-IS05-00	240000	240000	1240	0	0	0
Xylenes (total)	2.1	2.1	SWMU294-IS03-03	1000000000	200000000	4958	0	0	0
SEMIVOLATILES (ug/kg) (8270B)									
Benzo(a)anthracene	72 J	72 J	SWMU294-IS06-00	7800	7800	343	0	0	0
Benzo(a)pyrene	71 J	71 J	SWMU294-IS06-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	93 J	93 J	SWMU294-IS06-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	51 J	51 J	SWMU294-IS06-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	68 J	68 J	SWMU294-IS06-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	120 J	250 J	SWMU294-IS02-00	410000	410000	6670	0	0	0
Chrysene	94 J	94 J	SWMU294-IS06-00	780000	780000	38150	0	0	0
Fluoranthene	46 J	180 J	SWMU294-IS06-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	49 J	49 J	SWMU294-IS06-00	7800	7800	NE	0	0	0
Phenanthrene	68 J	68 J	SWMU294-IS06-00	NE	NE	59640	0	0	0
Pyrene	140 J	140 J	SWMU294-IS06-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Barium	22.3	25.7	SWMU294-IS02-00	140000	28000	848	0	0	0
Cadmium	0.53	0.53	SWMU294-IS04-00	1000	200	2.72	0	0	0
Chromium	4.1	11.3	SWMU294-IS04-00	10000	2000	27.2	0	0	0
Lead	2.3	89.9	SWMU294-IS04-00	NE	400	270.06	0	0	0
Mercury	0.036	0.21	SWMU294-IS06-00	610	122	0.0154	0	0	7

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 294
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.27 SWMU 295 - 1601 Aboveground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.27.1 SWMU Description and History

SWMU 295 was identified in the RFA Report (EnSafe, 1996) as an aboveground storage tank (AST). Groundwater in the vicinity of SWMU295 is known to be contaminated with trichloroethene. Reference to doc. of site? Is GW? Prev detections @ MW 28 GW09-1?

4.27.2 Confirmatory Investigation Activities

The soil investigation at SWMU 295 was developed to determine the condition of the surface and subsurface soils in the area of the AST.

A total of three soil borings, SWMU295-IS01 through SWMU295-IS03, were installed on September 12, 1997. Figure 1 presents the locations of the soil borings. One surface soil sample was collected from each of the soil borings and submitted for analysis. Surface soil samples were collected from the ground surface to a depth of 2.0 feet bgs and submitted for analysis. A duplicate surface soil sample was also collected from soil boring SWMU295-IS01. One subsurface soil sample was collected from each of the three soil borings and submitted for analysis. The subsurface soil samples were collected from just above the water table at depths ranging from 8.0 to 10.0 feet bgs. Groundwater was encountered at a depth of 12.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. The results for the field duplicate sample are presented in Appendix E. Equipment rinsate blank 371ER05A, associated with September 12th sample collection, was collected from a stainless steel spatula used at this SWMU. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB10 and 371TB11 were shipped with the VOA fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.27.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Six VOCs were detected in the sample set but at levels below the screening criteria.

The only SVOC which exceeded comparison criteria was naphthalene (SWMU295-IS03-02; 940 µg/kg). This compound exceeded the North Carolina Category S-3:G-1 Target Concentration of 584 µg/kg. This compound were not detected in the rinsate blank for the day's sampling.

No metals were detected above comparison criteria.

Soil boring SWMU295-IS03, located in the south of the AST, exhibited an organic constituent in exceedence of one comparison criteria. Refer to Figure 1 for the location of boring SWMU295-IS03.

4.27.4 Recommendations

Based on the analytical data, an additional investigation is recommended at SWMU 319. This investigation would consist of soil borings to the north, east and west of soil boring SWMU295-IS03 (farther out than the Phase I soil borings) to confirm and define the contamination. A minimum of two temporary groundwater monitoring wells would be installed. These monitoring wells would be installed north and west of boring SWMU295-IS03. Additionally, existing monitoring well 78GW09-1 (located east of boring location SWMU295-IS03) will also be sampled during the additional investigation. Soil and groundwater samples collected during the investigation would be analyzed for SVOCs.

TABLE 1
DETECTION SUMMARY
SWMU 295
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1601 - AST, 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU295-IS01-00	SWMU295-IS01-05	SWMU295-IS02-00	SWMU295-IS02-05	SWMU295-IS03-00	SWMU295-IS03-05
DATE SAMPLED	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997	09-12-1997
DEPTH	0' - 2'	10' - 12'	0' - 2'	10' - 12'	0' - 2'	10' - 12'
VOLATILES (ug/kg) (8020)						
1,2-Dichlorobenzene	1.1 U	1.2 U	1.1 U	1.3 U	1.1 U	300
1,3-Dichlorobenzene	1.1 U	1.2 U	1.1 U	1.3 U	1.1 U	630
1,4-Dichlorobenzene	1.1 U	3.6	1.1 U	1.3 U	1.1 U	620
Chlorobenzene	1.1 U	1.2 U	1.1 U	1.3 U	1.1 U	68
Ethylbenzene	1.1 U	1.2 U	1.1 U	1.3 U	1.1 U	29
Xylenes (total)	1.1 U	1.2 U	1.1 U	1.3 U	1.1 U	480
SEMIVOLATILES (ug/kg) (8270B)						
2-Methylnaphthalene	360 U	410 U	360 U	410 U	370 U	2200
Acenaphthylene	360 U	410 U	360 U	410 U	370 U	150 J
Anthracene	360 U	410 U	360 U	410 U	370 U	59 J
bis(2-Ethylhexyl) phthalate	110 J	68 J	82 J	160 J	57 J	1300 J
Butyl benzyl phthalate	64 J	410 U	360 U	410 U	370 U	380 U
Di-n-butyl phthalate	360 U	410 U	360 U	410 U	370 U	86 J
Fluoranthene	45 J	410 U	360 U	410 U	370 U	380 U
Fluorene	360 U	410 U	360 U	410 U	370 U	140 J
Isophorone	360 U	410 U	360 U	410 U	370 U	60 J
Naphthalene	360 U	410 U	360 U	410 U	370 U	940
N-Nitrosodiphenylamine	360 U	410 U	360 U	410 U	370 U	380
Phenanthrene	360 U	410 U	360 U	410 U	370 U	340 J
Pyrene	360 U	410 U	360 U	410 U	370 U	93 J
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.2 U	1.1 U	1.7	1.1 U	1.7
Chromium	3.3	2.6	9.3	6	4.9	8.8
Lead	7.9	3.1	23.2	5.1	3.1	6.3

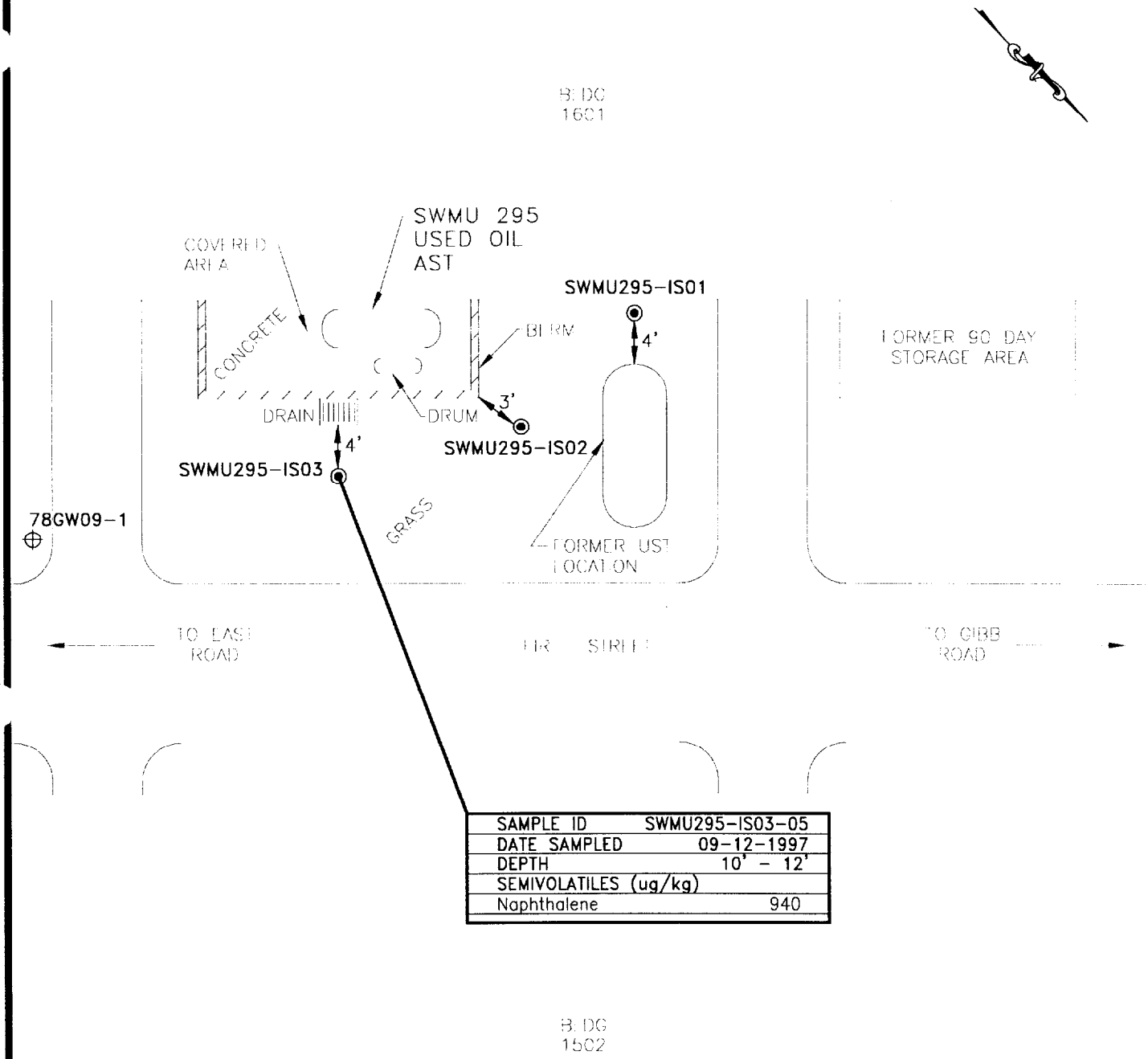
TABLE 1
DETECTION SUMMARY
SWMU 295
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1601 - AST, 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	1.1 U	1.3 U	300	300	SWMU295-IS03-05	1/6	300	300
1,3-Dichlorobenzene	1.1 U	1.3 U	630	630	SWMU295-IS03-05	1/6	630	630
1,4-Dichlorobenzene	1.1 U	1.3 U	3.6	620	SWMU295-IS03-05	2/6	311.8	311.8
Chlorobenzene	1.1 U	1.3 U	68	68	SWMU295-IS03-05	1/6	68	68
Ethylbenzene	1.1 U	1.3 U	29	29	SWMU295-IS03-05	1/6	29	29
Xylenes (total)	1.1 U	1.3 U	480	480	SWMU295-IS03-05	1/6	480	480
SEMIVOLATILES (ug/kg) (8270B)								
2-Methylnaphthalene	360 U	410 U	2200	2200	SWMU295-IS03-05	1/6	2200	2200
Acenaphthylene	360 U	410 U	150 J	150 J	SWMU295-IS03-05	1/6	150	150
Anthracene	360 U	410 U	59 J	59 J	SWMU295-IS03-05	1/6	59	59
bis(2-Ethylhexyl) phthalate	ND	ND	57 J	1300 J	SWMU295-IS03-05	6/6	296.17	96
Butyl benzyl phthalate	360 U	410 U	64 J	64 J	SWMU295-IS01-00	1/6	64	64
Di-n-butyl phthalate	360 U	410 U	86 J	86 J	SWMU295-IS03-05	1/6	86	86
Fluoranthene	360 U	410 U	45 J	45 J	SWMU295-IS01-00	1/6	45	45
Fluorene	360 U	410 U	140 J	140 J	SWMU295-IS03-05	1/6	140	140
Isophorone	360 U	410 U	60 J	60 J	SWMU295-IS03-05	1/6	60	60
Naphthalene	360 U	410 U	940	940	SWMU295-IS03-05	1/6	940	940
N-Nitrosodiphenylamine	360 U	410 U	380	380	SWMU295-IS03-05	1/6	380	380
Phenanthrene	360 U	410 U	340 J	340 J	SWMU295-IS03-05	1/6	340	340
Pyrene	360 U	410 U	93 J	93 J	SWMU295-IS03-05	1/6	93	93
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.7	1.7	SWMU295-IS02-05,SWMU295-IS03-05	2/6	1.7	1.7
Chromium	ND	ND	2.6	9.3	SWMU295-IS02-00	6/6	5.82	5.45
Lead	ND	ND	3.1	23.2	SWMU295-IS02-00	6/6	8.12	5.7

TABLE 2
STATISTICAL SUMMARY
SWMU 295
SWMU CONFIRMATORY SAMPLING (CTO-0371)
1601 - AST, 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,2-Dichlorobenzene	300	300	SWMU295-IS03-05	180000000	36000000	7270	0	0	0
1,3-Dichlorobenzene	630	630	SWMU295-IS03-05	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	3.6	620	SWMU295-IS03-05	240000	240000	1240	0	0	0
Chlorobenzene	68	68	SWMU295-IS03-05	41000000	8200000	438	0	0	0
Ethylbenzene	29	29	SWMU295-IS03-05	200000000	40000000	241	0	0	0
Xylenes (total)	480	480	SWMU295-IS03-05	1000000000	200000000	4958	0	0	0
SEMIVOLATILES (ug/kg) (8270B)									
2-Methylnaphthalene	2200	2200	SWMU295-IS03-05	82000000	NE	NE	0	0	0
Acenaphthylene	150 J	150 J	SWMU295-IS03-05	NE	NE	11360	0	0	0
Anthracene	59 J	59 J	SWMU295-IS03-05	610000000	122000000	995000	0	0	0
bis(2-Ethylhexyl) phthalate	57 J	1300 J	SWMU295-IS03-05	410000	410000	6670	0	0	0
Butyl benzyl phthalate	64 J	64 J	SWMU295-IS01-00	410000000	82000000	27800	0	0	0
Di-n-butyl phthalate	86 J	86 J	SWMU295-IS03-05	NE	NE	NE	0	0	0
Fluoranthene	45 J	45 J	SWMU295-IS01-00	82000000	16400000	276080	0	0	0
Fluorene	140 J	140 J	SWMU295-IS03-05	82000000	16400000	44297	0	0	0
Isophorone	60 J	60 J	SWMU295-IS03-05	6000000	6000000	NE	0	0	0
Naphthalene	940	940	SWMU295-IS03-05	200000000	16400000	584	0	0	1
N-Nitrosodiphenylamine	380	380	SWMU295-IS03-05	1200000	1200000	NE	0	0	0
Phenanthrene	340 J	340 J	SWMU295-IS03-05	NE	NE	59640	0	0	0
Pyrene	93 J	93 J	SWMU295-IS03-05	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.7	1.7	SWMU295-IS02-05,SWMU295-IS03-05	3.8	3.8	26.2	0	0	0
Chromium	2.6	9.3	SWMU295-IS02-00	10000	2000	27.2	0	0	0
Lead	3.1	23.2	SWMU295-IS02-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU295-IS03-05
DATE SAMPLED	09-12-1997
DEPTH	10' - 12'
SEMIVOLATILES (ug/kg)	
Naphthalene	940

NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA

N.T.S.

Baker Environmental, Inc.

LEGEND

- ◉ SOIL BORING AND SAMPLE LOCATION
- ⊕ EXISTING GROUNDWATER MONITORING WELL LOCATION

ug/kg – MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 295
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.28 SWMU 299 - AS114 Aboveground Storage Tank MCAS Auto Hobby Shop

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.28.1 SWMU Description and History

SWMU 299 consists of an AST that stores used oil generated from the Hobby Shop. The steel tank was installed in 1992 and is still used. At the time of the investigation, significant staining was noted on the outside of the tank, apparently resultant from overfills/spills. The SWMU is located in the MCAS area, west of Bancroft Road, in a fenced-in, asphalt-paved area adjacent to Buildings AS-114 and AS-116. Surface water from the paved area in the vicinity of the AST is runs off to a narrow grass area between the fence line and the AST. A site plan is presented on Figure 1.

4.28.2 Confirmatory Investigation Activities

The soil investigation for SWMU 299 was developed to determine if overfills and spills in the vicinity of the AST have impacted surface and subsurface soils.

Four borings, SWMU299-IS01, SWMU299-IS02, SWMU299-IS03, and SWMU299-IS04 were advanced at the SWMU on September 14, 1997, at the locations depicted on Figure 1. One sample from each boring was collected from the ground surface to 2.0 feet bgs (SWMU299-IS01-00, SWMU299-IS02-00, and SWMU299-IS03-00, and SWMU299-IS04-00). From boring SWMU299-IS04, one subsurface soil sample was collected from just above the water table at a depth of 2.0 to 4.0 feet bgs (SWMU299-IS04-01). Groundwater was encountered at a depth of approximately 4.0 feet bgs during drilling at this boring. However, the shallow depth (approximately 2.0 feet bgs) at which groundwater was encountered in the remaining borings precluded collection of subsurface soil samples at these borings. These borings, which could not be accessed by a drill rig due to the presence of the AST, wash pad, and fence were advanced via a tripod-mounted split-spoon sampling apparatus.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8020), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. One duplicate sample (SWMU306-IS02-02D) was collected at the SWMU. Duplicate sample results are included in Appendix E. Equipment rinsate blank 371ER06B was collected from a split-spoon sampler which was used to collect soil samples from the SWMU. Results for the rinsate blank are included in Appendix F. Trip blanks 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.28.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminants detected at concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Five VOCs (which are petroleum-related) were detected in the samples collected during the Confirmatory Sampling Investigation. Twenty-two SVOCs, primarily PAHs, were detected. The presence of the vast majority of the detected organic compounds is site-related. Six metals (barium, cadmium, chromium, lead, mercury, and silver) were detected.

Six organic compounds were detected at levels exceeding one or more of the screening criteria. The concentration of ethylbenzene (620 µg/kg and 570 µg/kg) in two samples (SWMU299-IS02-00 and SWMU299-IS03-00, respectively) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (231 µg/kg). The concentration of benzo(a)pyrene (2,500J µg/kg, 2,400J µg/kg, and 1,500J µg/kg) in three samples (SWMU299-IS01-00, SWMU299-IS02-00, and SWMU299-IS03-00, respectively) exceeded the USEPA Region III Industrial RBC (780 µg/kg), and the North Carolina Risk Analysis Framework, Method I, Category S-2 Target Concentration (780 µg/kg). The SVOC bis(2-ethylhexyl)phthalate was also detected at concentrations exceeding the applicable criteria. However, the presence of this compound is not suspected to be site-related, but rather attributable to sampling or analytical procedures. The concentration of dibenzo(a,h)anthracene (830J µg/kg and 810J µg/kg) in two samples (SWMU299-IS02-00 and SWMU299-IS04-00, respectively) exceeded the USEPA Region III Industrial RBC (780 µg/kg), and the North Carolina Risk Analysis Framework, Method I, Category S-2 Target Concentration (780 µg/kg). The concentration of naphthalene (970J µg/kg, 1,900J µg/kg, 640J µg/kg, and 950J µg/kg) in four samples (SWMU299-IS01-00, SWMU299-IS02-00, SWMU299-IS03-00, and SWMU299-IS04-00, respectively) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (584 µg/kg).

In addition to the exceedence of the screening criteria by the organic compounds discussed above, five metals (cadmium, chromium, lead, mercury, and silver) were each detected in at least one sample at concentrations greater than one or more of the screening criteria.

4.28.4 Recommendations

Additional investigative activities are recommended for SWMU 299 to further characterize contamination which is the result of operations at the Hobby Shop. This recommendation was formulated based on the extensive VOC, SVOC, and metals contamination that was detected in the samples. It is recommended that a minimum of three temporary monitoring well borings (with soil sample acquisition) be advanced with subsequent collection of groundwater samples. The soil and groundwater samples should be analyzed for VOAs, SVOAs, and metals. In addition, ~~institutional~~/engineering controls such as secondary containment or overfill prevention measures should be implemented.

TABLE 1
DETECTION SUMMARY
SWMU 299
SWMU CONFIMATORY SAMPLING (CTO-0371)
ASS114 - AST, MCAS AUTO HOBBY SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU299-IS01-00	SWMU299-IS02-00	SWMU299-IS03-00	SWMU299-IS04-00	SWMU299-IS04-01
DATE SAMPLED	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997
DEPTH	0' - 2'	0' - 2'	0' - 2'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)					
1,2-Dichlorobenzene	770	960	470	100	3.5
1,3-Dichlorobenzene	550	1600	140 U	67 U	1.3 U
1,4-Dichlorobenzene	860	470	200	270	7.8
Ethylbenzene	270 U	620	570	71	2.2
Xylenes (total)	2600	4300	2600	470	3.6
SEMIVOLATILES (ug/kg) (8270)					
2-Methylnaphthalene	1200 J	3100 J	6600	1900 J	54 J
Acenaphthene	4400 U	830 J	780 J	4400 U	420 U
Anthracene	490 J	1100 J	4700 U	810 J	61 J
Benzo(a)anthracene	2000 J	3400 J	1200 J	3200 J	200 J
Benzo(a)pyrene	2500 J	2400 J	1500 J	4400 U	200 J
Benzo(b)fluoranthene	3300 J	5900	3000 J	6100	330 J
Benzo(ghi)perylene	1000 J	1500 J	810 J	1800 J	120 J
Benzo(k)fluoranthene	3500 J	3600 J	2000 J	6700	350 J
bis(2-Ethylhexyl) phthalate	11000 J	16000 J	7600 J	6600 J	160 J
Butyl benzyl phthalate	7800	2600 J	3800 J	2900 J	43 J
Carbazole	4400 U	870 J	4700 U	4400 U	420 U
Chrysene	3500 J	4800	2000 J	4800	260 J
Dibenz(a,h)anthracene	590 J	830 J	4700 U	810 J	75 J
Dibenzofuran	4400 U	730 J	4700 U	4400 U	420 U
Di-n-butyl phthalate	3700 J	1600 J	4700 U	4400 U	420 U
Fluoranthene	4900	7500	2600 J	6100	640
Fluorene	510 J	1700 J	1100 J	560 J	420 U
Indeno(1,2,3-cd)pyrene	1200 J	1500 J	860 J	1900 J	130 J
Isophorone	4400 U	4300 U	990 J	4400 U	420 U
Naphthalene	970 J	1900 J	640 J	950 J	48 J
Phenanthrene	2300 J	7000	4200 J	3100 J	320 J
Pyrene	4200 J	7100	3000 J	7600	380 J

TABLE 1
DETECTION SUMMARY
SWMU 299
SWMU CONFIMATORY SAMPLING (CTO-0371)
ASS114 - AST, MCAS AUTO HOBBY SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU299-IS01-00	SWMU299-IS02-00	SWMU299-IS03-00	SWMU299-IS04-00	SWMU299-IS04-01
DATE SAMPLED	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997
DEPTH	0' - 2'	0' - 2'	0' - 2'	0' - 2'	2' - 4'
TOTAL METALS (mg/kg) (6010/7410)					
Arsenic	1.3 U	2.1	2.1	1.3 U	1.3 U
Barium	29.7	185	72.2	26.6 U	25.4 U
Cadmium	1.8	3.6	5	0.67 U	0.64 U
Chromium	38.9	33.3	44	14	4.9
Lead	193	300	636	56.1	5.7
Mercury	0.078	0.1	0.069	0.044 U	0.042 U
Silver	1.3 U	1.8	1.4 U	1.3 U	1.3 U

TABLE 1
DETECTION SUMMARY
SWMU 299
SWMU CONFIMATORY SAMPLING (CTO-0371)
ASS114 - AST, MCAS AUTO HOBBY SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	ND	ND	3.5	960	SWMU299-IS02-00	5/5	460.7	470
1,3-Dichlorobenzene	1.3 U	140 U	550	1600	SWMU299-IS02-00	2/5	1075	1075
1,4-Dichlorobenzene	ND	ND	7.8	860	SWMU299-IS01-00	5/5	361.56	270
Ethylbenzene	270 U	270 U	2.2	620	SWMU299-IS02-00	4/5	315.8	320.5
Xylenes (total)	ND	ND	3.6	4300	SWMU299-IS02-00	5/5	1994.72	2600
SEMIVOLATILES (ug/kg) (8270)								
2-Methylnaphthalene	ND	ND	54 J	6600	SWMU299-IS03-00	5/5	2570.8	1900
Acenaphthene	420 U	4400 U	780 J	830 J	SWMU299-IS02-00	2/5	805	805
Anthracene	4700 U	4700 U	61 J	1100 J	SWMU299-IS02-00	4/5	615.25	650
Benzo(a)anthracene	ND	ND	200 J	3400 J	SWMU299-IS02-00	5/5	2000	2000
Benzo(a)pyrene	4400 U	4400 U	200 J	2500 J	SWMU299-IS01-00	4/5	1650	1950
Benzo(b)fluoranthene	ND	ND	330 J	6100	SWMU299-IS04-00	5/5	3726	3300
Benzo(ghi)perylene	ND	ND	120 J	1800 J	SWMU299-IS04-00	5/5	1046	1000
Benzo(k)fluoranthene	ND	ND	350 J	6700	SWMU299-IS04-00	5/5	3230	3500
bis(2-Ethylhexyl) phthalate	ND	ND	160 J	16000 J	SWMU299-IS02-00	5/5	8272	7600
Butyl benzyl phthalate	ND	ND	43 J	7800	SWMU299-IS01-00	5/5	3428.6	2900
Carbazole	420 U	4700 U	870 J	870 J	SWMU299-IS02-00	1/5	870	870
Chrysene	ND	ND	260 J	4800	SWMU299-IS02-00,SWMU299-IS04-00	5/5	3072	3500
Dibenz(a,h)anthracene	4700 U	4700 U	75 J	830 J	SWMU299-IS02-00	4/5	576.25	700
Dibenzofuran	420 U	4700 U	730 J	730 J	SWMU299-IS02-00	1/5	730	730
Di-n-butyl phthalate	420 U	4700 U	1600 J	3700 J	SWMU299-IS01-00	2/5	2650	2650
Fluoranthene	ND	ND	640	7500	SWMU299-IS02-00	5/5	4348	4900
Fluorene	420 U	420 U	510 J	1700 J	SWMU299-IS02-00	4/5	967.5	830
Indeno(1,2,3-cd)pyrene	ND	ND	130 J	1900 J	SWMU299-IS04-00	5/5	1118	1200
Isophorone	420 U	4400 U	990 J	990 J	SWMU299-IS03-00	1/5	990	990
Naphthalene	ND	ND	48 J	1900 J	SWMU299-IS02-00	5/5	901.6	950
Phenanthrene	ND	ND	320 J	7000	SWMU299-IS02-00	5/5	3384	3100
Pyrene	ND	ND	380 J	7600	SWMU299-IS04-00	5/5	4456	4200

TABLE 1
DETECTION SUMMARY
SWMU 299
SWMU CONFIMATORY SAMPLING (CTO-0371)
ASS114 - AST, MCAS AUTO HOBBY SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.3 U	1.3 U	2.1	2.1	SWMU299-IS02-00,SWMU299-IS03-00	2/5	2.1	2.1
Barium	25.4 U	26.6 U	29.7	185	SWMU299-IS02-00	3/5	95.63	72.2
Cadmium	0.64 U	0.67 U	1.8	5	SWMU299-IS03-00	3/5	3.47	3.6
Chromium	ND	ND	4.9	44	SWMU299-IS03-00	5/5	27.02	33.3
Lead	ND	ND	5.7	636	SWMU299-IS03-00	5/5	238.16	193
Mercury	0.042 U	0.044 U	0.069	0.1	SWMU299-IS02-00	3/5	0.08	0.08
Silver	1.3 U	1.4 U	1.8	1.8	SWMU299-IS02-00	1/5	1.8	1.8

TABLE 2
STATISTICAL SUMMARY
SWMU 299
SWMU CONFIMATORY SAMPLING (CTO-0371)
ASS114 - AST, MCAS AUTO HOBBY SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

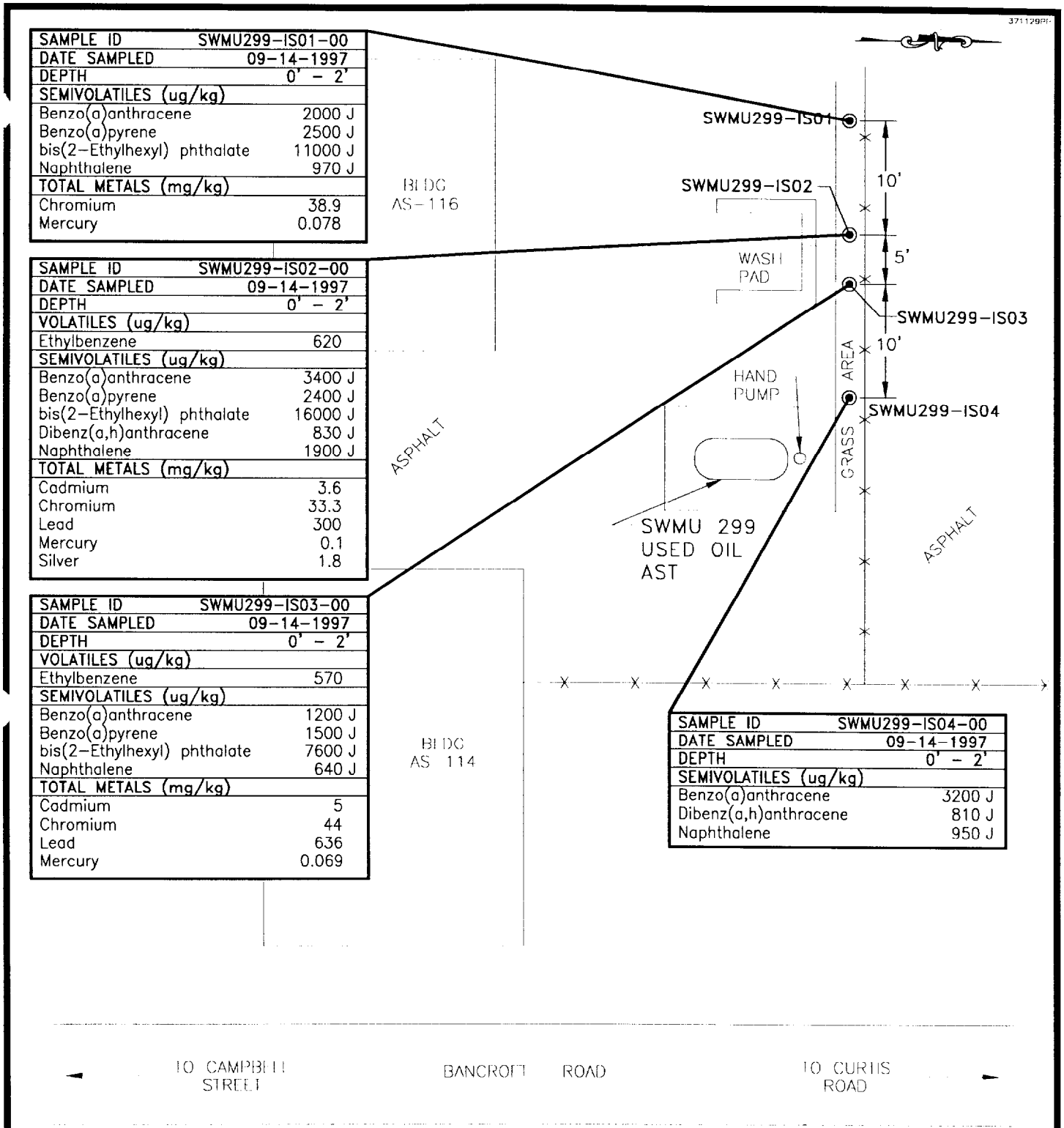
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,2-Dichlorobenzene	3.5	960	SWMU299-IS02-00	180000000	36000000	7270	0	0	0
1,3-Dichlorobenzene	550	1600	SWMU299-IS02-00	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	7.8	860	SWMU299-IS01-00	240000	240000	1240	0	0	0
Ethylbenzene	2.2	620	SWMU299-IS02-00	200000000	40000000	241	0	0	2
Xylenes (total)	3.6	4300	SWMU299-IS02-00	1000000000	200000000	4958	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
2-Methylnaphthalene	54 J	6600	SWMU299-IS03-00	82000000	NE	NE	0	0	0
Acenaphthene	780 J	830 J	SWMU299-IS02-00	120000000	24000000	8160	0	0	0
Anthracene	61 J	1100 J	SWMU299-IS02-00	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	200 J	3400 J	SWMU299-IS02-00	7800	7800	343	0	0	4
Benzo(a)pyrene	200 J	2500 J	SWMU299-IS01-00	780	780	NE	3	3	0
Benzo(b)fluoranthene	330 J	6100	SWMU299-IS04-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	120 J	1800 J	SWMU299-IS04-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	350 J	6700	SWMU299-IS04-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	160 J	16000 J	SWMU299-IS02-00	410000	410000	6670	0	0	3
Butyl benzyl phthalate	43 J	7800	SWMU299-IS01-00	410000000	82000000	27800	0	0	0
Carbazole	870 J	870 J	SWMU299-IS02-00	290000	290000	NE	0	0	0
Chrysene	260 J	4800	SWMU299-IS02-00,SWMU299-IS04-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	75 J	830 J	SWMU299-IS02-00	780	780	NE	2	2	0
Dibenzofuran	730 J	730 J	SWMU299-IS02-00	8200000	1640000	NE	0	0	0
Di-n-butyl phthalate	1600 J	3700 J	SWMU299-IS01-00	NE	NE	NE	0	0	0
Fluoranthene	640	7500	SWMU299-IS02-00	82000000	16400000	276080	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 299
SWMU CONFIMATORY SAMPLING (CTO-0371)
ASS114 - AST, MCAS AUTO HOBBY SHOP
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (ug/kg) (8270) (cont)									
Fluorene	510 J	1700 J	SWMU299-IS02-00	82000000	16400000	44297	0	0	0
Indeno(1,2,3-cd)pyrene	130 J	1900 J	SWMU299-IS04-00	7800	7800	NE	0	0	0
Isophorone	990 J	990 J	SWMU299-IS03-00	6000000	6000000	NE	0	0	0
Naphthalene	48 J	1900 J	SWMU299-IS02-00	200000000	16400000	584	0	0	4
Phenanthrene	320 J	7000	SWMU299-IS02-00	NE	NE	59640	0	0	0
Pyrene	380 J	7600	SWMU299-IS04-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	2.1	2.1	SWMU299-IS02-00,SWMU299-IS03-00	3.8	3.8	26.2	0	0	0
Barium	29.7	185	SWMU299-IS02-00	140000	28000	848	0	0	0
Cadmium	1.8	5	SWMU299-IS03-00	1000	200	2.72	0	0	2
Chromium	4.9	44	SWMU299-IS03-00	10000	2000	27.2	0	0	3
Lead	5.7	636	SWMU299-IS03-00	NE	400	270.06	0	1	2
Mercury	0.069	0.1	SWMU299-IS02-00	610	122	0.0154	0	0	3
Silver	1.8	1.8	SWMU299-IS02-00	10000	2000	0.223	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU299-IS01-00
DATE SAMPLED	09-14-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	2000 J
Benzo(a)pyrene	2500 J
bis(2-Ethylhexyl) phthalate	11000 J
Naphthalene	970 J
TOTAL METALS (mg/kg)	
Chromium	38.9
Mercury	0.078

SAMPLE ID	SWMU299-IS02-00
DATE SAMPLED	09-14-1997
DEPTH	0' - 2'
VOLATILES (ug/kg)	
Ethylbenzene	620
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	3400 J
Benzo(a)pyrene	2400 J
bis(2-Ethylhexyl) phthalate	16000 J
Dibenz(a,h)anthracene	830 J
Naphthalene	1900 J
TOTAL METALS (mg/kg)	
Cadmium	3.6
Chromium	33.3
Lead	300
Mercury	0.1
Silver	1.8

SAMPLE ID	SWMU299-IS03-00
DATE SAMPLED	09-14-1997
DEPTH	0' - 2'
VOLATILES (ug/kg)	
Ethylbenzene	570
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	1200 J
Benzo(a)pyrene	1500 J
bis(2-Ethylhexyl) phthalate	7600 J
Naphthalene	640 J
TOTAL METALS (mg/kg)	
Cadmium	5
Chromium	44
Lead	636
Mercury	0.069

SAMPLE ID	SWMU299-IS04-00
DATE SAMPLED	09-14-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	3200 J
Dibenz(a,h)anthracene	810 J
Naphthalene	950 J

NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

ug/kg – MICROGRAM/KILOGRAM
mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 299
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.29 SWMU 300 - AS118 Aboveground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.29.1 SWMU Description and History

SWMU 300 is a steel AST for used motor oil from a vehicle maintenance facility (Building AS-118), located north of the AST. The used motor oil is hand transferred to the storage tank from the maintenance facility, as required.

4.29.2 Confirmatory Investigation Activities

The soil investigation at SWMU 300 was developed to determine if the operation and activities associated with the AST has impacted surface and subsurface soils in the area of the aboveground storage tank.

A total of three soil borings, SWMU300-IS01 through SWMU300-IS03, were installed on September 8, 1997. Figure 1 presents the locations of the three soil borings. One surface and one subsurface soil sample were collected from each of the three soil borings and submitted for analysis. Surface soil samples were collected from ground surface to 2.0 feet bgs and subsurface samples were collected from just above the water table at a depth of 2.0 to 4.0 feet bgs. Groundwater was encountered at a depth of 4.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270), and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER01A, associated with September 8th sample collection, was collected from a split spoon sampler used at this SWMU. Results from the rinsate blank are included in Appendix F of this report. Trip blank 371TB01 was shipped with the VOA fraction of the soil samples. The trip blank results are included in Appendix F.

4.29.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Three VOCs were detected in the sample set; no VOCs were detected above comparison criteria.

Benzo(a)pyrene was detected in sample SWMU300-IS03-00 at a concentration of 5,000 µg/kg. This was the only SVOC detected above a comparison criteria. This concentration was in exceedance of the USEPA Region III Industrial RBC (780 µg/kg) and North Carolina Category S-2 Target Concentration (780 µg/kg). Benzo(a)pyrene was not detected in the rinsate blank for the day's sampling.

Mercury was the only inorganic detected above comparison criteria. Mercury was detected in sample SWMU300-IS03-01 at a concentration of 0.044 mg/kg which exceeded the North Carolina Category S-3:G-1 Target Concentration of 0.0154 mg/kg. No metals were detected in the rinsate blank for this day's sampling.

Soil boring SWMU300-IS03, located off the southwest corner of the AST, exhibited all exceedences above comparison criteria. Refer to Figure 1 for the location of this boring.

4.29.4 Recommendations

An additional investigation is recommended to be performed at SWMU 300. This investigation would consist of soil borings southeast and southwest of boring SWMU300-IS03 to confirm and define the contamination in this area. Additionally, a minimum of two temporary groundwater monitoring wells would be installed. One well would be north of the AST and the second well would be east/southeast of boring SWMU300-IS03, which is the apparent groundwater downgradient direction. Soil and groundwater samples collected during the investigation would be analyzed for SVOCs and metals.

why metals?

TABLE 1
DETECTION SUMMARY
SWMU 300
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS118 - AST, MCAS MOTOR TRANSPORTATION
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU300-IS01-00	SWMU300-IS01-01	SWMU300-IS02-00	SWMU300-IS02-01	SWMU300-IS03-00	SWMU300-IS03-01
DATE SAMPLED	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)						
1,2-Dichlorobenzene	1.1	1.1 U	1.1 U	1.2 U	8.4	1.2 U
1,3-Dichlorobenzene	1.1 U	1.1 U	1.1 U	1.2 U	14	2.5
1,4-Dichlorobenzene	1.8	1.5	1.1 U	1.2 U	14	1.8
SEMIVOLATILES (ug/kg) (8270)						
Anthracene	360 U	370 U	370 U	390 U	22 J	400 U
Benzo(a)anthracene	360 U	370 U	370 U	390 U	46 J	400 U
Benzo(a)pyrene	360 U	370 U	370 U	390 U	5000	400 U
Benzo(b)fluoranthene	360 U	370 U	370 U	390 U	3000	400 U
Benzo(k)fluoranthene	360 U	370 U	370 U	390 U	4800	400 U
bis(2-Ethylhexyl) phthalate	97 J	1400	57 J	390 U	83 J	400 U
Butyl benzyl phthalate	360 U	54 J	370 U	390 U	56 J	400 U
Carbazole	360 U	370 U	370 U	390 U	110 J	400 U
Chrysene	360 U	370 U	370 U	390 U	71 J	400 U
Di-n-butyl phthalate	360 U	370 U	370 U	390 U	46 J	400 U
Fluoranthene	360 U	67 J	41 J	390 U	140 J	400 U
Phenanthrene	360 U	370 U	370 U	390 U	47 J	400 U
Pyrene	360 U	51 J	42 J	390 U	110 J	400 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.1 U	1.1 U	1.2	1	1.2 U
Cadmium	0.55 U	0.57 U	0.56 U	0.59 U	1.1	0.61 U
Chromium	15.4	10	11.2	12	16.3	4.9
Lead	1.9	7.4	11.6	6.6	95.3	5.2
Mercury	0.036 U	0.037 U	0.037 U	0.039 U	0.034 U	0.044

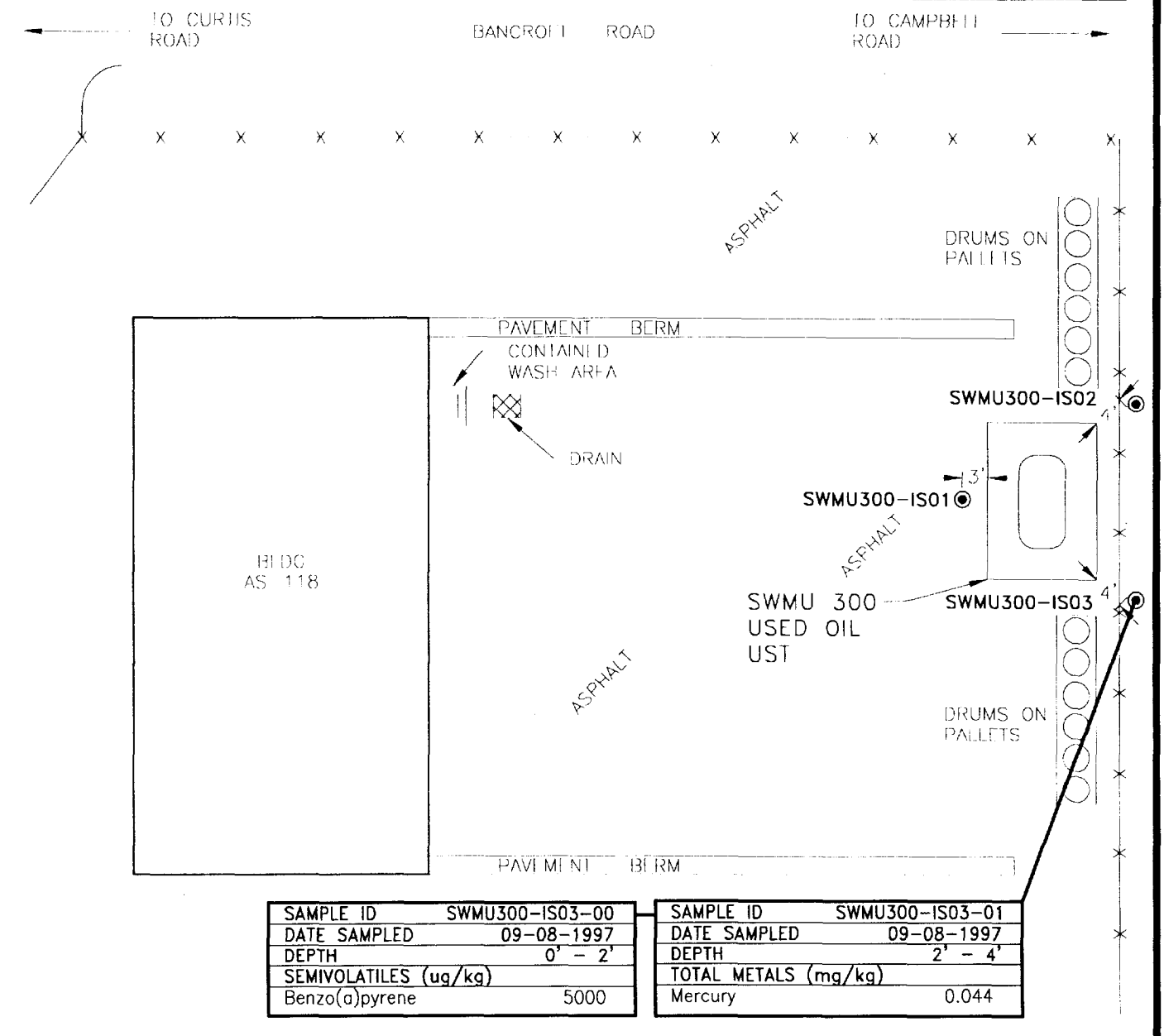
TABLE 1
DETECTION SUMMARY
SWMU 300
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS118 - AST, MCAS MOTOR TRANSPORTATION
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	1.1 U	1.2 U	1.1	8.4	SWMU300-IS03-00	2/6	4.75	4.75
1,3-Dichlorobenzene	1.1 U	1.2 U	2.5	14	SWMU300-IS03-00	2/6	8.25	8.25
1,4-Dichlorobenzene	1.1 U	1.2 U	1.5	14	SWMU300-IS03-00	4/6	4.78	1.8
SEMIVOLATILES (ug/kg) (8270)								
Anthracene	360 U	400 U	22 J	22 J	SWMU300-IS03-00	1/6	22	22
Benzo(a)anthracene	360 U	400 U	46 J	46 J	SWMU300-IS03-00	1/6	46	46
Benzo(a)pyrene	360 U	400 U	5000	5000	SWMU300-IS03-00	1/6	5000	5000
Benzo(b)fluoranthene	360 U	400 U	3000	3000	SWMU300-IS03-00	1/6	3000	3000
Benzo(k)fluoranthene	360 U	400 U	4800	4800	SWMU300-IS03-00	1/6	4800	4800
bis(2-Ethylhexyl) phthalate	390 U	400 U	57 J	1400	SWMU300-IS01-01	4/6	409.25	90
Butyl benzyl phthalate	360 U	400 U	54 J	56 J	SWMU300-IS03-00	2/6	55	55
Carbazole	360 U	400 U	110 J	110 J	SWMU300-IS03-00	1/6	110	110
Chrysene	360 U	400 U	71 J	71 J	SWMU300-IS03-00	1/6	71	71
Di-n-butyl phthalate	360 U	400 U	46 J	46 J	SWMU300-IS03-00	1/6	46	46
Fluoranthene	360 U	400 U	41 J	140 J	SWMU300-IS03-00	3/6	82.67	67
Phenanthrene	360 U	400 U	47 J	47 J	SWMU300-IS03-00	1/6	47	47
Pyrene	360 U	400 U	42 J	110 J	SWMU300-IS03-00	3/6	67.67	51
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1	1.2	SWMU300-IS02-01	2/6	1.1	1.1
Cadmium	0.55 U	0.61 U	1.1	1.1	SWMU300-IS03-00	1/6	1.1	1.1
Chromium	ND	ND	4.9	16.3	SWMU300-IS03-00	6/6	11.63	11.6
Lead	ND	ND	1.9	95.3	SWMU300-IS03-00	6/6	21.33	7
Mercury	0.034 U	0.039 U	0.044	0.044	SWMU300-IS03-01	1/6	0.04	0.04

TABLE 2
STATISTICAL SUMMARY
SWMU 300
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS118 - AST, MCAS MOTOR TRANSPORTATION
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,2-Dichlorobenzene	1.1	8.4	SWMU300-IS03-00	180000000	36000000	7270	0	0	0
1,3-Dichlorobenzene	2.5	14	SWMU300-IS03-00	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	1.5	14	SWMU300-IS03-00	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Anthracene	22 J	22 J	SWMU300-IS03-00	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	46 J	46 J	SWMU300-IS03-00	7800	7800	343	0	0	0
Benzo(a)pyrene	5000	5000	SWMU300-IS03-00	780	780	NE	1	1	0
Benzo(b)fluoranthene	3000	3000	SWMU300-IS03-00	7800	7800	NE	0	0	0
Benzo(k)fluoranthene	4800	4800	SWMU300-IS03-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	57 J	1400	SWMU300-IS01-01	410000	410000	6670	0	0	0
Butyl benzyl phthalate	54 J	56 J	SWMU300-IS03-00	410000000	82000000	27800	0	0	0
Carbazole	110 J	110 J	SWMU300-IS03-00	290000	290000	NE	0	0	0
Chrysene	71 J	71 J	SWMU300-IS03-00	780000	780000	38150	0	0	0
Di-n-butyl phthalate	46 J	46 J	SWMU300-IS03-00	NE	NE	NE	0	0	0
Fluoranthene	41 J	140 J	SWMU300-IS03-00	82000000	16400000	276080	0	0	0
Phenanthrene	47 J	47 J	SWMU300-IS03-00	NE	NE	59640	0	0	0
Pyrene	42 J	110 J	SWMU300-IS03-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1	1.2	SWMU300-IS02-01	3.8	3.8	26.2	0	0	0
Cadmium	1.1	1.1	SWMU300-IS03-00	1000	200	2.72	0	0	0
Chromium	4.9	16.3	SWMU300-IS03-00	10000	2000	27.2	0	0	0
Lead	1.9	95.3	SWMU300-IS03-00	NE	400	270.06	0	0	0
Mercury	0.044	0.044	SWMU300-IS03-01	610	122	0.0154	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU300-IS03-00
DATE SAMPLED	09-08-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)pyrene	5000

SAMPLE ID	SWMU300-IS03-01
DATE SAMPLED	09-08-1997
DEPTH	2' - 4'
TOTAL METALS (mg/kg)	
Mercury	0.044

NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

ug/kg – MICROGRAM/KILOGRAM
mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 300
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.30 SWMU 301 - AS4115 Aboveground Storage Tanks

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.30.1 SWMU Description and History

SWMU 301 consists of two steel, ASTs with secondary containment. The tanks contain petroleum, oil, and lubricants (POLs) including used oil, hydraulic fluid, and fuels, and are labeled "POL." The tanks are still in service and were installed in 1983. During the site visit, the soil in the vicinity of the containment structure drain was observed to be stained. The ASTs are located in an asphalt-paved area between Buildings AS-4106, AS-4108, AS-4133, and AS4115 (90 day hazardous waste storage structure). The SWMU is located east of White Street in the MCAS. A site plan is presented on Figure 1.

4.30.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 301 was developed to determine if the presence of the ASTs (e.g., spills, overfills, leaks, etc.) has impacted surface and subsurface soils surrounding the SWMU.

Three borings, SWMU301-IS01, SWMU301-IS02, and SWMU301-IS03 were advanced at the SWMU on September 8, 1997. As depicted on Figure 1, the soil borings were advanced immediately adjacent to the AST containment structure. Two samples were collected from each boring. The samples were collected from the ground surface to 2.0 feet bgs (SWMU301-IS01-00, SWMU301-IS02-00, and SWMU301-IS03-00), and from just above the water table at a depth of 8.0 to 10.0 feet bgs (SWMU301-IS01-04, SWMU301-IS02-04, and SWMU301-IS03-04). Groundwater was encountered at a depth of approximately 10.0 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8020), SVOAs (USEPA Method 8270B), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER01B was collected from a stainless steel sampling spatula used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB01 and 371TB03, and 371TB04 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.30.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminants detected at concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

No VOCs were detected in the samples collected during the Confirmatory Sampling Investigation. One SVOC, bis(2-ethylhexyl)phthalate, was detected but at levels below the screening criteria. Four metals (arsenic, chromium, lead, and mercury) were detected. Mercury in one sample (SWMU301-IS02-00) was detected at a concentration (0.039 µg/kg) exceeding the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (0.0154 µg/kg). None of the remaining detected compounds/analytes were present at levels exceeding the aforementioned comparison criteria.

4.30.4 Recommendations

No further action is recommended for SWMU 301. Only one metal (mercury) was detected at a concentration exceeding the criteria listed in Table 2. Although the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration was exceeded, the detected concentration was significantly below the USEPA Region III Industrial RBCs (610 mg/kg), and the North Carolina Risk Analysis Framework, Method I, Category S-2 Target Concentration (122 mg/kg). Further, no source of mercury contamination is known or expected to have been present at the site.

TABLE 1
DETECTION SUMMARY
SWMU 301
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4115 - AST, MHL 167, MAG 26, 2D MAW
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU301-IS01-00	SWMU301-IS01-04	SWMU301-IS02-00	SWMU301-IS02-04	SWMU301-IS03-00	SWMU301-IS03-04
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	8' - 10'	0' - 2'	8' - 10'	0' - 2'	8' - 10'
VOLATILES (8020) (ug/kg)	ND	ND	ND	ND	ND	ND
SEMIVOLATILES (8270B) (ug/kg)						
bis(2-Ethylhexyl) phthalate	120 J	78 J	380 U	69 J	370 U	180 J
METALS (mg/kg)(6010/7410)						
Arsenic	1.6	1.3 U	1.2	1.2 U	1.1 U	2
Chromium	15.1	14.8	11.8	15.3	8.2	16.5
Lead	5.9	5	16.3	5.6	3.9	5
Mercury	0.036 U	0.042 U	0.039	0.04 U	0.037 U	0.04 U

Notes:

ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 301
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4115 - AST, MHL 167, MAG 26, 2D MAW
MCB, CAMP LEJUENE, NORTH CAROLINA

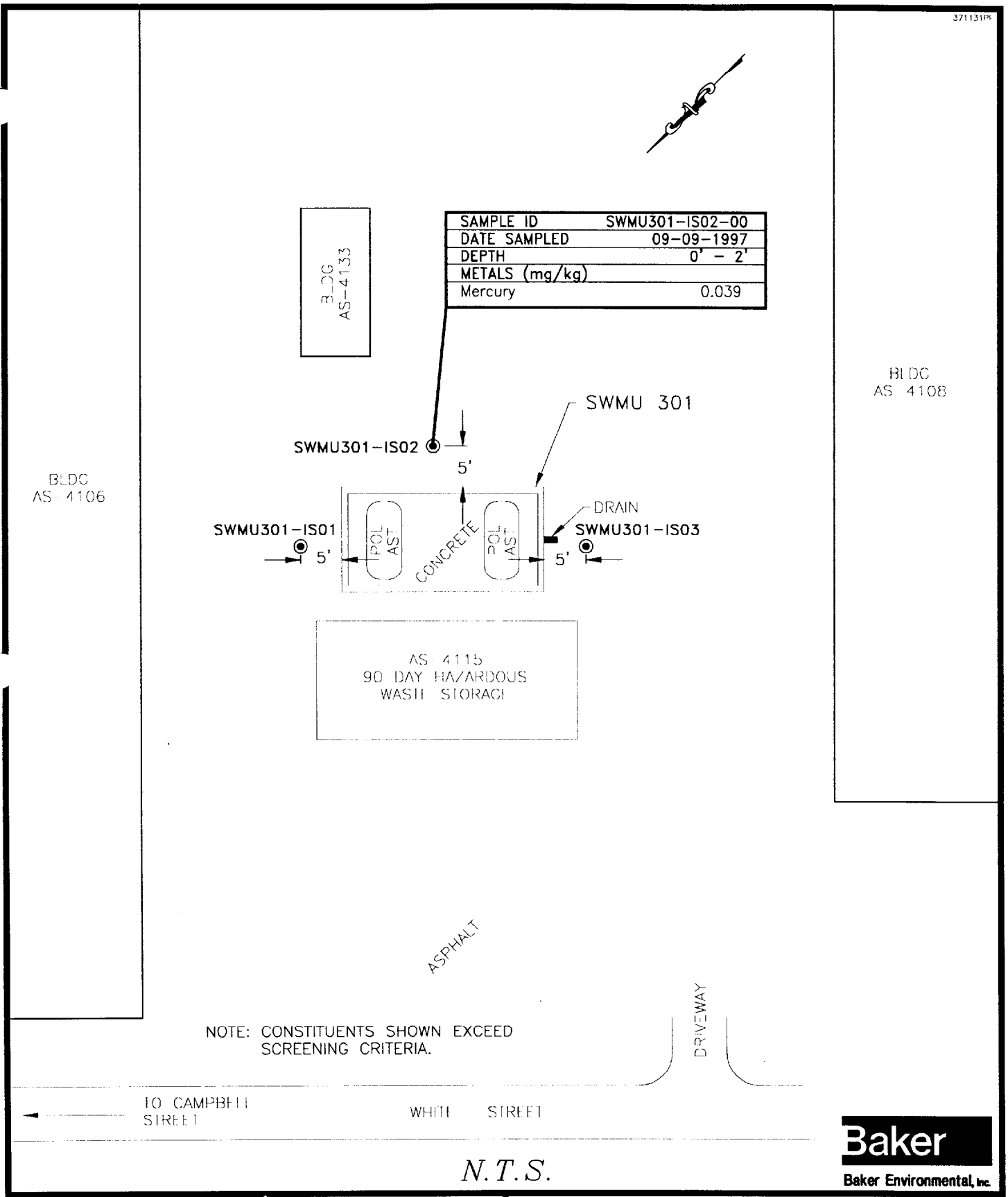
SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (8020) (ug/kg)	ND	ND	ND	ND		0/6	ND	ND
SEMIVOLATILES (8270B) (ug/kg)								
bis(2-Ethylhexyl) phthalate	370 U	380 U	69 J	180 J	SWMU301-IS03-04	4/6	111.75	99
METALS (mg/kg)(6010/7410)								
Arsenic	1.1 U	1.3 U	1.2	2	SWMU301-IS03-04	3/6	1.6	1.6
Chromium	ND	ND	8.2	16.5	SWMU301-IS03-04	6/6	13.62	14.95
Lead	ND	ND	3.9	16.3	SWMU301-IS02-00	6/6	6.95	5.3
Mercury	0.036 U	0.042 U	0.039	0.039	SWMU301-IS02-00	1/6	0.04	0.04

Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 301
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4115 - AST, MHL 167, MAG 26, 2D MAW
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (8270B) (ug/kg)									
bis(2-Ethylhexyl) phthalate	69 J	180 J	SWMU301-IS03-04	410000	410000	6670	0	0	0
METALS (mg/kg)(6010/7410)									
Arsenic	1.2	2	SWMU301-IS03-04	3.8	3.8	26.2	0	0	0
Chromium	8.2	16.5	SWMU301-IS03-04	10000	2000	27.2	0	0	0
Lead	3.9	16.3	SWMU301-IS02-00	NE	400	270.06	0	0	0
Mercury	0.039	0.039	SWMU301-IS02-00	610	122	0.0154	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 301
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.31 SWMU 302 - AS-563 Above Ground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.31.1 SWMU Description and History

SWMU 302 is located north of the MCAS behind the Fire Rescue Building at the intersection of Campbell and Foster Streets. The SWMU consists of an AST with secondary containment. The AST receives used engine, hydraulic and transmission oil. During the 1996 site visit, petroleum stains were observed on the steps to the AST. In addition, adjacent to the AST, four drums were resting on a containment pallet surrounded by sand bags were noted adjacent to the AST. The AST was installed in 1983 and is still in use. The area surrounding the SWMU is asphalt and grass covered.

4.31.2 Confirmatory Investigation Activities

The Confirmatory Investigation was performed on September 8, 1997 at the SWMU to determine if the used oil water introduced into the AST has impacted the soil around the system. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from four soil borings. The four borings were advanced around each side of the AST as presented on Figure 1. The soil borings were advanced to depths of approximately 4.0 feet bgs with groundwater encountered at approximately 4.0 feet bgs. Four surface soil samples (SWMU302-IS01-00, SWMU302-IS02-00, SWMU302-IS03-00, and SWMU302-IS04-00) were collected at depths of 0 to 2.0 feet bgs at all four boring locations. In addition, one subsurface soil sample was collected from each of the four soil borings (SWMU302-IS01-01, SWMU302-IS02-01, SWMU302-IS03-01, and SWMU302-IS04-01) at 2.0 to 4.0 feet bgs. All soil samples were analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270), and RCRA metals (EPA Method 6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. A duplicate field sample was collected (SWMU302-IS03-00D). The duplicate sample results are presented in Appendix E. A rinsate blank (371ER01A) was collected from a stainless steel sampling spoon and analyzed for the same parameters. The samples were sent to Quanterra laboratories along with trip blanks 371TB01, 371TB02, 371TB03, and 371TB04. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.31.3 Investigation Findings

Four surface soil and four subsurface soil samples were collected and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- USEPA Region III Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analyses indicated positive detections of four VOCs, 13 SVOCs, and three metals (Table 1). As shown on Figure 1 and presented on Table 2, only one constituent was detected in the samples above the screening criteria.

The four VOCs detected included 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene; and total xylenes. These VOCs were detected in samples SWMU302-IS01-00, SWMU302-IS01-01, SWMU302-IS02-00, and SWMU302-IS04-00 at concentrations that were below the screening criteria.

The SVOCs (primarily all PAHs) were detected in the sample set at concentrations below the screening criteria. The majority of the SVOC detections were collected from soil boring SWMU302-IS03.

Three metals (cadmium, chromium, and lead) were detected within the sample set. The detected concentrations of chromium and lead were below the screening criteria. A concentration of cadmium (2.9 mg/kg) slightly exceeded the North Carolina Target Concentration for Method I, Category S-3:G-1 of 2.72 mg/kg. The exceedence was from surface soil sample SWMU302-IS02-00.

4.31.4 Recommendations

No further investigations are recommended for SWMU 302. Cadmium exceeded the North Carolina screening criteria in only one of the eight samples. This exceedence only slightly exceeded the North Carolina Target Concentration for Method I, Category S-3:G-1 of 2.72 mg/kg.

TABLE 1
DETECTION SUMMARY
SWMU 302
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS504 AST, HMH 362 (AS 566)
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU302-IS01-00	SWMU302-IS01-01	SWMU302-IS02-00	SWMU302-IS02-01	SWMU302-IS03-00	SWMU302-IS03-01
DATE SAMPLED	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997	09-08-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)						
1,2-Dichlorobenzene	3.8	9.9	1.1 U	1.2 U	1.1 U	1.2 U
1,3-Dichlorobenzene	11	1.2 U	14	1.2 U	1.1 U	1.2 U
1,4-Dichlorobenzene	5.6	1.2 U	1.1 U	1.2 U	1.1 U	1.2 U
Xylenes (total)	1.2	1.2 U	1.1 U	1.2 U	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	370 U	380 U	360 U	380 U	240 J	150 J
Benzo(a)pyrene	370 U	380 U	360 U	380 U	420	200 J
Benzo(b)fluoranthene	51 J	380 U	360 U	380 U	570	270 J
Benzo(ghi)perylene	370 U	380 U	360 U	380 U	270 J	98 J
Benzo(k)fluoranthene	370 U	380 U	360 U	380 U	210 J	78 J
bis(2-Ethylhexyl) phthalate	89 J	380 U	360 U	380 U	390	420
Chrysene	370 U	380 U	360 U	380 U	360	260 J
Dibenz(a,h)anthracene	370 U	380 U	360 U	380 U	66 J	390 U
Di-n-butyl phthalate	370 U	380 U	360 U	380 U	54 J	390 U
Fluoranthene	370 U	380 U	360 U	380 U	370	180 J
Indeno(1,2,3-cd)pyrene	370 U	380 U	360 U	380 U	250 J	100 J
Phenanthrene	370 U	380 U	360 U	380 U	47 J	84 J
Pyrene	370 U	380 U	360 U	380 U	360	330 J
TOTAL METALS (mg/kg) (6010/7410)						
Cadmium	0.56 U	0.58 U	2.9	0.58 U	0.53 U	0.6 U
Chromium	6	3.7	7.1	7	8.2	7.6
Lead	4.5	2.8	18.7	4.6	15.5	7.9

TABLE 1
DETECTION SUMMARY
SWMU 302
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS504 AST, HMH 362 (AS 566)
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU302-IS04-00	SWMU302-IS04-01
DATE SAMPLED	09-08-1997	09-08-1997
DEPTH	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)		
1,2-Dichlorobenzene	1.1 U	1.2 U
1,3-Dichlorobenzene	8.6	1.2 U
1,4-Dichlorobenzene	1.1 U	1.2 U
Xylenes (total)	48	1.2 U
SEMIVOLATILES (ug/kg) (8270)		
Benzo(a)anthracene	170 J	390 U
Benzo(a)pyrene	370 U	390 U
Benzo(b)fluoranthene	370 U	390 U
Benzo(ghi)perylene	370 U	390 U
Benzo(k)fluoranthene	370 U	390 U
bis(2-Ethylhexyl) phthalate	240 J	90 J
Chrysene	140 J	390 U
Dibenz(a,h)anthracene	370 U	390 U
Di-n-butyl phthalate	370 U	390 U
Fluoranthene	200 J	390 U
Indeno(1,2,3-cd)pyrene	370 U	390 U
Phenanthrene	370 U	390 U
Pyrene	340 J	390 U
TOTAL METALS (mg/kg) (6010/7410)		
Cadmium	0.64	0.58 U
Chromium	11.4	4.5
Lead	78.7	4.3

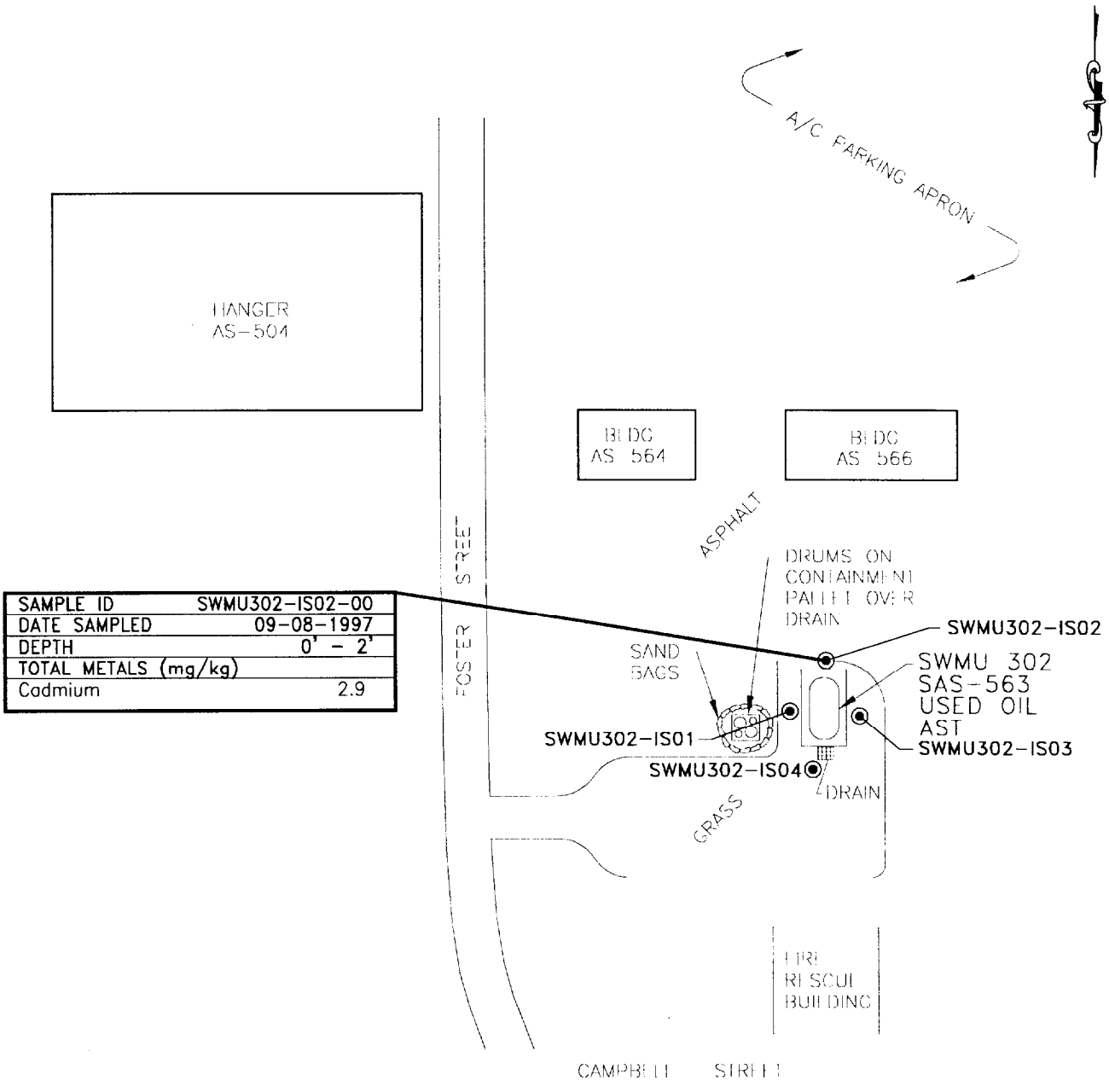
TABLE 1
DETECTION SUMMARY
SWMU 302
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS504 AST, HMH 362 (AS 566)
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	1.1 U	1.2 U	3.8	9.9	SWMU302-IS01-01	2/8	6.85	6.85
1,3-Dichlorobenzene	1.1 U	1.2 U	8.6	14	SWMU302-IS02-00	3/8	11.2	11
1,4-Dichlorobenzene	1.1 U	1.2 U	5.6	5.6	SWMU302-IS01-00	1/8	5.6	5.6
Xylenes (total)	1.1 U	1.2 U	1.2	48	SWMU302-IS04-00	2/8	24.6	24.6
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	360 U	390 U	150 J	240 J	SWMU302-IS03-00	3/8	186.67	170
Benzo(a)pyrene	360 U	390 U	200 J	420	SWMU302-IS03-00	2/8	310	310
Benzo(b)fluoranthene	360 U	390 U	51 J	570	SWMU302-IS03-00	3/8	297	270
Benzo(ghi)perylene	360 U	390 U	98 J	270 J	SWMU302-IS03-00	2/8	184	184
Benzo(k)fluoranthene	360 U	390 U	78 J	210 J	SWMU302-IS03-00	2/8	144	144
bis(2-Ethylhexyl) phthalate	360 U	380 U	89 J	420	SWMU302-IS03-01	5/8	245.8	240
Chrysene	360 U	390 U	140 J	360	SWMU302-IS03-00	3/8	253.33	260
Dibenz(a,h)anthracene	360 U	390 U	66 J	66 J	SWMU302-IS03-00	1/8	66	66
Di-n-butyl phthalate	360 U	390 U	54 J	54 J	SWMU302-IS03-00	1/8	54	54
Fluoranthene	360 U	390 U	180 J	370	SWMU302-IS03-00	3/8	250	200
Indeno(1,2,3-cd)pyrene	360 U	390 U	100 J	250 J	SWMU302-IS03-00	2/8	175	175
Phenanthrene	360 U	390 U	47 J	84 J	SWMU302-IS03-01	2/8	65.5	65.5
Pyrene	360 U	390 U	330 J	360	SWMU302-IS03-00	3/8	343.33	340
TOTAL METALS (mg/kg) (6010/7410)								
Cadmium	0.53 U	0.6 U	0.64	2.9	SWMU302-IS02-00	2/8	1.77	1.77
Chromium	ND	ND	3.7	11.4	SWMU302-IS04-00	8/8	6.94	7.05
Lead	ND	ND	2.8	78.7	SWMU302-IS04-00	8/8	17.13	6.25

TABLE 2
STATISTICAL SUMMARY
SWMU 302
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS504 AST, HMH 362 (AS 566)
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,2-Dichlorobenzene	3.8	9.9	SWMU302-IS01-01	180000000	36000000	7270	0	0	0
1,3-Dichlorobenzene	8.6	14	SWMU302-IS02-00	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	5.6	5.6	SWMU302-IS01-00	240000	240000	1240	0	0	0
Xylenes (total)	1.2	48	SWMU302-IS04-00	1000000000	200000000	4958	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Benzo(a)anthracene	150 J	240 J	SWMU302-IS03-00	7800	7800	343	0	0	0
Benzo(a)pyrene	200 J	420	SWMU302-IS03-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	51 J	570	SWMU302-IS03-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	98 J	270 J	SWMU302-IS03-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	78 J	210 J	SWMU302-IS03-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	89 J	420	SWMU302-IS03-01	410000	410000	6670	0	0	0
Chrysene	140 J	360	SWMU302-IS03-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	66 J	66 J	SWMU302-IS03-00	780	780	NE	0	0	0
Di-n-butyl phthalate	54 J	54 J	SWMU302-IS03-00	NE	NE	NE	0	0	0
Fluoranthene	180 J	370	SWMU302-IS03-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	100 J	250 J	SWMU302-IS03-00	7800	7800	NE	0	0	0
Phenanthrene	47 J	84 J	SWMU302-IS03-01	NE	NE	59640	0	0	0
Pyrene	330 J	360	SWMU302-IS03-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Cadmium	0.64	2.9	SWMU302-IS02-00	1000	200	2.72	0	0	1
Chromium	3.7	11.4	SWMU302-IS04-00	10000	2000	27.2	0	0	0
Lead	2.8	78.7	SWMU302-IS04-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU302-IS02-00
DATE SAMPLED	09-08-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Cadmium	2.9

NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

⊙ SOIL BORING AND SAMPLE LOCATION

mg/kg - MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 302
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.32 SWMU 303 - Aboveground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.32.1 SWMU Description and History

SWMU 303 consists of two ASTs that are labeled as "Hydraulic Fluid, Engine and Transmission Oils Only, No Solvents or Other Chemicals." The steel tanks were installed in 1983 and are still used. The tanks are contained within a concrete, bermed structure. At the time of the investigation, staining was noted on the outside of the concrete berm. The SWMU is located MCAS area, east of Bancroft Street, between the aircraft parking apron and Building AS-515. A hazardous waste storage facility (AS-528/HMM-266) is situated adjacent to the SWMU. A site plan is presented on Figure 1.

4.32.2 Confirmatory Investigation Activities

The soil investigation for SWMU 303 was developed to determine if overfills and spills in the vicinity of the ASTs have impacted surface and subsurface soils.

Four borings, SWMU303-IS01, SWMU303-IS02, and SWMU303 -IS03, and SWMU303-IS04 were advanced at the SWMU on September 8, 1997, at the locations depicted on Figure 1. Samples from each boring were collected from the ground surface to 2.0 feet bgs (SWMU303-IS01-00, SWMU303-IS02-00, and SWMU303-IS03-00, and SWMU303-IS04-00), and from just above the water table at a depth of 6.0 to 8.0 feet bgs (SWMU303-IS01-03, SWMU303-IS02-03, and SWMU303-IS03-03, and SWMU303-IS04-03). Groundwater was encountered at a depth of approximately 7.6 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Methods 8020 and 8260A), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. One duplicate sample (SWMU303-IS01-03D) was collected at the SWMU. Duplicate analytical results are included in Appendix E. Equipment rinsate blank 371ER01B was collected from a stainless-steel sampling spatula which was used to collect soil samples from the SWMU. Results for the rinsate blank are included in Appendix F. Trip blanks 371TB01, 371TB03, and 371TB04 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.32.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminants detected at concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Three VOCs (2-butanone, acetone, and methylene chloride) were detected in the samples collected during the Confirmatory Sampling Investigation. The presence of these compounds is suspected to be attributable to decontamination or analytical procedures. Fourteen SVOCs were detected. Three of the detected SVOCs are phthalates and are suspected to be attributable to decontamination or analytical procedures. The presence of the remaining detected SVOCs (primarily PAHs) is suspected to be attributable to fuel combustion associated with vehicular traffic or airfield operations. Six metals (arsenic, barium, cadmium, chromium, lead, and selenium) were detected in the sample set.

Two organic compounds were detected at levels exceeding one or more of the screening criteria. The concentration of acetone (14,000 µg/kg) in one sample (SWMU303-IS04-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (2,810 µg/kg). However, the presence of this compound is not suspected to be site-related, but rather attributable to decontamination or analytical procedures. The concentration of the SVOC benzo(a)anthracene (1,000 µg/kg) detected in one sample (SWMU303-IS04-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (343 µg/kg). The presence of benzo(a)anthracene is suspected to be the result of fuel combustion associated with vehicular traffic or airfield operations.

In addition to the exceedence of the screening criteria by the organic compounds discussed above, two metals (arsenic and chromium) were each detected in at least one sample at concentrations greater than one or more of the screening criteria.

4.32.4 Recommendations

Based on the analytical results, an additional investigation is recommended for SWMU 303. Although screening criteria were exceeded, the compounds/analytes detected are not suspected to be related to the presence of the ASTs. Acetone is a common laboratory/field contaminant. Benzo(a)anthracene (as well as the other detected PAHs) is derived from the combustion of fuel and is most likely attributable to the surrounding traffic and airfield operations. Finally, detections of arsenic and chromium exceeded certain criteria. However, there is no known source of these metals present at the SWMU or suspected to have been present in the past. It is recommended that additional soil borings to be installed to confirm the detected organic and inorganic results. The soil samples should be analyzed for SVOAs, and metals.

TABLE 1
DETECTION SUMMARY
SWMU 303
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS515 - AST-E, HMM 266 HMM 261
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU303-IS01-00	SWMU303-IS01-03	SWMU303-IS02-00	SWMU303-IS02-03	SWMU303-IS03-00	SWMU303-IS03-03
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	6' - 8'	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8260A)						
2-Butanone	110 U	21 U	21 U	14 J	110 U	130 U
Acetone	1900	21 U	30	59	510	800
Methylene chloride	8	5.3 U	5.3 U	1.9 J	7.1	32 U
VOLATILES (ug/kg) (8020)						
1,4-Dichlorobenzene	1.6	1.5	1.8	1.8	1.1 U	3.5
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	370 U	350 U	52 J	390 U	360 U	420 U
Benzo(a)pyrene	370 U	350 U	59 J	390 U	59 J	420 U
Benzo(b)fluoranthene	370 U	350 U	98 J	390 U	71 J	420 U
Benzo(ghi)perylene	370 U	350 U	350 U	390 U	360 U	420 U
Benzo(k)fluoranthene	370 U	350 U	48 J	390 U	37 J	420 U
bis(2-Ethylhexyl) phthalate	130 J	340 J	75 J	110 J	55 J	100 J
Butyl benzyl phthalate	370 U	350 U	350 U	390 U	360 U	420 U
Chrysene	370 U	350 U	82 J	390 U	360 U	420 U
Dibenz(a,h)anthracene	370 U	350 U	350 U	390 U	360 U	420 U
Di-n-butyl phthalate	370 U	350 U	350 U	390 U	360 U	420 U
Fluoranthene	370 U	350 U	350 U	390 U	360 U	420 U
Indeno(1,2,3-cd)pyrene	370 U	350 U	350 U	390 U	360 U	420 U
Phenol	370 U	350 U	350 U	390 U	360 U	420 U
Pyrene	370 U	350 U	88 J	390 U	360 U	420 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	5.9	1.9	1.5	1.3	3.7
Barium	22.6 U	21.3 U	40.3	47.4	107	25.5 U
Cadmium	0.69	0.53 U	0.53 U	0.59 U	1.1	1.5
Chromium	10.3	13.4	10.1	6.7	16.9	33.9
Lead	12.3	6.9	10.1	3.3	13.6	21.2
Selenium	0.56 U	0.66	0.53 U	0.59 U	0.54 U	0.64 U

TABLE 1
DETECTION SUMMARY
SWMU 303
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS515 - AST-E, HMM 266 HMM 261
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU303-IS04-00	SWMU303-IS04-03
DATE SAMPLED	09-09-1997	09-09-1997
DEPTH	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8260A)		
2-Butanone	2900 U	250 U
Acetone	14000	890
Methylene chloride	730 U	62 U
VOLATILES (ug/kg) (8020)		
1,4-Dichlorobenzene	3.4	1.3
SEMIVOLATILES (ug/kg) (8270)		
Benzo(a)anthracene	1000	410 U
Benzo(a)pyrene	650	410 U
Benzo(b)fluoranthene	1100	410 U
Benzo(ghi)perylene	200 J	410 U
Benzo(k)fluoranthene	350 J	410 U
bis(2-Ethylhexyl) phthalate	290 J	82 J
Butyl benzyl phthalate	86 J	410 U
Chrysene	830	410 U
Dibenz(a,h)anthracene	42 J	410 U
Di-n-butyl phthalate	1800	410 U
Fluoranthene	1400	410 U
Indeno(1,2,3-cd)pyrene	250 J	410 U
Phenol	160 J	410 U
Pyrene	1300	410 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.2 U	3.3
Barium	50.9	24.8 U
Cadmium	0.59 U	0.62 U
Chromium	7.9	15.8
Lead	16.3	7.8
Selenium	0.59 U	0.79

TABLE 1
DETECTION SUMMARY
SWMU 303
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS515 - AST-E, HMM 266 HMM 261
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
2-Butanone	21 U	2900 U	14 J	14 J	SWMU303-IS02-03	1/8	14	14
Acetone	21 U	21 U	30	14000	SWMU303-IS04-00	7/8	2598.43	800
Methylene chloride	5.3 U	730 U	1.9 J	8	SWMU303-IS01-00	3/8	5.67	7.1
VOLATILES (ug/kg) (8020)								
1,4-Dichlorobenzene	1.1 U	1.1 U	1.3	3.5	SWMU303-IS03-03	7/8	2.13	1.8
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	350 U	420 U	52 J	1000	SWMU303-IS04-00	2/8	526	526
Benzo(a)pyrene	350 U	420 U	59 J	650	SWMU303-IS04-00	3/8	256	59
Benzo(b)fluoranthene	350 U	420 U	71 J	1100	SWMU303-IS04-00	3/8	423	98
Benzo(ghi)perylene	350 U	420 U	200 J	200 J	SWMU303-IS04-00	1/8	200	200
Benzo(k)fluoranthene	350 U	420 U	37 J	350 J	SWMU303-IS01-03,SWMU303-IS04-00	3/8	145	48
bis(2-Ethylhexyl) phthalate	ND	ND	55 J	340 J	SWMU303-IS01-03	8/8	147.75	105
Butyl benzyl phthalate	350 U	420 U	86 J	86 J	SWMU303-IS04-00	1/8	86	86
Chrysene	350 U	420 U	82 J	830	SWMU303-IS04-00	2/8	456	456
Dibenz(a,h)anthracene	350 U	420 U	42 J	42 J	SWMU303-IS04-00	1/8	42	42
Di-n-butyl phthalate	350 U	420 U	1800	1800	SWMU303-IS04-00	1/8	1800	1800
Fluoranthene	350 U	420 U	1400	1400	SWMU303-IS04-00	1/8	1400	1400
Indeno(1,2,3-cd)pyrene	350 U	420 U	250 J	250 J	SWMU303-IS04-00	1/8	250	250
Phenol	350 U	420 U	160 J	160 J	SWMU303-IS04-00	1/8	160	160
Pyrene	350 U	420 U	88 J	1300	SWMU303-IS04-00	2/8	694	694
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.3	5.9	SWMU303-IS01-03	6/8	2.93	2.6
Barium	21.3 U	25.5 U	40.3	107	SWMU303-IS03-00	4/8	61.4	49.15
Cadmium	0.53 U	0.62 U	0.69	1.5	SWMU303-IS03-03	3/8	1.1	1.1
Chromium	ND	ND	6.7	33.9	SWMU303-IS03-03	8/8	14.38	11.85
Lead	ND	ND	3.3	21.2	SWMU303-IS03-03	8/8	11.44	11.2
Selenium	0.53 U	0.64 U	0.66	0.79	SWMU303-IS04-03	2/8	0.73	0.73

TABLE 2
STATISTICAL SUMMARY
SWMU 303
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS515 - AST-E, HMM 266 HMM 261
MCB, CAMP LEJUENE, NORTH CAROLINA

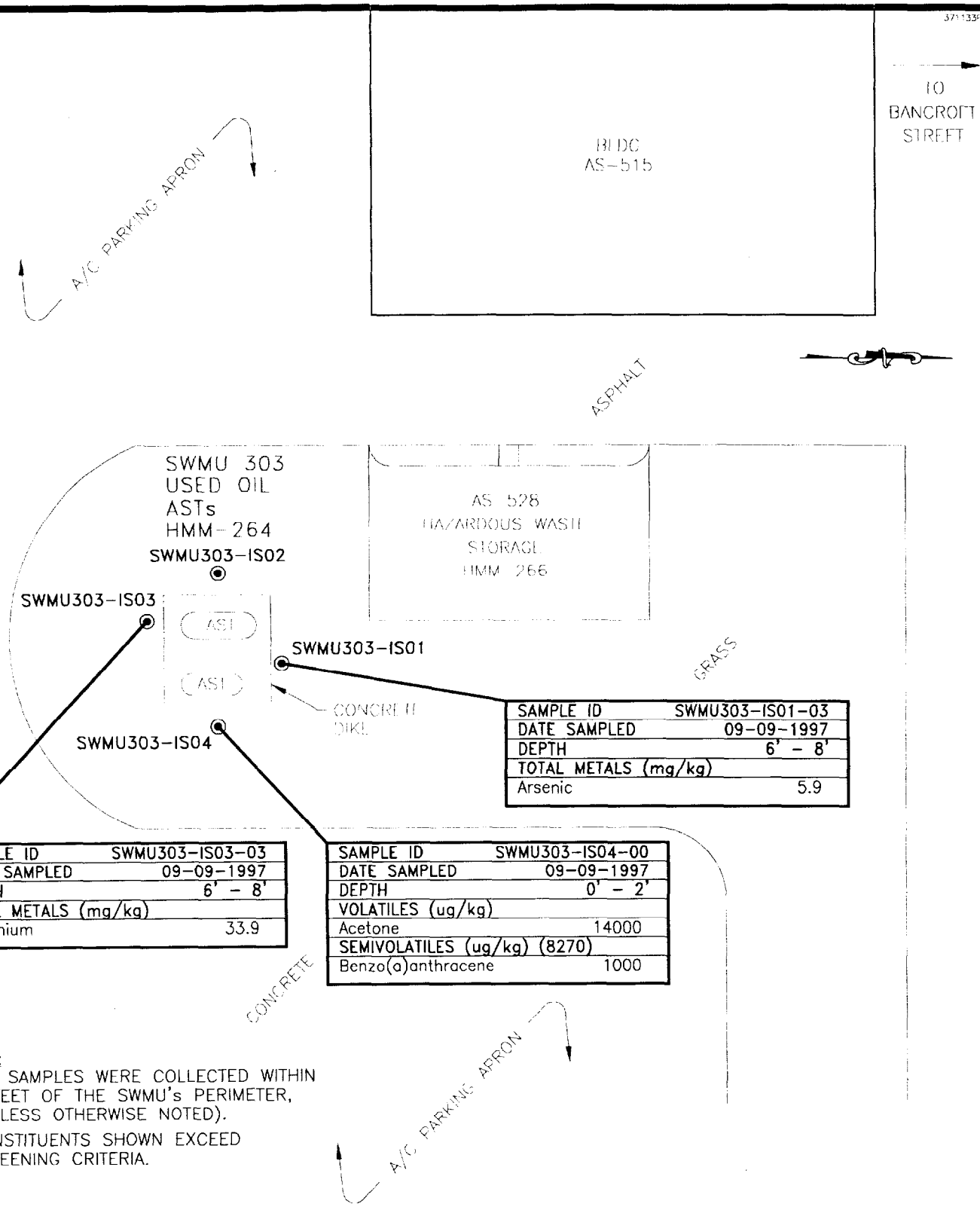
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
2-Butanone	14 J	14 J	SWMU303-IS02-03	1000000000	200000000	692	0	0	0
Acetone	30	14000	SWMU303-IS04-00	200000000	40000000	2810	0	0	1
Methylene chloride	1.9 J	8	SWMU303-IS01-00	760000	760000	22.1	0	0	0
VOLATILES (ug/kg) (8020)									
1,4-Dichlorobenzene	1.3	3.5	SWMU303-IS03-03	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Benzo(a)anthracene	52 J	1000	SWMU303-IS04-00	7800	7800	343	0	0	1
Benzo(a)pyrene	59 J	650	SWMU303-IS04-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	71 J	1100	SWMU303-IS04-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	200 J	200 J	SWMU303-IS04-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	37 J	350 J	SWMU303-IS01-03,SWMU303-IS04-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	55 J	340 J	SWMU303-IS01-03	410000	410000	6670	0	0	0
Butyl benzyl phthalate	86 J	86 J	SWMU303-IS04-00	410000000	82000000	27800	0	0	0
Chrysene	82 J	830	SWMU303-IS04-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	42 J	42 J	SWMU303-IS04-00	780	780	NE	0	0	0
Di-n-butyl phthalate	1800	1800	SWMU303-IS04-00	NE	NE	NE	0	0	0
Fluoranthene	1400	1400	SWMU303-IS04-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	250 J	250 J	SWMU303-IS04-00	7800	7800	NE	0	0	0
Phenol	160 J	160 J	SWMU303-IS04-00	1000000000	200000000	1746	0	0	0
Pyrene	88 J	1300	SWMU303-IS04-00	61000000	12264000	286440	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 303
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS515 - AST-E, HMM 266 HMM 261
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.3	5.9	SWMU303-IS01-03	3.8	3.8	26.2	1	1	0
Barium	40.3	107	SWMU303-IS03-00	140000	28000	848	0	0	0
Cadmium	0.69	1.5	SWMU303-IS03-03	1000	200	2.72	0	0	0
Chromium	6.7	33.9	SWMU303-IS03-03	10000	2000	27.2	0	0	1
Lead	3.3	21.2	SWMU303-IS03-03	NE	400	270.06	0	0	0
Selenium	0.66	0.79	SWMU303-IS04-03	10000	2000	12.2	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU303-IS01-03
DATE SAMPLED	09-09-1997
DEPTH	6' - 8'
TOTAL METALS (mg/kg)	
Arsenic	5.9

SAMPLE ID	SWMU303-IS03-03
DATE SAMPLED	09-09-1997
DEPTH	6' - 8'
TOTAL METALS (mg/kg)	
Chromium	33.9

SAMPLE ID	SWMU303-IS04-00
DATE SAMPLED	09-09-1997
DEPTH	0' - 2'
VOLATILES (ug/kg)	
Acetone	14000
SEMIVOLATILES (ug/kg) (8270)	
Benzo(a)anthracene	1000

NOTE:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM
ug/kg – MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 303
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.33 SWMU 304 - BA103 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.33.1 SWMU Description and History

SWMU 304 is an oil/water separator located near Building BA130 on Ocean Drive. The oil/water separator has been in operation since 1980. It is an in-ground structure connected to a drain field. Due to hurricane damage, SWMU 304 was inaccessible during the site visit conducted by Baker in 1996. Swbody?

4.33.2 Confirmatory Investigation Activities

To determine if contamination resides in the soils surrounding SWMU 304, four soil borings (SWMU304-IS01 through SWMU304-IS04) were advanced approximately 3 feet from the SWMU perimeter on each side of the oil/water separator. The sample locations are depicted on Figure 1. During advancement of the soil borings, split-spoon samples were collected continuously to a total depth of 8.0 feet bgs. Groundwater was encountered at a depth of 6.0 feet bgs. One surface soil sample and one subsurface soil sample were collected from each boring in accordance with the Final Project Plans submitted in August, 1997.

The surface soil samples, SWMU304-IS01-00 through SWMU304-IS04-00, were collected from 0 to 2.0 feet bgs. The subsurface soil samples, SWMU304-IS02-01 through SWMU304-IS04-01, were collected from a depth of 2.0 to 4.0 feet bgs. The subsurface soil sample, SWMU304-IS01-02, was collected from just above the water table at a depth of 4 feet to 6 feet. The analytical data from the surface and subsurface soil samples are presented in Appendix D. A duplicate sample, SWMU304-IS02-01D, was also collected from this interval. Duplicate sample results are presented in Appendix E. All soil samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270), and RCRA metals (EPA Method 6010/7410).

Equipment rinsate blank 371ER07A was collected from a split spoon sampler used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB12 and 371TB13 were shipped with the volatile fractions of the soil samples. The results are included in Appendix F. Two field blanks, 371FB01 and 371FB02, were also collected as described in Section 3.5 of this report. The analytical results of the field blanks are presented in Appendix F.

4.33.3 Investigation Findings

A total of eight samples were obtained at SWMU 304 and submitted for the analyses previously mentioned. Table 1 presents the positive detection results. Table 2 presents the comparison of the positive detections to a specific set of screening criteria. The criteria include:

- USEPA Region III Industrial RBCs
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

As shown on Table 1, there were no VOCs detected in any of the soil samples collected.

As presented in Table 1, two SVOCs were detected in the soil samples submitted for laboratory analysis: bis(2-ethylhexyl)phthalate and fluoranthene. As shown in Table 2, none of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria. Fluoranthene, a noncarcinogenic PAH, was detected in the soil samples SWMU304-IS02-00 and SWMU304-IS03-01 at estimated concentrations of 42J and 47J µg/kg, respectively. However, as shown in Table 2, the detected concentration of fluoranthene did not exceed USEPA Region III Industrial RBCs or state criteria.

Four of the eight RCRA metals were detected in the surface and subsurface soil samples collected at SWMU 304. Arsenic, cadmium, chromium, and lead were detected at location SWMU304-IS01, while arsenic, chromium, and lead were detected at locations SWMU304-IS02 through SWMU304-IS04. As shown in Table 2, none of the detected concentrations of metals exceeded USEPA Region III Industrial RBCs or state criteria.

4.33.4 Recommendations

No further action is recommended for SWMU 304. The SVOCs and metals detected in the samples collected from SWMU 304 did not exceed any of the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 304
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA130 - O/W, MOTOR T, 2D RECON BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU304-IS01-00	SWMU304-IS01-02	SWMU304-IS02-00	SWMU304-IS02-01	SWMU304-IS03-00	SWMU304-IS03-01
DATE SAMPLED	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND	ND	ND
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	100 J	210 J	130 J	120 J	120 J	140 J
Fluoranthene	370 U	350 U	42 J	350 U	330 U	47 J
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1	1.5	1.9	1.2	1.6	1.4
Cadmium	0.56 U	0.65	0.53 U	0.53 U	0.51 U	0.52 U
Chromium	11.9	11.1	7.9	7	8.2	8.8
Lead	2.6	10.6	12.8	14.2	15.6	16.8

Notes:
ND = Compounds analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 304
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA130 - O/W, MOTOR T, 2D RECON BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU304-IS04-00	SWMU304-IS04-01
DATE SAMPLED	09-14-1997	09-14-1997
DEPTH	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)	ND	ND
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	140 J	110 J
Fluoranthene	360 U	350 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.6	2
Cadmium	0.54 U	0.53 U
Chromium	10.7	9.7
Lead	13.7	21.9

Notes:

ND = Compounds analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 304
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA130 - O/W, MOTOR T, 2D RECON BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/8	ND	ND
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	100 J	210 J	SWMU304-IS01-02	8/8	133.75	125
Fluoranthene	330 U	370 U	42 J	47 J	SWMU304-IS03-01	2/8	44.5	44.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	ND	ND	1.1	2	SWMU304-IS04-01	8/8	1.54	1.55
Cadmium	0.51 U	0.56 U	0.65	0.65	SWMU304-IS01-02	1/8	0.65	0.65
Chromium	ND	ND	7	11.9	SWMU304-IS01-00	8/8	9.41	9.25
Lead	ND	ND	2.6	21.9	SWMU304-IS04-01	8/8	13.53	13.95

Notes:

ND = Compounds analyzed but not detected.

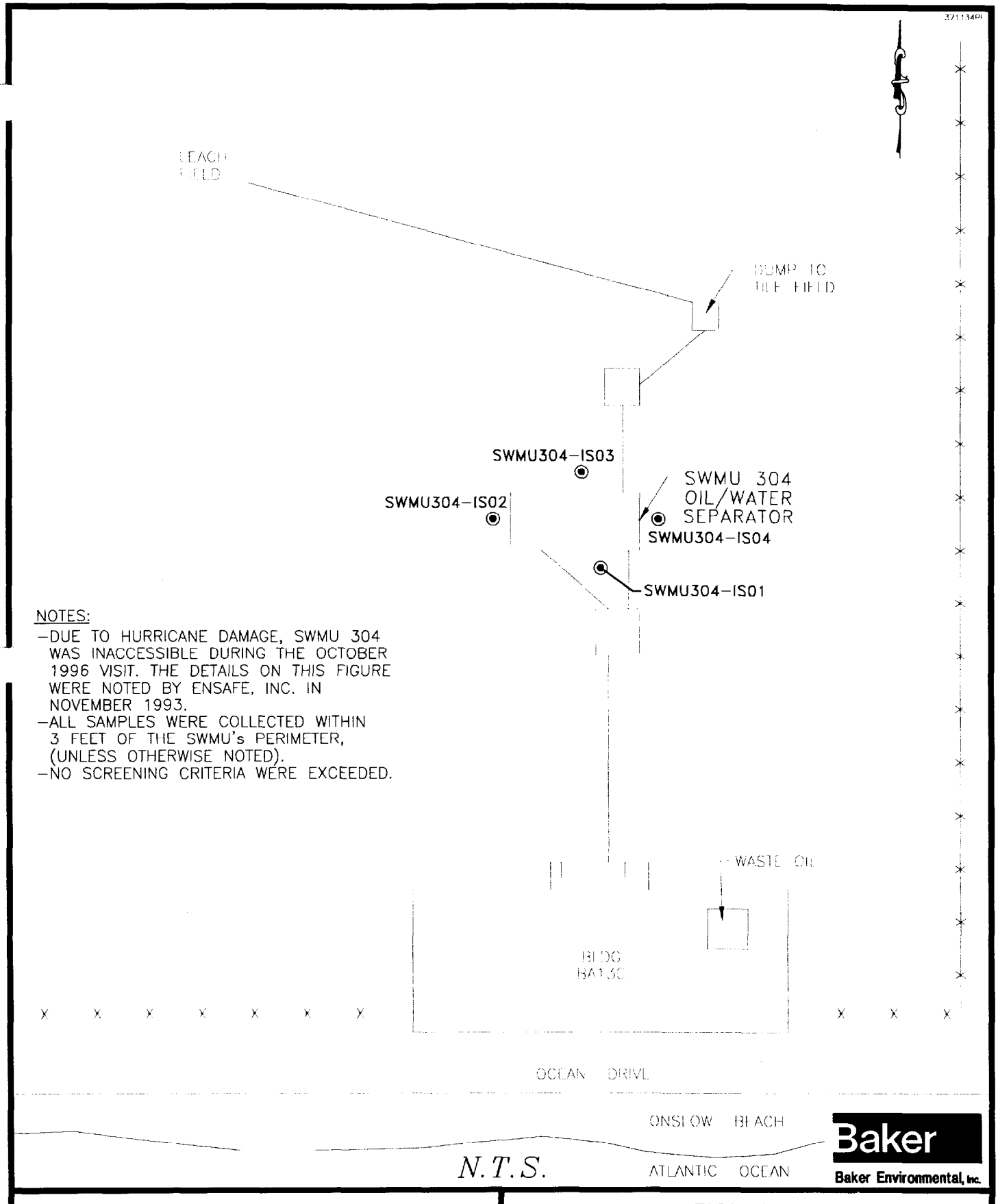
TABLE 2
STATISTICAL SUMMARY
SWMU 304
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA130 - O/W, MOTOR T, 2D RECON BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	100 J	210 J	SWMU304-IS01-02	410000	410000	6670	32900
Fluoranthene	42 J	47 J	SWMU304-IS03-01	82000000	16400000	276080	131000
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.1	2	SWMU304-IS04-01	3.8	3.8	26.2	65.5
Cadmium	0.65	0.65	SWMU304-IS01-02	1000	200	2.72	2.72
Chromium	7	11.9	SWMU304-IS01-00	10000	2000	27.2	NE
Lead	2.6	21.9	SWMU304-IS04-01	NE	400	270.06	1130

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 304
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BA130 - O/W, MOTOR T, 2D RECON BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
Fluoranthene	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Cadmium	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0



NOTES:

- DUE TO HURRICANE DAMAGE, SWMU 304 WAS INACCESSIBLE DURING THE OCTOBER 1996 VISIT. THE DETAILS ON THIS FIGURE WERE NOTED BY ENSAFE, INC. IN NOVEMBER 1993.
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- NO SCREENING CRITERIA WERE EXCEEDED.

Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 304
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.34 SWMU 305 BB224-Pile

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.34.1 SWMU Description and History

SWMU 305 is a soil pile that was located near Jackson Street in the vicinity of Building BB82. The soil pile was removed prior to October of 1996. The soil pile reportedly contained grease and contaminated soil. During the site visit conducted by Baker in 1996, it was noted that there was very little evidence of the location of the pile.

4.34.2 Confirmatory Investigation Activities

To confirm if any residual contamination remained in the area following the removal of the soil pile, three soil borings were advanced in the area where the soil mound was identified during previous investigations. These borings, SWMU305-IS01, SWMU305-IS02, and SWMU305-IS03, were located approximately 15, 25, and 35 feet, respectively, west of Jackson Street. The sample locations are depicted on Figure 1. During advancement of the soil borings, split-spoon samples were collected continuously to a total depth of 4.0 feet bgs. Groundwater was encountered at a depth of 4.0 feet bgs. One surface soil sample and one subsurface soil sample were collected from each boring in accordance with the Final Project Plans submitted in August, 1997.

The surface soil samples, SWMU305-IS01-00 through SWMU305-IS03-00, were collected from 0 to 2.0 feet bgs. The subsurface soil samples, SWMU305-IS01-01 through SWMU305-IS03-01, were collected from just above the water table at a depth of 2.0 to 4.0 feet bgs. The analytical data from the surface and subsurface soil samples are presented in Appendix D. A duplicate sample, SWMU305-IS02-01D, was also collected from this interval. Duplicate sample results are presented in Appendix E. All soil samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270), pesticides PCBs (EPA Method 8080), and RCRA metals (EPA Method 6010/7410).

Equipment rinsate blank 371ER07A was collected from a split spoon sampler used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB10, 371TB11, 371TB12 and 371TB13 were shipped with the volatile fractions of the soil samples. The results are included in Appendix F. Two field blanks, 371FB01 and 371FB02, were also collected as described in Section 3.5 of this report. The analytical results of the field blanks are presented in Appendix F.

4.34.3 Investigation Findings

A total of six samples were obtained at SWMU 305 and submitted for the analyses previously mentioned. Table 1 presents the positive detection results. Table 2 presents the comparison of the positive detections to a specific set of screening criteria. The criteria include:

- USEPA Region III Industrial Risk-Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protectived of groundwater which migrates to surface water) Target Concentrations

As presented in Table 1, two VOCs were detected in the soil samples submitted for laboratory analysis: 1,4-dichlorobenzene and toluene. 1,4-Dichlorobenzene was detected in SWMU305-IS01-01, SWMU305-IS02-01, and SWMU305-IS03-00 at concentrations of 1.5, 1.9, and 1.9 µg/kg, respectively. Toluene was detected in two subsurface soil samples, SWMU305-IS01-01 and SWMU30-5-IS02-01, at concentrations of 4.2 and 2.2 µg/kg, respectively. As shown in Table 2, the detected concentrations of 1,4-dichlorobenzene did not exceed the USEPA Region III Industrial RBC or state criteria. Toluene was detected in two subsurface sol samples, SWMU305-IS01-01 and SWMU305-IS02-01, at concentrations of 4.2 and 2.2 µg/kg, respectively. As shown in Table 2, the detected concentration of toluene did not exceed USEPA Region III Industrial RBC or state criteria.

As presented in Table 1, two SVOCs were detected in the soil samples submitted for laboratory analysis: bis(2-ethylhexyl)phthalate and fluoranthene. Bis(2-ethylhexyl)phthalate was detected in all soil samples collected. The detected (estimated) concentrations ranged from 72J to 120J µg/kg. As shown in Table 2, none of the detected concentrations of bis(2-ethylhexyl)phthalate exceeded the USEPA Region III Industrial RBC or state criteria. Fluoranthene, a noncarcinogenic PAH, was detected in the surface soil sample SWMU305-IS03-00 at an estimated concentration of 48J µg/kg. However, as shown in Table 2, the detected concentration of fluoranthene did not exceed the USEPA Region III Industrial RBC or state criteria.

As presented in Table 1, two pesticides were detected in the soil samples submitted for laboratory analysis: 4,4'-DDE and 4,4'-DDT. 4,4'-DDE was detected in surface soil samples SWMU305-IS01-00 and SWMU305-IS02-00 at 27 and 8.4 µg/kg, respectively. However, as shown in Table 2, the detected concentrations of 4,4'-DDE did not exceed the USEPA Region III Industrial RBC or state criteria. 4,4'-DDT was detected in all surface soil samples (SWMU305-IS01-00, SWMU305-IS02-00, and SWMU305-IS03-00) at concentrations ranging from 4.6 to 5.6 µg/kg. However, as shown in Table 2, the detected concentrations of 4,4'-DDT did not exceed the USEPA Region III Industrial RBC or state criteria. There were no PCBs detected in any of the soil samples collected.

Four of the eight RCRA metals were detected in the surface and subsurface soil samples collected at SWMU 305. Arsenic, chromium, lead, and selenium were detected at location SWMU305-IS01; chromium and lead were detected at location SWMU305-IS02; and arsenic, chromium, and lead were detected at location SWMU305-IS03. As shown in Table 2, none of the detected concentrations of metals exceeded the USEPA Region III Industrial RBCs or state criteria.

4.34.4 Recommendations

No further action is recommended for SWMU 305. The VOCs, SVOCs, pesticides, and metals detected in the samples collected from SWMU 305 did not exceed any of the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 305
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB224 - PILE, MCB
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU305-IS01-00	SWMU305-IS01-01	SWMU305-IS02-00	SWMU305-IS02-01	SWMU305-IS03-00	SWMU305-IS03-01
DATE SAMPLED	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997	09-14-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)						
1,4-Dichlorobenzene	1.1 U	1.5	1.1 U	1.9	1.9	1.2 U
Toluene	1.1 U	4.2	1.1 U	2.2	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	72 J	96 J	74 J	110 J	110 J	120 J
Fluoranthene	370 U	390 U	370 U	380 U	48 J	400 U
PESTICIDES/PCBS (ug/kg) (8080)						
4,4'-DDE	27	2 U	8.4	3.9 U	3.9 U	4.1 U
4,4'-DDT	5.6	2 U	4.8	3.9 U	4.6	4.1 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	2.3	1.1 U	1.1 U	1.4	1.2 U
Chromium	3.9	11.4	3.7	2.8	5.5	2.4
Lead	14.5	6.7	20.6	6.7	15.1	2.1
Selenium	0.57 U	0.94	0.56 U	0.57 U	0.57 U	0.6 U

TABLE 1
DETECTION SUMMARY
SWMU 305
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB224 - PILE, MCB
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,4-Dichlorobenzene	1.1 U	1.2 U	1.5	1.9	SWMU305-IS02-01,SWMU305-IS03-00	3/6	1.77	1.9
Toluene	1.1 U	1.2 U	2.2	4.2	SWMU305-IS01-01	2/6	3.2	3.2
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	72 J	120 J	SWMU305-IS03-01	6/6	97	103
Fluoranthene	370 U	400 U	48 J	48 J	SWMU305-IS03-00	1/6	48	48
PESTICIDES/PCBS (ug/kg) (8080)								
4,4'-DDE	2 U	4.1 U	8.4	27	SWMU305-IS01-00	2/6	17.7	17.7
4,4'-DDT	2 U	4.1 U	4.6	5.6	SWMU305-IS01-00	3/6	5	4.8
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.4	2.3	SWMU305-IS01-01	2/6	1.85	1.85
Chromium	ND	ND	2.4	11.4	SWMU305-IS01-01	6/6	4.95	3.8
Lead	ND	ND	2.1	20.6	SWMU305-IS02-00	6/6	10.95	10.6
Selenium	0.56 U	0.6 U	0.94	0.94	SWMU305-IS01-01	1/6	0.94	0.94

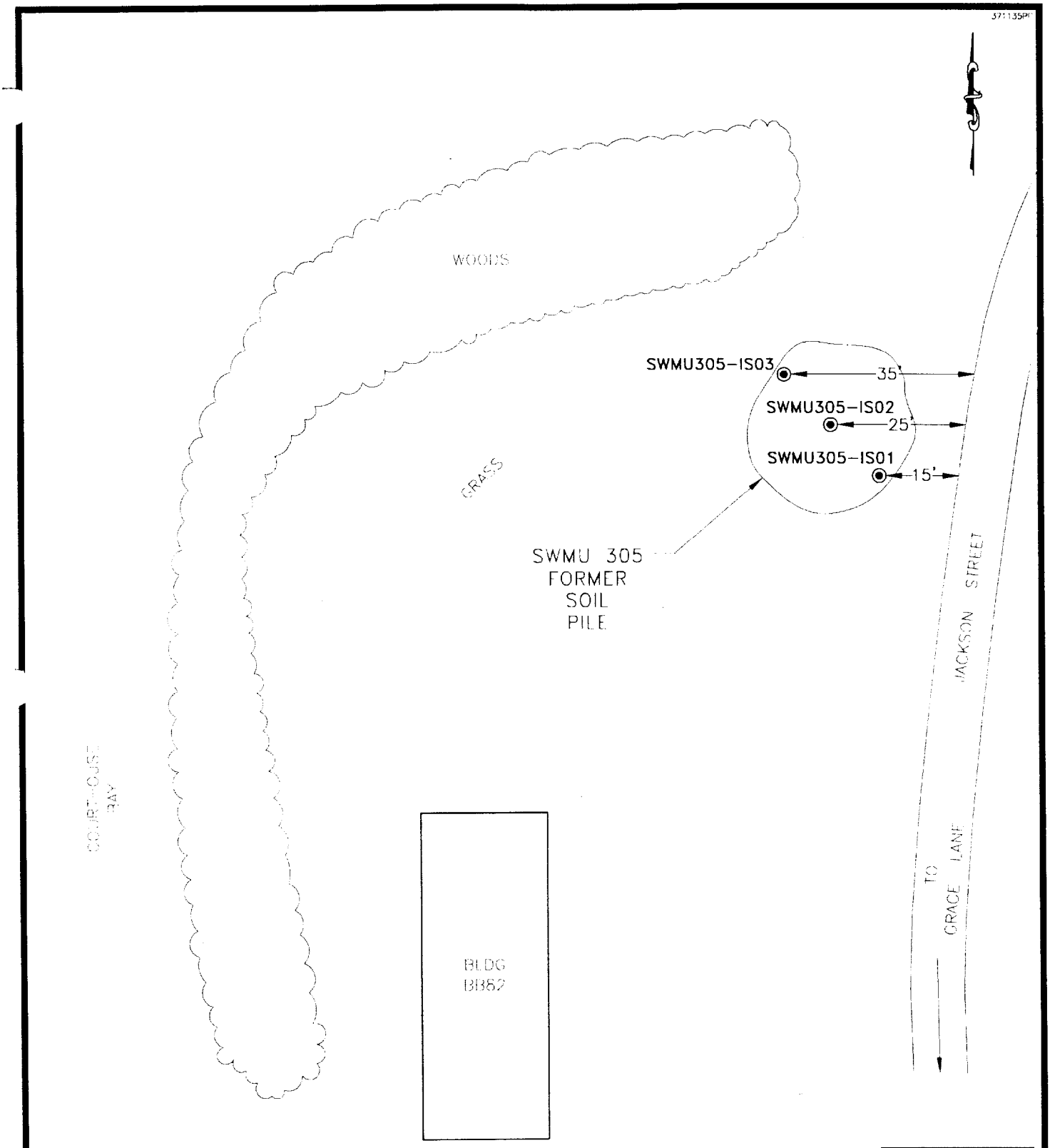
TABLE 2
STATISTICAL SUMMARY
SWMU 305
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB224 - PILE, MCB
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8020)							
1,4-Dichlorobenzene	1.5	1.9	SWMU305-IS02-01,SWMU305-IS03-00	240000	240000	1240	NE
Toluene	2.2	4.2	SWMU305-IS01-01	410000000	82000000	7275	200
SEMIVOLATILES (ug/kg) (8270)							
bis(2-Ethylhexyl) phthalate	72 J	120 J	SWMU305-IS03-01	410000	410000	6670	32900
Fluoranthene	48 J	48 J	SWMU305-IS03-00	82000000	16400000	276080	131000
PESTICIDES/PCBS (ug/kg) (8080)							
4,4'-DDE	8.4	27	SWMU305-IS01-00	17000	17000	NE	NE
4,4'-DDT	4.6	5.6	SWMU305-IS01-00	17000	17000	NE	NE
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.4	2.3	SWMU305-IS01-01	3.8	3.8	26.2	65.5
Chromium	2.4	11.4	SWMU305-IS01-01	10000	2000	27.2	NE
Lead	2.1	20.6	SWMU305-IS02-00	NE	400	270.06	1130
Selenium	0.94	0.94	SWMU305-IS01-01	10000	2000	12.2	3.05

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 305
SWMU CONFIRMATORY SAMPLING (CTO-0371)
BB224 - PILE, MCB
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8020)				
1,4-Dichlorobenzene	0	0	0	0
Toluene	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
bis(2-Ethylhexyl) phthalate	0	0	0	0
Fluoranthene	0	0	0	0
PESTICIDES/PCBS (ug/kg) (8080)				
4,4'-DDE	0	0	0	0
4,4'-DDT	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0
Selenium	0	0	0	0



NOTE: NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 305
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.35 SWMU 306 - FC230 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.35.1 SWMU Description and History

SWMU 306 consists of an oil/water separator that is associated with a vehicle wash area. The SWMU is located in the Hadnot Point Industrial Area, southeast of the intersection of Daly and Main Service Roads. The oil/water separator and vehicle wash area are situated in an asphalt paved, fenced-in area between Building FC-230 and Daly Road. The separator is a concrete, in-ground unit that was installed in 1988 and is still active. The concrete vault measures 8 feet by 20 feet by 12 feet. Fluids are conveyed from the structure to the waste water treatment plant. At the time of the investigation, the wash rack pit was filled with water. Stains were observed both on the soils along the fence line, and on the inside of the oil/water separator. A site plan is presented on Figure 1.

4.35.2 Confirmatory Investigation Activities

The soil investigation for SWMU 306 was developed to determine if the presence of the oil/water separator and wash area impacted surface and subsurface soils in the vicinity of the SWMU.

Four borings, SWMU306-IS01, SWMU306-IS02, and SWMU306-IS03, and SWMU306-IS04 were advanced at the SWMU on September 12, 1997, at the locations depicted on Figure 1. Two samples were collected from each boring. One sample from each boring was collected from the ground surface to 2.0 feet bgs (SWMU306-IS01-00, SWMU306-IS02-00, and SWMU306-IS03-00, and SWMU306-IS04-00), and from just above the water table at a depth of 4.0 to 6.0 feet bgs (SWMU306-IS01-02, SWMU306-IS02-02, and SWMU306-IS03-02, and SWMU306-IS04-02). Groundwater was encountered at a depth of approximately 6.0 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Methods 8020 and 8260A), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. One duplicate sample (SWMU306-IS02-02D) was collected at the SWMU. The analytical results for the duplicate are presented in Appendix E. An equipment rinsate blank 371ER05B was collected from a stainless-steel sampling spoon which was used to collect soil samples from the SWMU. Results for the rinsate blank are included in Appendix F. Trip blanks 371TB06, 371TB07, 371TB08, 371TB09, 371TB10, and 371TB11 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.35.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Two VOCs, and one SVOC were detected in the sample set. No detected organic compounds were present at a levels exceeding the aforementioned comparison criteria.

Six metals were detected in the sample set. Two metals were detected at concentrations exceeding the aforementioned screening criteria. The concentration of mercury (0.041 mg/kg, 0.039 and 0.037 mg/kg) in three samples (SWMU306-IS02-02, SWMU306-IS03-02 and SWMU306-IS04-02, respectively) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (0.0154 mg/kg). The concentration of silver (1.5 mg/kg) in one sample (SWMU306-IS04-02) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (0.223 mg/kg). No other criteria for the remaining analyzed metals were exceeded in any of the remaining samples.

4.35.4 Recommendations

Based on the analytical results, a limited additional investigation is recommended for SWMU 306. This investigation would consist of a soil boring to confirm the results for silver. Soil samples collected during this investigation would be analyzed for metals.

only silver for this sample

TABLE 1
DETECTION SUMMARY
SWMU 306
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC230 - O/W-1, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU306-IS01-00	SWMU306-IS01-02	SWMU306-IS02-00	SWMU306-IS02-02	SWMU306-IS03-00	SWMU306-IS03-02
DATE SAMPLED	09-12-1997	09-12-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	4' - 6'	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)						
Acetone	23 U	23 U	23 U	67 J	24 U	23 U
Methylene chloride	5.6 U	5.8 U	2.2 J	2 J	2.7 J	2.8 J
VOLATILES (ug/kg) (8020)						
1,4-Dichlorobenzene	1.1 U	1.2 U	1.6	1.2 U	1.2 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	370 J	64 J	180 J	94 J	86 J	270 J
Butyl benzyl phthalate	370 U	380 U	380 U	380 U	390 U	390 U
TOTAL METALS (mg/kg) (6010/7410)						
Barium	22.6 U	23.2 U	23.2 U	37.4	23.8 U	23.3 U
Cadmium	0.56 U	0.58 U	0.58 U	0.58 U	0.6 U	0.58 U
Chromium	6.8	6.4	7.9	11	5	4.6
Lead	7.8	4	6.8	5.3	7.3	6.6
Mercury	0.037 U	0.038 U	0.038 U	0.041	0.039 U	0.039
Silver	1.1 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U

TABLE 1
DETECTION SUMMARY
SWMU 306
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC230 - O/W-1, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU306-IS04-00	SWMU306-IS04-02
DATE SAMPLED	09-12-1997	09-13-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)		
Acetone	25 U	26 J
Methylene chloride	6.2 U	5.6 U
VOLATILES (ug/kg) (8020)		
1,4-Dichlorobenzene	1.2 U	1.1 U
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	510 J	62 J
Butyl benzyl phthalate	82 J	370 U
TOTAL METALS (mg/kg) (6010/7410)		
Barium	24.8 U	22.2 U
Cadmium	1.7	0.56 U
Chromium	6.7	6.2
Lead	10.9	4.6
Mercury	0.041 U	0.037
Silver	1.2 U	1.5

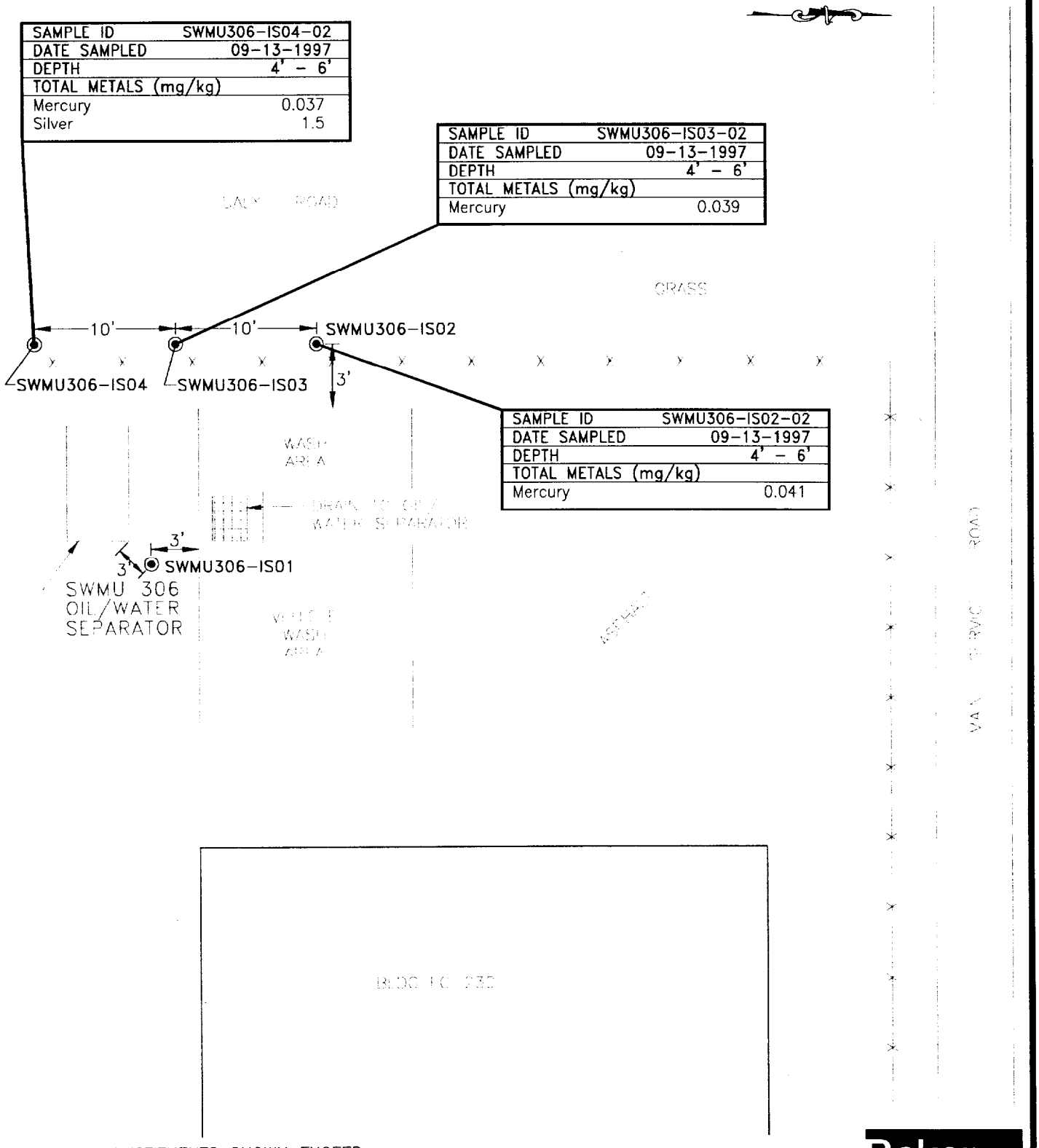
TABLE 1
DETECTION SUMMARY
SWMU 306
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC230 - O/W-1, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	23 U	25 U	26 J	67 J	SWMU306-IS02-02	2/8	46.5	46.5
Methylene chloride	5.6 U	6.2 U	2 J	2.8 J	SWMU306-IS03-02	4/8	2.43	2.45
VOLATILES (ug/kg) (8020)								
1,4-Dichlorobenzene	1.1 U	1.2 U	1.6	1.6	SWMU306-IS02-00	1/8	1.6	1.6
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	62 J	510 J	SWMU306-IS04-00	8/8	204.5	137
Butyl benzyl phthalate	370 U	390 U	82 J	82 J	SWMU306-IS04-00	1/8	82	82
TOTAL METALS (mg/kg) (6010/7410)								
Barium	22.2 U	24.8 U	37.4	37.4	SWMU306-IS02-02	1/8	37.4	37.4
Cadmium	0.56 U	0.6 U	1.7	1.7	SWMU306-IS04-00	1/8	1.7	1.7
Chromium	ND	ND	4.6	11	SWMU306-IS02-02	8/8	6.83	6.55
Lead	ND	ND	4	10.9	SWMU306-IS04-00	8/8	6.66	6.7
Mercury	0.037 U	0.041 U	0.037	0.041	SWMU306-IS02-02	3/8	0.04	0.04
Silver	1.1 U	1.2 U	1.5	1.5	SWMU306-IS04-02	1/8	1.5	1.5

TABLE 2
STATISTICAL SUMMARY
SWMU 306
SWMU CONFIRMATORY SAMPLING (CTO-0371)
FC230 - O/W-1, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
Acetone	26 J	67 J	SWMU306-IS02-02	200000000	40000000	2810	0	0	0
Methylene chloride	2 J	2.8 J	SWMU306-IS03-02	760000	760000	22.1	0	0	0
VOLATILES (ug/kg) (8020)									
1,4-Dichlorobenzene	1.6	1.6	SWMU306-IS02-00	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	62 J	510 J	SWMU306-IS04-00	410000	410000	6670	0	0	0
Butyl benzyl phthalate	82 J	82 J	SWMU306-IS04-00	410000000	82000000	27800	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Barium	37.4	37.4	SWMU306-IS02-02	140000	28000	848	0	0	0
Cadmium	1.7	1.7	SWMU306-IS04-00	1000	200	2.72	0	0	0
Chromium	4.6	11	SWMU306-IS02-02	10000	2000	27.2	0	0	0
Lead	4	10.9	SWMU306-IS04-00	NE	400	270.06	0	0	0
Mercury	0.037	0.041	SWMU306-IS02-02	610	122	0.0154	0	0	3
Silver	1.5	1.5	SWMU306-IS04-02	10000	2000	0.223	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE: CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 306
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.36 SWMU 307 - G649 Wash Rack

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.36.1 SWMU Description and History

SWMU 307 is a concrete oil/water separator and associated vehicle wash. The oil/water separator measures approximately 10 feet by 25 feet. Water from the wash rack is collected and transported by underground pipelines to the oil/water separator (SWMU 307). The oil/water separator is located west/northwest of the vehicle wash rack. A steam plant building (G-650) is located west/northwest of the oil/water separator and two aboveground storage tanks (ASTs) are located southwest of the separator.

4.36.2 Confirmatory Investigation Activities

The soil investigation at SWMU 307 was developed to determine if the operation of the oil/water separator has impacted the surface and subsurface soils in the area of the and vehicle wash rack.

A total of four soil borings, SWMU307-IS01 through SWMU307-IS04, were installed on September 9, 1997. Figure 1 presents the locations of the soil borings. One surface and one subsurface soil sample were collected from each boring and submitted for analysis. Surface soil samples were collected from ground surface to 2.0 feet bgs and subsurface samples were collected from just above the water table at a depth of 4.0 to 6.0 feet bgs. Groundwater was encountered at a depth of six feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Methods 8020 and 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER02A, associated with September 9th sample collection, was collected from a split spoon sampler used at SWMU 317. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB02, 371TB03 and 371TB04 were shipped with the VOA fraction of the soil samples. The results for the trip blanks are included in Appendix F.

4.36.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Five VOCs and one SVOC were detected in the sample set.

No VOCs and SVOCs were detected above the screening criteria.

Five metals were detected in the sample set. Mercury was the only metal detected above comparison criteria. Sample SWMU307-IS02-02 exhibited a mercury concentration of 0.14 mg/kg which is above the North Carolina Category S-3:G-1 Target Concentration (0.0154 mg/kg). No metals were detected in the rinsate blank for this day's sampling.

Soil Boring SWMU307-IS02, located west of the oil/water separator, exhibited the only sample with a compound concentration above the screening criteria. Refer to Figure 1 for the location of this boring.

4.36.4 Recommendations

No further action is recommended for SWMU 307. No VOCs or SVOCs were detected in exceedence of screening criteria. The detection of mercury above state criteria does not indicate impact from the oil/water separator.

TABLE 1
DETECTION SUMMARY
SWMU 307
SWMU CONFIRMATORY SAMPLING (CTO-0371)
G649 - RACK, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU307-IS01-00	SWMU307-IS01-03	SWMU307-IS02-00	SWMU307-IS02-02	SWMU307-IS03-00	SWMU307-IS03-02
LAB ID	H7I110131063	H7I110131064	H7I110131065	H7I110131066	H7I110131067	H7I110131068
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	4' - 6'	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)						
Acetone	24 U	32 J	23 U	30 J	22 U	22 U
Methylene chloride	6 U	6.1 U	3 J	5.8 U	1.8 J	5.6 U
Trichloroethene	6 U	6.1 U	1.9 J	5.8 U	5.4 U	1.9 J
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	1.2 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1
1,4-Dichlorobenzene	1.2 U	1.2 U	1.1 U	2.5	4.9	5.6
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	59 J	64 J	77 J	230 J	76 J	57 J
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.2 U	1.2 U	1.1 U	1.2 U	2.3	1.1 U
Barium	28.9	31.1	23 U	23.3 U	21.6 U	22.5 U
Chromium	14.1	13.5	22.8	6.8	11	6.4
Lead	25.8	9	86.2	12.5	11.9	10.5
Mercury	0.04 U	0.04 U	0.038 U	0.14	0.036 U	0.037 U

TABLE 1
DETECTION SUMMARY
SWMU 307
SWMU CONFIRMATORY SAMPLING (CTO-0371)
G649 - RACK, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU307-IS04-00	SWMU307-IS04-02
LAB ID	H7I110131069	H7I110131070
DATE SAMPLED	09-09-1997	09-09-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)		
Acetone	26 U	23 U
Methylene chloride	6.5 U	5.8 U
Trichloroethene	2.1 J	5.8 U
VOLATILES (ug/kg) (8020)		
1,3-Dichlorobenzene	7.4	8.7
1,4-Dichlorobenzene	1.3 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	72 J	280 J
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.3 U	1.2 U
Barium	25.9 U	23.3 U
Chromium	1.8	4.7
Lead	1.9	3.9
Mercury	0.043 U	0.038 U

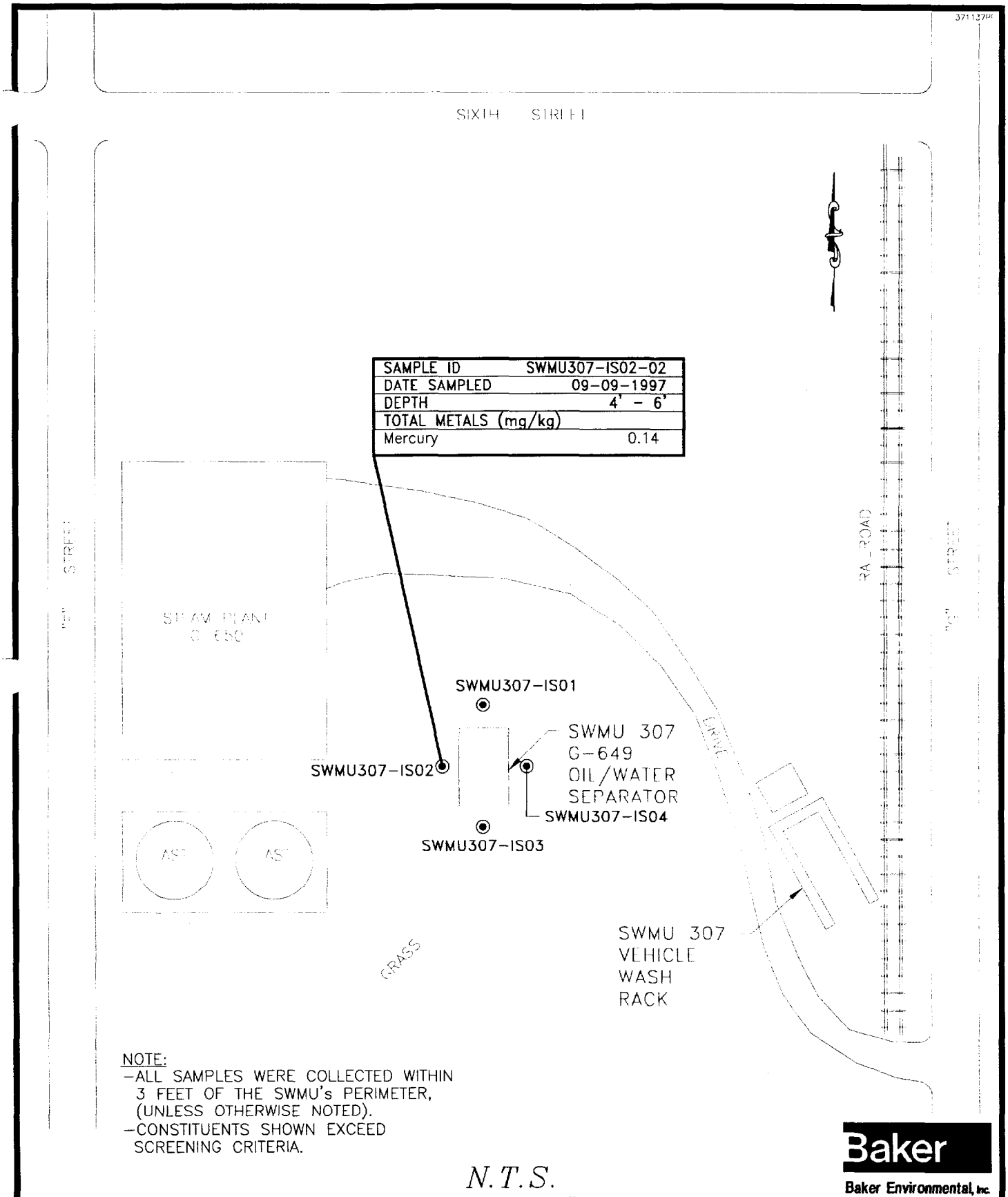
TABLE 1
DETECTION SUMMARY
SWMU 307
SWMU CONFIRMATORY SAMPLING (CTO-0371)
G649 - RACK, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID LAB ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	22 U	26 U	30 J	32 J	SWMU307-IS01-03	2/8	31	31
Methylene chloride	5.6 U	6.5 U	1.8 J	3 J	SWMU307-IS02-00	2/8	2.4	2.4
Trichloroethene	5.4 U	6.1 U	1.9 J	2.1 J	SWMU307-IS04-00	3/8	1.97	1.9
VOLATILES (ug/kg) (8020)					SWMU307-IS01-00			1
1,3-Dichlorobenzene	1.1 U	1.2 U	1.1	8.7	SWMU307-IS04-02	3/8	5.73	7.4
1,4-Dichlorobenzene	1.1 U	1.3 U	2.5	5.6	SWMU307-IS03-02	3/8	4.33	4.9
SEMIVOLATILES (ug/kg) (8270)					SWMU307-IS01-00			1
bis(2-Ethylhexyl) phthalate	ND	ND	57 J	280 J	SWMU307-IS04-02	8/8	114.38	74
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.3 U	2.3	2.3	SWMU307-IS03-00	1/8	2.3	2.3
Barium	21.6 U	25.9 U	28.9	31.1	SWMU307-IS01-03	2/8	30	30
Chromium	ND	ND	1.8	22.8	SWMU307-IS02-00	8/8	10.14	8.9
Lead	ND	ND	1.9	86.2	SWMU307-IS02-00	8/8	20.21	11.2
Mercury	0.036 U	0.043 U	0.14	0.14	SWMU307-IS02-02	1/8	0.14	0.14

TABLE 2
STATISTICAL SUMMARY
SWMU 307
SWMU CONFIRMATORY SAMPLING (CTO-0371)
G649 - RACK, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
Acetone	30 J	32 J	SWMU307-IS01-03	200000000	40000000	2810	0	0	0
Methylene chloride	1.8 J	3 J	SWMU307-IS02-00	760000	760000	22.1	0	0	0
Trichloroethene	1.9 J	2.1 J	SWMU307-IS04-00	520000	520000	18.3	0	0	0
VOLATILES (ug/kg) (8020)			SWMU307-IS01-00						
1,3-Dichlorobenzene	1.1	8.7	SWMU307-IS04-02	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	2.5	5.6	SWMU307-IS03-02	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)			SWMU307-IS01-00						
bis(2-Ethylhexyl) phthalate	57 J	280 J	SWMU307-IS04-02	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	2.3	2.3	SWMU307-IS03-00	3.8	3.8	26.2	0	0	0
Barium	28.9	31.1	SWMU307-IS01-03	140000	28000	848	0	0	0
Chromium	1.8	22.8	SWMU307-IS02-00	10000	2000	27.2	0	0	0
Lead	1.9	86.2	SWMU307-IS02-00	NE	400	270.06	0	0	0
Mercury	0.14	0.14	SWMU307-IS02-02	610	122	0.0154	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 307
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.37 SWMU 308 - GP19 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.37.1 SWMU Description and History

SWMU 308 consists of an oil/water separator (GP-19) that is associated with a vehicle wash rack. The separator is currently active and was installed in 1982. The separator is an in-ground concrete structure that measures 4 feet by 6 feet by 6 feet, and discharges to a sanitary sewer. A potential overflow area exists in a low-lying area adjacent to (approximately 10 feet away from) the separator. At the time of the October 1996 site visit, tree debris was noted in the wash area, and the drain of the vehicle wash rack was clogged. The SWMU is located in the Hadnot Point Industrial Area, just southwest of the intersection of Main Service and Daly Roads, adjacent to Building GP-19. A site plan is presented on Figure 1.

4.37.2 Confirmatory Investigation Activities

The soil investigation for SWMU 308 was developed to determine if overflow/runoff from the wash rack or oil/water separator has impacted surface and subsurface soils.

Four borings, SWMU308-IS01, SWMU308-IS02, and SWMU308 -IS03, and SWMU308-IS04 were advanced at the SWMU on September 13, 1997, at the locations depicted on Figure 1. The borings were located adjacent to the vehicle wash rack (SWMU308-IS01), adjacent to the oil/water separator (SWMU308-IS02), and within the overflow area (SWMU308-IS03 and SWMU308-IS04). Samples from each boring were collected from the ground surface to 2.0 feet bgs (SWMU308-IS01-00, SWMU308-IS02-00, and SWMU308-IS03-00, and SWMU308-IS04-00), and from just above the water table at a depth of 12.0 to 14.0 feet bgs (SWMU308-IS01-06, SWMU308-IS02-06, and SWMU308-IS03-06, and SWMU308-IS04-06). Groundwater was encountered at a depth of approximately 14.0 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8020), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. One duplicate sample (SWMU308-IS02-00D) was collected at the SWMU. Duplicate sample results are included in Appendix E. Equipment rinsate blank 371ER06A was collected from a stainless-steel sampling spatula which was used to collect soil samples from the SWMU. Results for the rinsate blank are included in Appendix F. Trip blanks 371TB06, 371TB07, 371TB08, 371TB08, 371TB09, 371TB10 and 371TB11 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.37.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs);

- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations;

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations.

As shown on Table 1, no VOCs were detected in the samples collected during the Confirmatory Sampling Investigation. Four SVOCs were detected including bis(2-chloroethyl)ether, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, and di-n-octylphthalate. The presence of these compounds is suspected to be attributable to sampling, decontamination, or analytical procedures. Three metals (cadmium, chromium, and lead) were detected.

None of the detected compounds detected at the SWMU were present at levels exceeding the aforementioned screening criteria.

4.37.4 Recommendations

No further action is recommended for SWMU 308. No VOCs were detected, and the detected SVOCs are not suspected to be related to SWMU-operations. The detected metals (cadmium, chromium, and lead) could each possibly be resultant from vehicle washing. However, the detected concentrations of these analytes were significantly below the screening criteria listed in Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 308
SWMU CONFIRMATORY SAMPLING (CTO-0371)
GP19 - O/W, 8th ENGINEERS 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU308-IS01-00	SWMU308-IS01-06	SWMU308-IS02-00	SWMU308-IS02-06	SWMU308-IS03-00	SWMU308-IS03-06
DATE SAMPLED	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997
DEPTH	0' - 2'	12' - 14'	0' - 2'	12' - 14'	0' - 2'	12' - 14'
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND	ND	ND
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Chloroethyl) ether	370 U	360 U	370 U	370 U	350 U	380 U
bis(2-Ethylhexyl) phthalate	120 J	130 J	450 J	150 J	190 J	1600 J
Di-n-butyl phthalate	370 U	360 U	370 U	370 U	350 U	380 U
Di-n-octyl phthalate	370 U	360 U	170 J	370 U	350 U	380 U
TOTAL METALS (mg/kg) (6010/7410)						
Cadmium	0.55 U	0.55 U	0.71	0.56 U	1.8	0.57 U
Chromium	7.9	5.4	6.8	4.1	5.5	6.8
Lead	12.5	2.8	16.2	3.1	20.1	5.5

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 308
SWMU CONFIRMATORY SAMPLING (CTO-0371)
GP19 - O/W, 8th ENGINEERS 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU308-IS04-00	SWMU308-IS04-06
DATE SAMPLED	09-13-1997	09-13-1997
DEPTH	0' - 2'	12' - 14'
VOLATILES (ug/kg) (8020)	ND	ND
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Chloroethyl) ether	260 J	400 U
bis(2-Ethylhexyl) phthalate	310 J	140 J
Di-n-butyl phthalate	27 J	400 U
Di-n-octyl phthalate	410 U	400 U
TOTAL METALS (mg/kg) (6010/7410)		
Cadmium	0.62 U	0.61 U
Chromium	5	4.9
Lead	19.2	3

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 308
SWMU CONFIRMATORY SAMPLING (CTO-0371)
GP19 - O/W, 8th ENGINEERS 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/8	ND	ND
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Chloroethyl) ether	350 U	400 U	260 J	260 J	SWMU308-IS04-00	1/8	260	260
bis(2-Ethylhexyl) phthalate	ND	ND	120 J	1600 J	SWMU308-IS03-06	8/8	386.25	170
Di-n-butyl phthalate	350 U	400 U	27 J	27 J	SWMU308-IS04-00	1/8	27	27
Di-n-octyl phthalate	350 U	410 U	170 J	170 J	SWMU308-IS02-00	1/8	170	170
TOTAL METALS (mg/kg) (6010/7410)								
Cadmium	0.55 U	0.62 U	0.71	1.8	SWMU308-IS03-00	2/8	1.26	1.26
Chromium	ND	ND	4.1	7.9	SWMU308-IS01-00	8/8	5.8	5.45
Lead	ND	ND	2.8	20.1	SWMU308-IS03-00	8/8	10.3	9

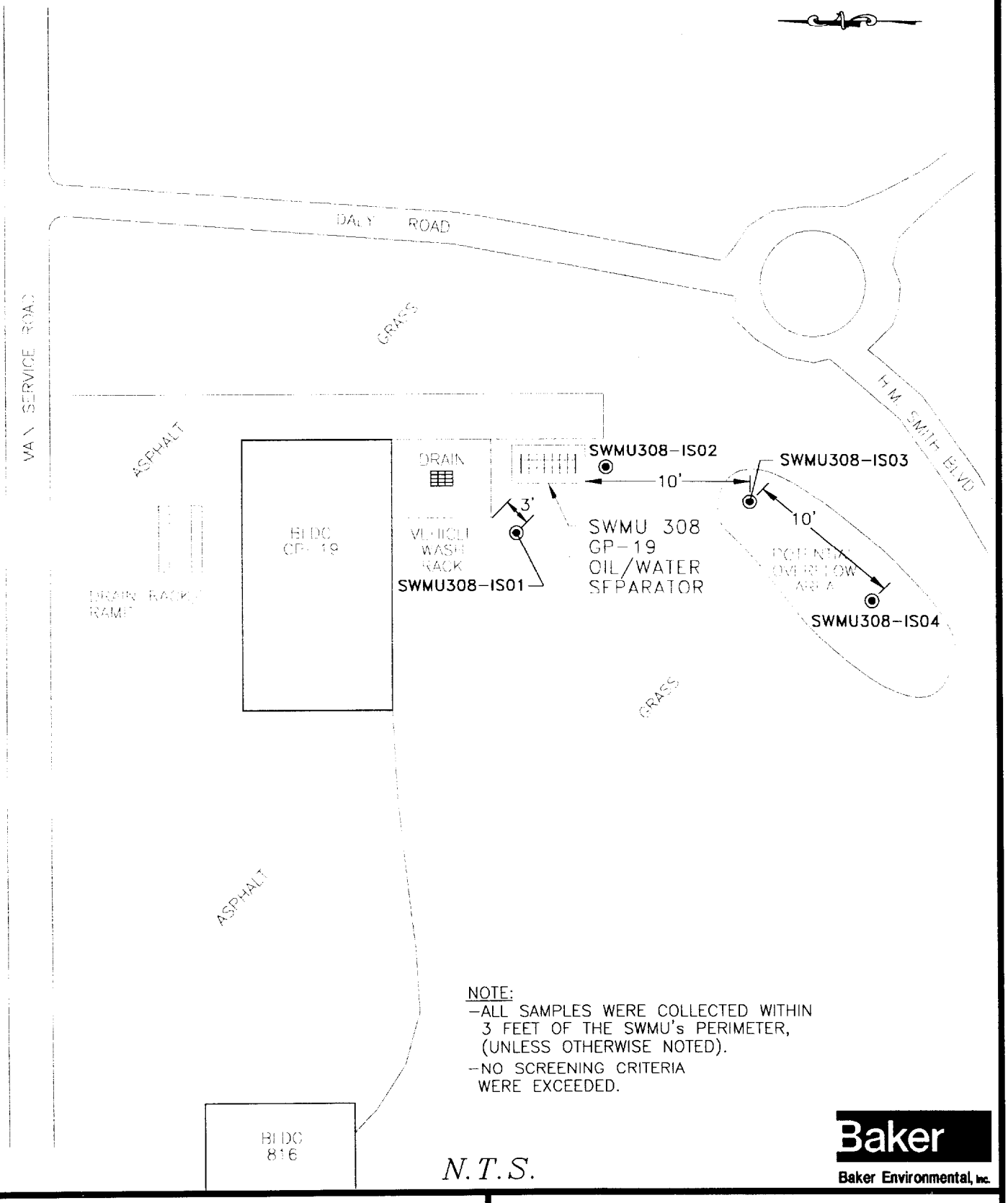
Notes:

ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 308
SWMU CONFIRMATORY SAMPLING (CTO-0371)
GP19 - O/W, 8th ENGINEERS 2D FSSG
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Chloroethyl) ether	260 J	260 J	SWMU308-IS04-00	5200	5200	NE	0	0	0
bis(2-Ethylhexyl) phthalate	120 J	1600 J	SWMU308-IS03-06	410000	410000	6670	0	0	0
Di-n-butyl phthalate	27 J	27 J	SWMU308-IS04-00	NE	NE	NE	0	0	0
Di-n-octyl phthalate	170 J	170 J	SWMU308-IS02-00	41000000	8200000	233000000	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Cadmium	0.71	1.8	SWMU308-IS03-00	1000	200	2.72	0	0	0
Chromium	4.1	7.9	SWMU308-IS01-00	10000	2000	27.2	0	0	0
Lead	2.8	20.1	SWMU308-IS03-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
-NO SCREENING CRITERIA WERE EXCEEDED.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 308
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.38 SWMU 309 - NH118 Underground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.38.1 SWMU Description and History

SWMU 309 is located near the main gate off of Brewster Boulevard adjacent to Building NH-118. SWMU 309 consists of a waste oil UST. An AST was described in the RFA Report and located during the 1996 site visit. Both of the tanks receive waste oil and are still in operation. The area surrounding the SWMU is grass covered.

4.38.2 Confirmatory Investigation Activities

An investigation was performed on September 11, 1997 at the SWMU to determine if the waste oil introduced into the system has impacted the surrounding area. All field procedures were performed in accordance with the Final Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from four soil borings. Four borings were advanced around the concrete pad perimeter of the AST. Figure 1 shows the locations of the soil borings. The soil borings were advanced to depths of approximately 18.0 feet bgs with groundwater encountered at approximately 16.0 feet bgs. Four surface soil samples (SWMU309-IS1-00, SWMU309-IS2-00, SWMU309-IS3-00, SWMU309-IS4-00) were collected at depths of 0 to 2.0 feet bgs at all four boring locations. In addition, subsurface soil samples were collected at all the soil boring locations. The subsurface soil samples (SWMU309-IS1-08, SWMU309-IS2-08, SWMU309-IS3-08, SWMU309-IS4-08) were collected at 16.0 to 18.0 feet bgs. All soil samples were analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270), and RCRA metals (EPA Method 6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. In addition, a rinsate blank (371ER03A) was collected from a split-spoon and analyzed for the same parameters. The samples were sent to Quanterra laboratories along with trip blank 371TB05. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.38.3 Investigation Findings

Four surface soil and four subsurface soil samples were collected and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- USEPA Region III Industrial/Residential Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analyses indicated positive detections of two VOCs, one SVOC, and three metals.

The VOCs, toluene and xylene, were detected in one surface soil sample but at levels below the screening criteria.

One SVOC (bi[2-ethylhexyl]phthalate) was detected within five of the soil samples at concentrations below the screening criteria.

Three metals (arsenic, chromium, and lead) were detected within the sample set. All metal concentrations detected in the samples were below the screening criteria.

4.38.4 Recommendations

Based on the sample analytical results, no additional investigations are recommended to be performed at SWMU 309. The analytical results of the surface and subsurface soil samples were below all screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 309
SWMU CONFIRMATORY SAMPLING (CTO-0371)
NH 118 - UST, NEAR BUILDING NH 118
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU309-IS01-00	SWMU309-IS01-08	SWMU309-IS02-00	SWMU309-IS02-08	SWMU309-IS03-00	SWMU309-IS03-08
LAB ID	H7I120130002	H7I120130004	H7I120130003	H7I120130005	H7I120130008	H7I120130006
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997
DEPTH	0' - 2'	16' - 18'	0' - 2'	16' - 18'	0' - 2'	16' - 18'
VOLATILES (ug/kg) (8020)						
Toluene	1.1 U	1.1 U	2.3	1.1 U	1.1 U	1.1 U
Xylenes (total)	1.1 U	1.1 U	1.1	1.1 U	1.1 U	1.1 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	40 J	170 J	370 U	170 J	350 U	360 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.9	1.1 U	2.1	1.1 U	2.1	1.1 U
Chromium	11.4	8.1	10.1	3	9.9	4.1
Lead	8.2	1.9	5.1	2.1	14.3	1.4

Notes:

ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 309
SWMU CONFIRMATORY SAMPLING (CTO-0371)
NH 118 - UST, NEAR BUILDING NH 118
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU309-IS04-00	SWMU309-IS04-08
LAB ID	H7I120130001	H7I120130007
DATE SAMPLED	09-10-1997	09-10-1997
DEPTH	0' - 2'	16' - 18'
VOLATILES (ug/kg) (8020)		
Toluene	1.1 U	1.1 U
Xylenes (total)	1.1 U	1.1 U
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	93 J	470 J
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.5	1.1 U
Chromium	8.4	11.5
Lead	3.8	2.9

Notes:

ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 309
SWMU CONFIRMATORY SAMPLING (CTO-0371)
NH 118 - UST, NEAR BUILDING NH 118
MCB, CAMP LEJUENE, NORTH CAROLINA

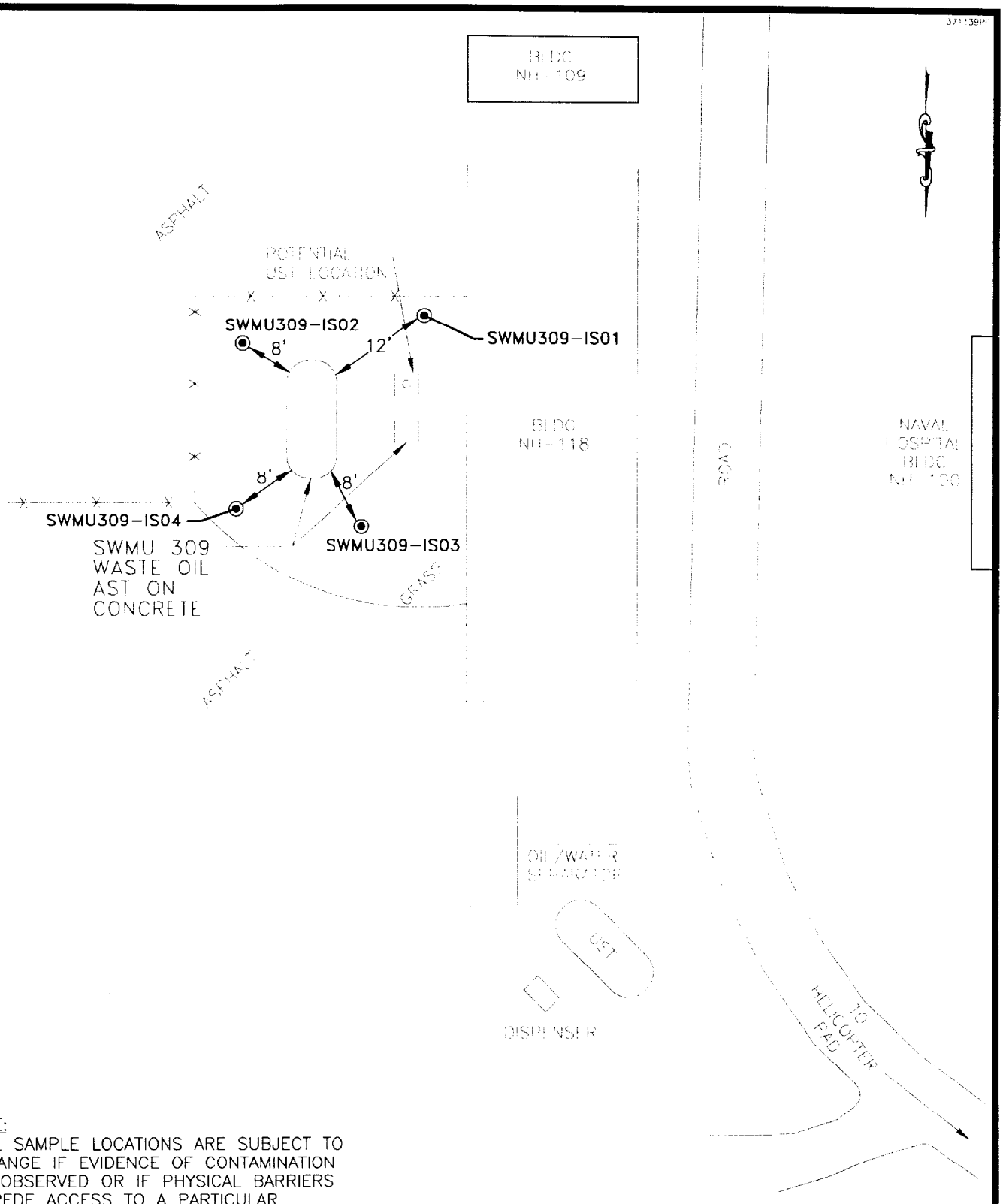
SAMPLE ID LAB ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
Toluene	1.1 U	1.1 U	2.3	2.3	SWMU309-IS02-00	1/8	2.3	2.3
Xylenes (total)	1.1 U	1.1 U	1.1	1.1	SWMU309-IS02-00	1/8	1.1	1.1
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	350 U	370 U	40 J	470 J	SWMU309-IS04-08	5/8	188.6	170
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.1 U	1.5	2.1	309-IS02-00,SWMU309-I	4/8	1.9	2
Chromium	ND	ND	3	11.5	SWMU309-IS04-08	8/8	8.31	9.15
Lead	ND	ND	1.4	14.3	SWMU309-IS03-00	8/8	4.96	3.35

Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 309
SWMU CONFIRMATORY SAMPLING (CTO-0371)
NH 118 - UST, NEAR BUILDING NH 118
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
Toluene	2.3	2.3	SWMU309-IS02-00	410000000	82000000	7275	0	0	0
Xylenes (total)	1.1	1.1	SWMU309-IS02-00	1000000000	200000000	4958	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	40 J	470 J	SWMU309-IS04-08	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.5	2.1	SWMU309-IS02-00,SWMU309-IS03-00	3.8	3.8	26.2	0	0	0
Chromium	3	11.5	SWMU309-IS04-08	10000	2000	27.2	0	0	0
Lead	1.4	14.3	SWMU309-IS03-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
- ALL SAMPLE LOCATIONS ARE SUBJECT TO CHANGE IF EVIDENCE OF CONTAMINATION IS OBSERVED OR IF PHYSICAL BARRIERS IMPEDE ACCESS TO A PARTICULAR SAMPLE LOCATION.
- NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 309
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.39 SWMU 310 - PT33 Pond Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.39.1 SWMU Descriptions and History

SWMU 310 is located on Parachute tower Road near Holcomb Boulevard. SWMU 310 consists of several earthen impoundments that are used to dewater cooking grease prior to its disposal at an approved land fill. The grease contained in the ponds is not petroleum based. The SWMU is still in operation. The area surrounding the SWMU is grass covered.

oil containers? do disposed of still there

4.39.2 Confirmatory Investigation Activities

An investigation was performed on September 11, 1997 at SWMU 310 to determine if the waste water introduced into the impoundments has impacted the soil around the system. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from six borings. Three borings were advanced around each of the impoundments as presented on Figure 1. Six surface soil samples (SWMU310-IS01-00, SWMU310-IS02-00, SWMU310-IS03-00, SWMU310-IS04-00, SWMU310-IS05-00, and SWMU310-IS06-00) were collected at depths of 0 to 2.0 feet bgs at all six boring locations. In addition, subsurface soil samples were collected at all the soil boring locations. Six samples (SWMU310-IS01-09, SWMU310-IS02-09, SWMU310-IS03-09, SWMU310-IS04-09, SWMU310-IS05-09, and SWMU310-IS06-09) were collected at 18.0 to 20.0 feet bgs. The soil borings were advanced to depths of approximately 20.0 feet bgs with groundwater encountered at approximately 18.0 feet bgs. All soil samples were analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270), pesticides/PCBs (EPA Method 8080) and RCRA metals (EPA Method 6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. Two field duplicate samples were also collected. SWMU310-IS04-00D and SWMU310-IS04-09D. The analytical data for the duplicates are presented in Appendix E. In addition, a rinsate blank (371ER03B) was collected from a sampling spatula and analyzed for the same parameters. The samples were sent to Quanterra laboratories along with trip blanks 371TB10 and 371TB11. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.39.3 Investigation Findings

Six surface soil and six subsurface soil samples were collected and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- USEPA Region III Industrial Risk-Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Results of the analysis indicate positive detections of three VOCs, two SVOCs, two pesticides, and three metals.

The VOCs acetone, methylene chloride, and toluene were detected in two of the surface soil and six of the subsurface soil samples, but at concentrations below the screening criteria.

Two SVOCs (bis[2-ethylhexyl]phthalate and benzo[a]pyrene) were detected the sample set at concentrations below the screening criteria.

The pesticides, 4,4'-DDE and 4,4'-DDT, were detected in the sample set, but at concentrations below the screening criteria.

Three metals (arsenic, chromium, and lead) were detected within the sample set. Chromium and lead were detected in all of the soil samples, while arsenic was detected in three of the subsurface soil samples. All metal concentrations detected in the samples were below the screening criteria.

4.39.4 Recommendations

Based on the sample analytical results, additional investigation activities are not recommended for SWMU 310. The analytical results of the surface and subsurface soil samples were below all screening criteria.

TABLE 1
DETECTION SUMMARY
SWMU 310
SWMU CONFIRMATORY SAMPLING (CTO 0371)
PT33 - POND-O/W, MCB KITCHEN GREASE CONTRACTOR
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU310-IS01-00	SWMU310-IS01-09	SWMU310-IS02-00	SWMU310-IS02-09	SWMU310-IS03-00	SWMU310-IS03-09
DATE SAMPLED	09-12-1997	09-12-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	18' - 20'	0' - 2'	18' - 20'	0' - 2'	18' - 20'
VOLATILES (ug/kg) (8260)						
Acetone	19 J	77	25 U	150 J	23 U	130 J
Methylene chloride	5.3 U	6.3 U	6.2 U	6 U	2.3 J	6.1 U
Toluene	5.3 U	6.3 U	6.2 U	6 U	5.7 U	6.1 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)pyrene	350 U	420 U	410 U	400 U	370 U	400 U
bis(2-Ethylhexyl) phthalate	84 J	95 J	86 J	110 J	220 J	120 J
PESTICIDES/PCBS (ug/kg) (8080)						
4,4'-DDE	4.4	2.1 U	10	2.1 U	1.9 U	2.1 U
4,4'-DDT	1.8 U	2.1 U	5.1	2.1 U	1.9 U	2.1 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.5	1.2 U	1.2 U	1.1 U	1.2 U
Chromium	1.4	14.7	6.1	9.1	5.9	10.5
Lead	4	6.2	6	4.4	4.2	4.8

TABLE 1
DETECTION SUMMARY
SWMU 310
SWMU CONFIRMATORY SAMPLING (CTO-0371)
PT33 - POND-O/W, MCB KITCHEN GREASE CONTRACTOR
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU310-IS04-00	SWMU310-IS04-09	SWMU310-IS05-00	SWMU310-IS05-09	SWMU310-IS06-00	SWMU310-IS06-09
DATE SAMPLED	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	18' - 20'	0' - 2'	18' - 20'	0' - 2'	18' - 20'
VOLATILES (ug/kg) (8260)						
Acetone	22 U	220	2100 J	14 J	23 U	260 J
Methylene chloride	5.5 U	6.4 U	53 U	5.3 U	1.9 J	5.8 U
Toluene	5.5 U	6.4 U	53 U	1.6 J	5.9 U	5.8 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)pyrene	370 U	420 U	350 U	350 U	41 J	380 U
bis(2-Ethylhexyl) phthalate	120 J	130 J	150 J	1800 J	190 J	200 J
PESTICIDES/PCBS (ug/kg) (8080)						
4,4'-DDE	10	2.2 U	23	28	5.6	2 U
4,4'-DDT	3.9	2.2 U	9.2	15	2.8	2 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.6	1.1 U	1.1 U	1.2 U	1.5
Chromium	7.4	12.1	3.8	5.9	6.2	8.9
Lead	4.2	5.9	12.5	4.1	4.7	4

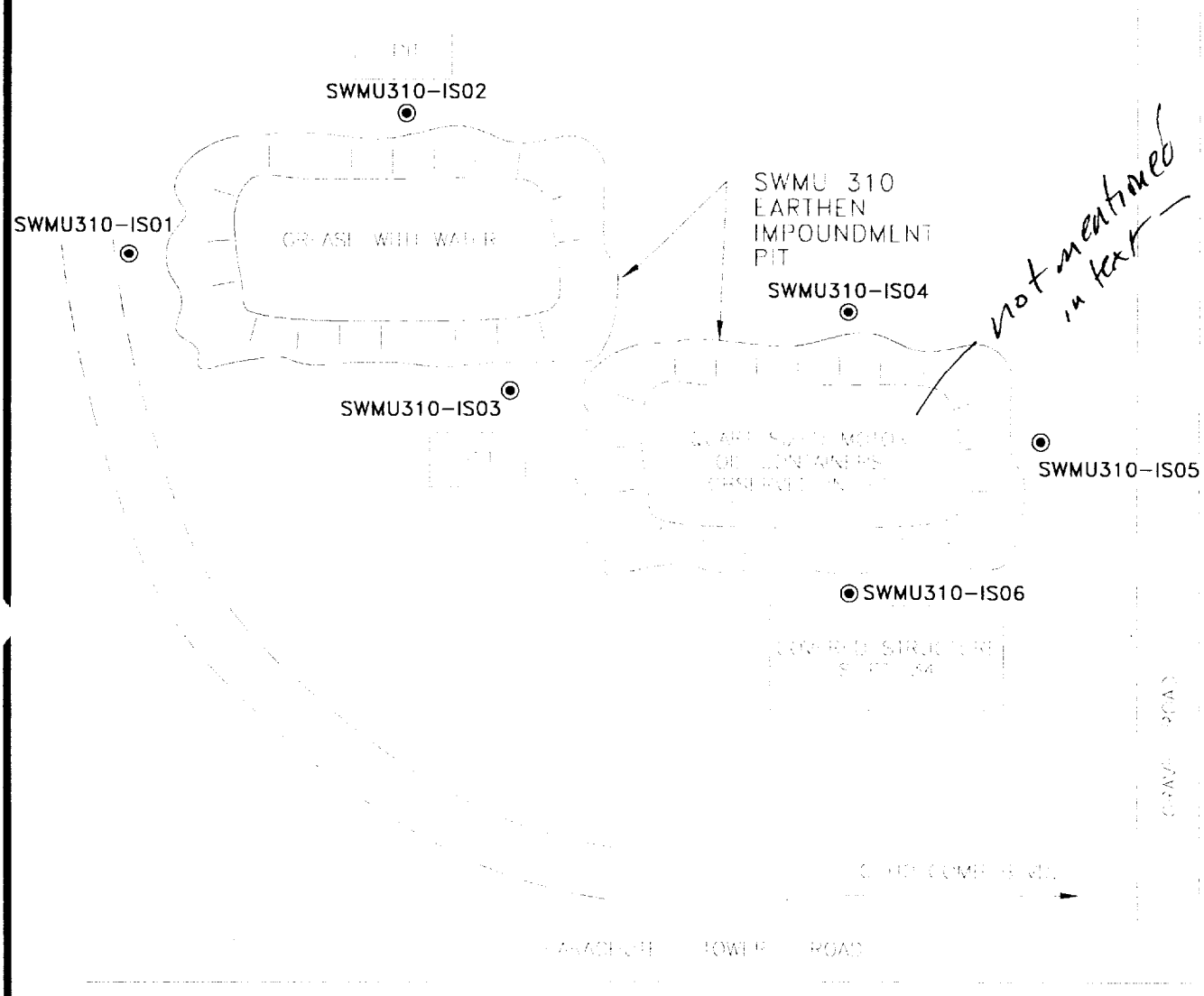
TABLE 1
DETECTION SUMMARY
SWMU 310
SWMU CONFIRMATORY SAMPLING (CTO-0371)
PT33 - POND-O/W, MCB KITCHEN GREASE CONTRACTOR
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
Acetone	22 U	25 U	14 J	2100 J	SWMU310-IS05-00	8/12	371.25	140
Methylene chloride	5.3 U	53 U	1.9 J	2.3 J	SWMU310-IS03-00	2/12	2.1	2.1
Toluene	5.3 U	53 U	1.6 J	1.6 J	SWMU310-IS05-09	1/12	1.6	1.6
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)pyrene	350 U	420 U	41 J	41 J	SWMU310-IS06-00	1/12	41	41
bis(2-Ethylhexyl) phthalate	ND	ND	84 J	1800 J	SWMU310-IS05-09	12/12	275.42	125
PESTICIDES/PCBS (ug/kg) (8080)								
4,4'-DDE	1.9 U	2.2 U	4.4	28	SWMU310-IS05-09	6/12	13.5	10
4,4'-DDT	1.8 U	2.2 U	2.8	15	SWMU310-IS05-09	5/12	7.2	5.1
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.5	1.6	SWMU310-IS04-09	3/12	1.53	1.5
Chromium	ND	ND	1.4	14.7	SWMU310-IS01-09	12/12	7.67	6.8
Lead	ND	ND	4	12.5	SWMU310-IS05-00	12/12	5.42	4.55

TABLE 2
STATISTICAL SUMMARY
SWMU 310
SWMU CONFIRMATORY SAMPLING (CTO-0371)
PT33 - POND-O/W, MCB KITCHEN GREASE CONTRACTOR
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
Acetone	14 J	2100 J	SWMU310-IS05-00	200000000	40000000	2810	0	0	0
Methylene chloride	1.9 J	2.3 J	SWMU310-IS03-00	760000	760000	22.1	0	0	0
Toluene	1.6 J	1.6 J	SWMU310-IS05-09	410000000	82000000	7275	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Benzo(a)pyrene	41 J	41 J	SWMU310-IS06-00	780	780	NE	0	0	0
bis(2-Ethylhexyl) phthalate	84 J	1800 J	SWMU310-IS05-09	410000	410000	6670	0	0	0
PESTICIDES/PCBS (ug/kg) (8080)									
4,4'-DDE	4.4	28	SWMU310-IS05-09	17000	17000	NE	0	0	0
4,4'-DDT	2.8	15	SWMU310-IS05-09	17000	17000	NE	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.5	1.6	SWMU310-IS04-09	3.8	3.8	26.2	0	0	0
Chromium	1.4	14.7	SWMU310-IS01-09	10000	2000	27.2	0	0	0
Lead	4	12.5	SWMU310-IS05-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
-NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 310
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.40 SWMU 311 - S1619 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.40.1 SWMU Description and History

SWMU 311 consists of an oil/water separator that is associated with a vehicle wash rack. The SWMU is located in the Hadnot Point Industrial Area, just north of Michael Road, between Gum and Fir Streets. The vehicle wash rack is associated with vehicle maintenance and is situated between Buildings 1604 and 1605, in a fenced-in, paved area. The oil/water separator is in a grassy area adjacent to the paved area, outside of the fence line. The separator was installed in 1984 and is currently used. The structure is a concrete, in-ground unit that discharges to a waste water treatment plant. A drainage swale runs parallel to Michael Road and flows into a culvert that leads to Cogdels Creek. The drain from the wash rack to the oil/water separator showed evidence of overflow (i.e., eroded soils) during the October 1996 site visit. Overflow from the earthen drainage way could potentially reach Cogdels Creek.

SWMU)

4.40.2 Confirmatory Investigation Activities

The soil investigation for SWMU 311 was developed to determine if the presence of the oil/water separator and wash rack has impacted surface and subsurface soils in the vicinity of the SWMU.

Three borings, SWMU311-IS02, SWMU311-IS03, and SWMU311-IS04 were advanced at the SWMU on September 13, 1997, at the locations depicted on Figure 1. Two of the borings (SWMU311-IS03 and SWMU311-IS04) were located adjacent to the oil/water separator. One boring (SWMU311-IS02) was located between the drain and the drainage way. One boring which was proposed (SWMU311-IS01) was not advanced due to limited drill rig access. Two samples were collected from each boring. One sample from each boring was collected from the ground surface to 2.0 bgs (SWMU311-IS02-00, SWMU311-IS03-00 and SWMU3111-IS04-00). From borings SWMU311-IS02 and SWMU311-IS03, subsurface soil samples were collected from just above the water table at a depth of 6.0 to 8.0 feet bgs (SWMU311-IS02-03 and SWMU311-IS03-03). From boring SWMU311-IS04, a subsurface soil sample was collected from just above the water table at a depth of 12.0 to 14.0 feet bgs (SWMU311-IS04-06) Groundwater was encountered at a depth of approximately 14.0 feet bgs during drilling at this boring. Borings SWMU311-IS02 and SWMU311-IS03 were located approximately 5 feet lower topographically than boring SWMU311-IS04. As such, depth to groundwater was approximately 5 feet less at these locations.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8020), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. One duplicate sample (SWMU311-IS04-06D) was collected from the SWMU; analytical results are in Appendix E. Equipment rinsate blank 371ER06A was collected from a stainless-steel sampling spatula which was used to collect soil samples from the SWMU. Results for the rinsate blank are included in Appendix F. Trip blanks 371TB06, 371TB07, 371TB08, and 371TB09 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.40.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

Contaminants detected at concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Six VOCs were detected in the samples collected during the Confirmatory Sampling Investigation. These compounds were only detected in one sample (SWMU-IS02-03). Eleven SVOCs were detected. The presence of one SVOC (bis[2-ethylhexyl]phthalate) is suspected to be related to sampling or analytical procedures. The remaining SVOCs were detected only in sample SWMU-IS03-00. The two sample locations at which the potentially SWMU-related compounds were detected are situated adjacent to the drainage way which receives surface water runoff from Michael Road. The detected compounds are primarily petroleum-related, or PAHs that could be derived from either the wash rack or from runoff from Michael Road. Five metals (arsenic, cadmium, chromium, lead, and mercury) were detected.

One detected VOC, chlorobenzene was present at a level exceeding the aforementioned comparison criteria. The concentration of chlorobenzene (530 µg/kg) in one sample (SWMU311-IS02-03) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentration (438 µg/kg). No other criteria for the remaining analyzed organic compounds were exceeded in any of the remaining samples.

Four detected metals, cadmium, chromium, lead, and mercury were present at a levels exceeding at least one of the aforementioned comparison criteria in at least one sample. The concentration of cadmium (5.2 mg/kg) in one sample (SWMU311-IS02-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentration (2.72 mg/kg) and the North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentration (2.72 mg/kg). The concentration of chromium (28.8 mg/kg) in one sample (SWMU311-IS02-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentration (27.2 mg/kg). The concentration of lead (1,110 mg/kg) in one sample (SWMU311-IS04-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentration (270.06 mg/kg). The concentration of mercury (0.09 mg/kg and 0.057 mg/kg) in two samples (SWMU311-IS02-00 and SWMU311-IS02-03, respectively) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking

water) Target Concentration (0.0154 mg/kg) and the North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentration (0.00042 mg/kg).

4.40.4 Recommendations

Based on the analytical results, additional investigative activities are recommended for the SWMU to further characterize contamination which may be related to site operations/activities. This recommendation is predicated on the prevalence of (possibly SWMU-related) VOCs, SVOCs, and metals, and the exceedence of applicable screening criteria.

It is recommended that a minimum of three temporary monitoring well borings (with soil sample acquisition) be advanced with subsequent collection of groundwater samples. Soil and groundwater samples should be analyzed for VOAs, SVOAs, and metals. One of these borings should be placed at the proposed SWMU-IS01 location and advanced via tripod or otherwise driven sampler that can afford access to the location. In addition, sediment/surface soil samples should be collected from the drainage way that is parallel to Michael Road to determine if the detected contaminants are related to vehicular traffic.

TABLE 1
DETECTION SUMMARY
SWMU 311
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU311-IS02-00	SWMU311-IS02-03	SWMU311-IS03-00	SWMU311-IS03-03	SWMU311-IS04-00	SWMU311-IS04-06
DATE SAMPLED	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997
DEPTH	0' - 2'	6' - 8'	0' - 2'	6' - 8'	0' - 2'	12' - 14'
VOLATILES (ug/kg) (8020)						
1,2-Dichlorobenzene	1.2 U	530	1.2 U	1.1 U	1 U	1.2 U
1,3-Dichlorobenzene	1.2 U	140	1.2 U	1.1 U	1 U	1.2 U
1,4-Dichlorobenzene	1.2 U	220	1.2 U	1.1 U	1 U	1.2 U
Chlorobenzene	1.2 U	530	1.2 U	1.1 U	1 U	1.2 U
Toluene	1.2 U	200	1.2 U	1.1 U	1 U	1.2 U
Xylenes (total)	1.2 U	2000	1.2 U	1.1 U	1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)						
2-Methylnaphthalene	400 U	1300 J	380 U	370 U	340 U	390 U
Benzo(a)anthracene	400 U	4000 U	33 J	370 U	340 U	390 U
Benzo(a)pyrene	400 U	4000 U	48 J	370 U	340 U	390 U
Benzo(b)fluoranthene	400 U	4000 U	48 J	370 U	340 U	390 U
Benzo(ghi)perylene	400 U	4000 U	50 J	370 U	340 U	390 U
Benzo(k)fluoranthene	400 U	4000 U	60 J	370 U	340 U	390 U
bis(2-Ethylhexyl) phthalate	230 J	4000 U	170 J	800 J	190 J	110 J
Chrysene	400 U	4000 U	49 J	370 U	340 U	390 U
Fluoranthene	400 U	4000 U	65 J	370 U	340 U	390 U
Indeno(1,2,3-cd)pyrene	400 U	4000 U	41 J	370 U	340 U	390 U
Pyrene	400 U	4000 U	62 J	370 U	340 U	390 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.2 U	1.9	1.2 U	1.1 U	1 U	2.6
Cadmium	5.2	0.61	0.74	0.57 U	0.52 U	0.59 U
Chromium	28.8	21	6.1	4.5	6.4	17
Lead	211	42.1	15.6	2.8	1110	5.1
Mercury	0.09	0.057	0.038 U	0.037 U	0.034 U	0.039 U

TABLE 1
DETECTION SUMMARY
SWMU 311
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	1 U	1.2 U	530	530	SWMU311-IS02-03	1/6	530	530
1,3-Dichlorobenzene	1 U	1.2 U	140	140	SWMU311-IS02-03	1/6	140	140
1,4-Dichlorobenzene	1 U	1.2 U	220	220	SWMU311-IS02-03	1/6	220	220
Chlorobenzene	1 U	1.2 U	530	530	SWMU311-IS02-03	1/6	530	530
Toluene	1 U	1.2 U	200	200	SWMU311-IS02-03	1/6	200	200
Xylenes (total)	1 U	1.2 U	2000	2000	SWMU311-IS02-03	1/6	2000	2000
SEMIVOLATILES (ug/kg) (8270)								
2-Methylnaphthalene	340 U	400 U	1300 J	1300 J	SWMU311-IS02-03	1/6	1300	1300
Benzo(a)anthracene	340 U	4000 U	33 J	33 J	SWMU311-IS03-00	1/6	33	33
Benzo(a)pyrene	340 U	4000 U	48 J	48 J	SWMU311-IS03-00	1/6	48	48
Benzo(b)fluoranthene	340 U	4000 U	48 J	48 J	SWMU311-IS03-00	1/6	48	48
Benzo(ghi)perylene	340 U	4000 U	50 J	50 J	SWMU311-IS03-00	1/6	50	50
Benzo(k)fluoranthene	340 U	4000 U	60 J	60 J	SWMU311-IS03-00	1/6	60	60
bis(2-Ethylhexyl) phthalate	4000 U	4000 U	110 J	800 J	SWMU311-IS03-03	5/6	300	190
Chrysene	340 U	4000 U	49 J	49 J	SWMU311-IS03-00	1/6	49	49
Fluoranthene	340 U	4000 U	65 J	65 J	SWMU311-IS03-00	1/6	65	65
Indeno(1,2,3-cd)pyrene	340 U	4000 U	41 J	41 J	SWMU311-IS03-00	1/6	41	41
Pyrene	340 U	4000 U	62 J	62 J	SWMU311-IS03-00	1/6	62	62
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1 U	1.2 U	1.9	2.6	SWMU311-IS04-06	2/6	2.25	2.25
Cadmium	0.52 U	0.59 U	0.61	5.2	SWMU311-IS02-00	3/6	2.18	0.74
Chromium	ND	ND	4.5	28.8	SWMU311-IS02-00	6/6	13.97	11.7
Lead	ND	ND	2.8	1110	SWMU311-IS04-00	6/6	231.1	28.85
Mercury	0.034 U	0.039 U	0.057	0.09	SWMU311-IS02-00	2/6	0.07	0.07

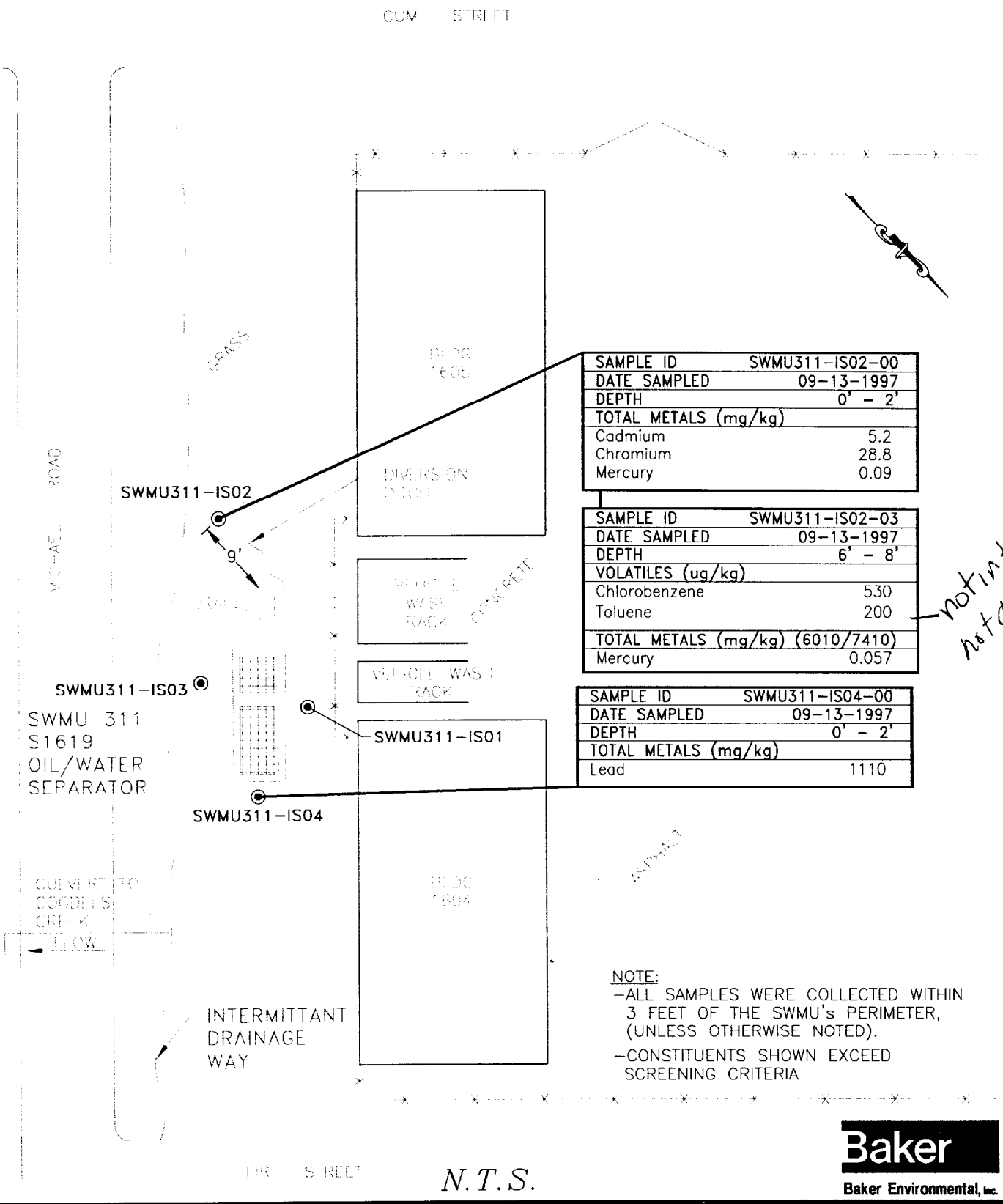
TABLE 2
STATISTICAL SUMMARY
SWMU 311
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8020)							
1,2-Dichlorobenzene	530	530	SWMU311-IS02-03	180000000	36000000	7270	498000
1,3-Dichlorobenzene	140	140	SWMU311-IS02-03	180000000	36000000	23700	248000
1,4-Dichlorobenzene	220	220	SWMU311-IS02-03	240000	240000	1240	NE
Chlorobenzene	530	530	SWMU311-IS02-03	41000000	8200000	438	438000
Toluene	200	200	SWMU311-IS02-03	410000000	82000000	7275	200
Xylenes (total)	2000	2000	SWMU311-IS02-03	1000000000	200000000	4958	NE
SEMIVOLATILES (ug/kg) (8270)							
2-Methylnaphthalene	1300 J	1300 J	SWMU311-IS02-03	82000000	NE	NE	NE
Benzo(a)anthracene	33 J	33 J	SWMU311-IS03-00	7800	7800	343	878
Benzo(a)pyrene	48 J	48 J	SWMU311-IS03-00	780	780	NE	NE
Benzo(b)fluoranthene	48 J	48 J	SWMU311-IS03-00	7800	7800	NE	NE
Benzo(ghi)perylene	50 J	50 J	SWMU311-IS03-00	NE	NE	6720000	3920
Benzo(k)fluoranthene	60 J	60 J	SWMU311-IS03-00	78000	78000	NE	NE
bis(2-Ethylhexyl) phthalate	110 J	800 J	SWMU311-IS03-03	410000	410000	6670	32900
Chrysene	49 J	49 J	SWMU311-IS03-00	780000	780000	38150	976
Fluoranthene	65 J	65 J	SWMU311-IS03-00	82000000	16400000	276080	131000
Indeno(1,2,3-cd)pyrene	41 J	41 J	SWMU311-IS03-00	7800	7800	NE	NE
Pyrene	62 J	62 J	SWMU311-IS03-00	61000000	12264000	286440	109000
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.9	2.6	SWMU311-IS04-06	3.8	3.8	26.2	65.5
Cadmium	0.61	5.2	SWMU311-IS02-00	1000	200	2.72	2.72
Chromium	4.5	28.8	SWMU311-IS02-00	10000	2000	27.2	NE
Lead	2.8	1110	SWMU311-IS04-00	NE	400	270.06	1130
Mercury	0.057	0.09	SWMU311-IS02-00	610	122	0.0154	0.00042

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 311
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, 8th COMMUNICATIONS BN, 2D SRIG
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8020)				
1,2-Dichlorobenzene	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0
Chlorobenzene	0	0	1	0
Toluene	0	0	0	1
Xylenes (total)	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
2-Methylnaphthalene	0	0	0	0
Benzo(a)anthracene	0	0	0	0
Benzo(a)pyrene	0	0	0	0
Benzo(b)fluoranthene	0	0	0	0
Benzo(ghi)perylene	0	0	0	0
Benzo(k)fluoranthene	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0
Chrysene	0	0	0	0
Fluoranthene	0	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0	0
Pyrene	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Cadmium	0	0	1	1
Chromium	0	0	1	0
Lead	0	1	1	0
Mercury	0	0	2	2



LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg – MILLIGRAM/KILOGRAM

ug/kg – MICROGRAM/KILOGRAM

Baker Environmental, Inc.

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 311
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.41 SWMU 312 - Oil/Water Separator S-1735(S-1698)

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.41.1 SWMU Description and History

SWMU 312 is located within the central portion of Hadnot Point Industrial Area southwest of Gum Street, behind the Steam Plant (Building 1700). The SWMU consists of a concrete in-ground oil/water separator that receives steam condensate from the Steam Plant. During the 1996 site visit petroleum stains were observed on the SWMU and a hydrocarbon sheen was noted within the unit. The separator was installed in 1984 and is still in use. The area surrounding the SWMU is grass covered.

4.41.2 Confirmatory Investigation Activities

An investigation was performed on September 11, 1997 at SWMU 312 to determine if the waste water introduced into the oil/water separator has impacted the soil around the system. All field procedures were performed in accordance with the Project Plans (Baker, 1997). The investigation consisted of the collection of surface and subsurface soil samples from four soil borings. The four borings were advanced around each side of the oil/water separator as presented on Figure 1. The soil borings were advanced to depths of approximately 10.0 feet bgs with groundwater encountered at approximately 5.5 feet bgs. Five surface soil samples (SWMU312-IS01-00, SWMU312-IS02-00, SWMU312-IS03-00, SWMU312-IS04-00, and) were collected at depths of 0 to 2.0 feet bgs at all four boring locations. In addition, subsurface soil samples were collected at all the soil boring locations. The four samples (SWMU312-IS01-01, SWMU312-IS02-01, SWMU312-IS03-01, and SWMU312-IS04-01) were collected at 2.0 to 4.0 feet bgs. All soil samples were analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270), and RCRA metals (EPA Method 6010/7410). The analytical results for the surface and subsurface soil samples are presented in Appendix D. In addition, a rinsate blank (371ER03B) was collected from a stainless steel sampling spoon and analyzed for the same parameters. The samples were sent to Quanterra laboratories along with trip blanks 371TB10 and 371TB11. Analytical results for the rinsate sample and the trip blanks are presented in Appendix F.

4.41.3 Investigation Findings

Four surface soil and four subsurface soil samples were collected and submitted for analysis. The positive detections of the analytical results are presented on Table 1. The detected analytical results were compared to the following criteria (Table 2):

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

Results of the analysis indicate positive detections of several SVOCs and six metals.

Several SVOCs (primarily all PAHs) were detected the sample set at concentrations below the screening criteria. The majority of all detections were collected from soil boring SWMU312-IS01.

Six metals (arsenic, barium, chromium, lead, mercury, and selenium) were detected within the sample set. All concentrations (except mercury) detected in the samples were below the screening criteria. Concentrations of mercury exceeded the North Carolina Target Concentration for Method I, Category S-3:G-1 of 0.0154 mg/kg. The exceedences were from surface soil samples SWMU312-IS02-00 (0.04 mg/kg) and SWMU312-IS03-00 (0.05 mg/kg).

4.41.4 Recommendations

Based on the analytical results, no further actions are recommended for SWMU 312. The mercury detection is not expected to be site-related. No other contaminants were detected at levels exceeding the screening criteria.

TABLE 1
DETECTION SUMMARY
SWMU 312
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU312-IS01-00	SWMU312-IS01-01	SWMU312-IS02-00	SWMU312-IS02-01	SWMU312-IS03-00	SWMU312-IS03-01
DATE SAMPLED	09-12-1997	09-12-1997	09-11-1997	09-11-1997	09-11-1997	09-11-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	2' - 4'	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND	ND	ND
SEMIVOLATILES (ug/kg) (8270)						
2-Methylnaphthalene	83 J	94 J	370 U	410 U	390 U	380 U
Acenaphthylene	41 J	45 J	370 U	410 U	390 U	380 U
Anthracene	78 J	83 J	370 U	410 U	390 U	380 U
Benzo(a)anthracene	93 J	75 J	370 U	410 U	35 J	380 U
Benzo(a)pyrene	100 J	96 J	370 U	410 U	82 J	380 U
Benzo(b)fluoranthene	170 J	180 J	370 U	410 U	390 U	380 U
Benzo(ghi)perylene	81 J	78 J	370 U	410 U	390 U	380 U
Benzo(k)fluoranthene	140 J	100 J	370 U	410 U	390 U	380 U
bis(2-Ethylhexyl) phthalate	100 J	120 J	110 J	110 J	100 J	1700 J
Chrysene	160 J	150 J	370 U	410 U	43 J	380 U
Dibenz(a,h)anthracene	45 J	38 J	370 U	410 U	390 U	380 U
Fluoranthene	120 J	130 J	370 U	410 U	63 J	380 U
Indeno(1,2,3-cd)pyrene	76 J	72 J	370 U	410 U	390 U	380 U
Naphthalene	370 U	42 J	370 U	410 U	390 U	380 U
Phenanthrene	95 J	120 J	370 U	410 U	43 J	380 U
Pyrene	130 J	150 J	370 U	410 U	49 J	380 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1	2.7	1.4	1.2	1.2 U	1.2 U
Barium	760	62.4	22.2 U	24.8 U	23.7 U	23.2 U
Chromium	10.5	10.5	10.1	10	5.4	7.8
Lead	8.2	12.6	18.8	15.3	16.8	14.7
Mercury	0.037 U	0.038 U	0.04	0.041 U	0.05	0.038 U
Selenium	0.56 U	0.57 U	0.56	0.62 U	0.59 U	0.58 U

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 312
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU312-IS04-00	SWMU312-IS04-01
DATE SAMPLED	09-11-1997	09-11-1997
DEPTH	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8020)	ND	ND
SEMIVOLATILES (ug/kg) (8270)		
2-Methylnaphthalene	370 U	350 U
Acenaphthylene	370 U	350 U
Anthracene	370 U	350 U
Benzo(a)anthracene	370 U	350 U
Benzo(a)pyrene	55 J	350 U
Benzo(b)fluoranthene	370 U	350 U
Benzo(ghi)perylene	370 U	350 U
Benzo(k)fluoranthene	370 U	350 U
bis(2-Ethylhexyl) phthalate	120 J	70 J
Chrysene	370 U	350 U
Dibenz(a,h)anthracene	370 U	350 U
Fluoranthene	370 U	54 J
Indeno(1,2,3-cd)pyrene	370 U	350 U
Naphthalene	370 U	350 U
Phenanthrene	370 U	350 U
Pyrene	370 U	350 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.1 U	1.1 U
Barium	22.4 U	21.2 U
Chromium	7.7	6.4
Lead	10.6	14.7
Mercury	0.037 U	0.035 U
Selenium	0.56 U	0.53 U

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 312
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/8		
SEMIVOLATILES (ug/kg) (8270)							ND	ND
2-Methylnaphthalene	350 U	410 U	83 J	94 J	SWMU312-IS01-01	2/8	88.5	88.5
Acenaphthylene	350 U	410 U	41 J	45 J	SWMU312-IS01-01	2/8	43	43
Anthracene	350 U	410 U	78 J	83 J	SWMU312-IS01-01	2/8	80.5	80.5
Benzo(a)anthracene	350 U	410 U	35 J	93 J	SWMU312-IS01-00	3/8	67.67	75
Benzo(a)pyrene	350 U	410 U	55 J	100 J	SWMU312-IS01-00	4/8	83.25	89
Benzo(b)fluoranthene	350 U	410 U	170 J	180 J	SWMU312-IS01-01	2/8	175	175
Benzo(ghi)perylene	350 U	410 U	78 J	81 J	SWMU312-IS01-00	2/8	79.5	79.5
Benzo(k)fluoranthene	350 U	410 U	100 J	140 J	SWMU312-IS01-00	2/8	120	120
bis(2-Ethylhexyl) phthalate	ND	ND	70 J	1700 J	SWMU312-IS03-01	8/8	303.75	110
Chrysene	350 U	410 U	43 J	160 J	SWMU312-IS01-00	3/8	117.67	150
Dibenz(a,h)anthracene	350 U	410 U	38 J	45 J	SWMU312-IS01-00	2/8	41.5	41.5
Fluoranthene	370 U	410 U	54 J	130 J	SWMU312-IS01-01	4/8	91.75	91.5
Indeno(1,2,3-cd)pyrene	350 U	410 U	72 J	76 J	SWMU312-IS01-00	2/8	74	74
Naphthalene	350 U	410 U	42 J	42 J	SWMU312-IS01-01	1/8	42	42
Phenanthrene	350 U	410 U	43 J	120 J	SWMU312-IS01-01	3/8	86	95
Pyrene	350 U	410 U	49 J	150 J	SWMU312-IS01-01	3/8	109.67	130
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.1	2.7	SWMU312-IS01-01	4/8	1.6	1.3
Barium	21.2 U	24.8 U	62.4	760	SWMU312-IS01-00	2/8	411.2	411.2
Chromium	ND	ND	5.4	10.5	SWMU312-IS01-00,SWMU312-IS01-01	8/8	8.55	8.9
Lead	ND	ND	8.2	18.8	SWMU312-IS02-00	8/8	13.96	14.7
Mercury	0.035 U	0.041 U	0.04	0.05	SWMU312-IS03-00	2/8	0.05	0.05
Selenium	0.53 U	0.62 U	0.56	0.56	SWMU312-IS02-00	1/8	0.56	0.56

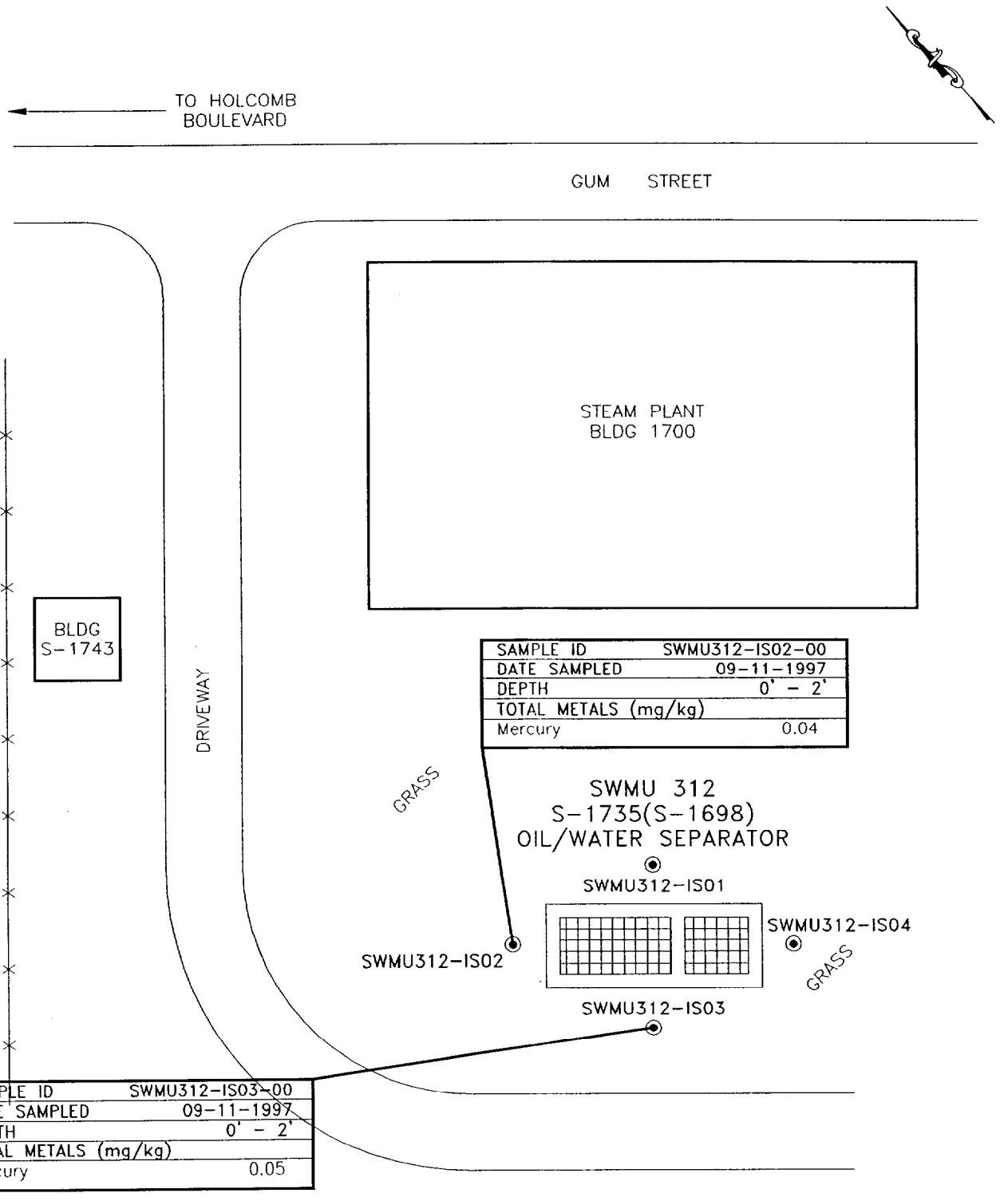
Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 312
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1735 - O/W, BASE MAINTENANCE
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
SEMIVOLATILES (ug/kg) (8270)									
2-Methylnaphthalene	83 J	94 J	SWMU312-IS01-01	82000000	NE	NE	0	0	0
Acenaphthylene	41 J	45 J	SWMU312-IS01-01	NE	NE	11360	0	0	0
Anthracene	78 J	83 J	SWMU312-IS01-01	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	35 J	93 J	SWMU312-IS01-00	7800	7800	343	0	0	0
Benzo(a)pyrene	55 J	100 J	SWMU312-IS01-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	170 J	180 J	SWMU312-IS01-01	7800	7800	NE	0	0	0
Benzo(ghi)perylene	78 J	81 J	SWMU312-IS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	100 J	140 J	SWMU312-IS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	70 J	1700 J	SWMU312-IS03-01	410000	410000	6670	0	0	0
Chrysene	43 J	160 J	SWMU312-IS01-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	38 J	45 J	SWMU312-IS01-00	780	780	NE	0	0	0
Fluoranthene	54 J	130 J	SWMU312-IS01-01	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	72 J	76 J	SWMU312-IS01-00	7800	7800	NE	0	0	0
Naphthalene	42 J	42 J	SWMU312-IS01-01	200000000	16400000	584	0	0	0
Phenanthrene	43 J	120 J	SWMU312-IS01-01	NE	NE	59640	0	0	0
Pyrene	49 J	150 J	SWMU312-IS01-01	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.1	2.7	SWMU312-IS01-01	3.8	3.8	26.2	0	0	0
Barium	62.4	760	SWMU312-IS01-00	140000	28000	848	0	0	0
Chromium	5.4	10.5	SWMU312-IS01-00,SWMU312-IS01-01	10000	2000	27.2	0	0	0
Lead	8.2	18.8	SWMU312-IS02-00	NE	400	270.06	0	0	0
Mercury	0.04	0.05	SWMU312-IS03-00	610	122	0.0154	0	0	2
Selenium	0.56	0.56	SWMU312-IS02-00	10000	2000	12.2	0	0	0

Notes:

J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
-ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 312
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.42 SWMU 313 - S1753 Oil/Water Separator and Above Ground Storage Tank

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.42.1 SWMU Description and History

SWMU 313 consists of an oil/water separator associated with a vehicle and equipment wash area, and a steel, AST. The separator is an in-ground concrete structure with dimensions of 5 feet by 10 feet by 8 feet. The SWMU is located in the Hadnot Point Industrial Area, southwest of Gum Street. The concrete paved areas associated with Building 1204, in which the wash area is situated, is used for maintenance of small crafts. During the October 1996 site visit, cracks were noted in the concrete wash pad. The used oil AST had notable stains due to overfills. The oil/water separator unit is apparently of recent construction.

4.42.2 Confirmatory Investigation Activities

The soil investigation for SWMU 313 was developed to determine if the surface and subsurface soils in the vicinity of the wash area and oil/water separator have been impacted by past spills.

Four borings, SWMU313-IS01, SWMU313-IS02, SWMU313-IS03, and SWMU313-IS04 were advanced at the SWMU on September 13, 1997, at the locations depicted on Figure 1. Two samples were collected from each boring. Samples from each boring were collected from the ground surface to 2.0 feet bgs (SWMU313-IS01-00, SWMU313-IS02-00, SWMU313-IS03-00, and SWMU313-IS04-00) and from just above the water table, at a depth of 4.0 to 6.0 feet bgs (SWMU313-IS01-02, SWMU313-IS02-02, SWMU313-IS03-02, and SWMU313-IS04-02). Groundwater was encountered at a depth of approximately 7.7 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Methods 8020 and 8260A), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER05B was collected from a split-spoon sampler which was used for soil sample collection at the SWMU. Results for the rinsate blank are included in Appendix F. Trip blanks 371TB06, 371TB07, 371TB08, and 371TB09 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.42.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminants detected at concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Three VOCs were detected in the samples collected during the Confirmatory Sampling Investigation including: acetone, methylene chloride, and 1,4-dichlorobenzene. Only one SVOC, bis(2-ethylhexyl)phthalate was detected. None of the detected organic compounds were present at levels exceeding the aforementioned comparison criteria.

Two metals were present at levels exceeding the criteria. The concentration of mercury (0.039 mg/kg) in one sample (SWMU313-IS04-00) exceeded the North Carolina Risk Framework, Method I, Category S-3:G-1 Target Concentration (0.0154 mg/kg). The concentration of silver (1.8 mg/kg) in one sample (SWMU313-IS02-00) exceeded the North Carolina Risk Framework, Method I, Category S-3:G-1 Target Concentration (0.223 mg/kg).

4.42.4 Recommendations

Based on the analytical results, a limited investigation is recommended for SWMU 313 to confirm the presence of silver. One additional soil boring would be drilled near boring SWMU313-IS02. A surface and subsurface soil sample would be collected from this boring and analyzed for metals.

TABLE 1
DETECTION SUMMARY
SWMU 313
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1753 - O/W-AST, SMALL CRAFT CO HQ, BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU313-IS01-00	SWMU313-IS01-02	SWMU313-IS02-00	SWMU313-IS02-02	SWMU313-IS03-00	SWMU313-IS03-02
DATE SAMPLED	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997	09-13-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	4' - 6'	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)						
Acetone	22 U	23 U	22 U	330	22 U	57
Methylene chloride	5.6 U	5.8 U	5.5 U	1.9 J	5.5 U	6 U
VOLATILES (ug/kg) (8020)						
1,4-Dichlorobenzene	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)						
bis(2-Ethylhexyl) phthalate	110 J	88 J	89 J	67 J	100 J	78 J
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1	1.2 U	1.6	1.1 U	1.3	1.2 U
Chromium	10.9	7.9	8	6.3	6.9	5.7
Lead	15.2	5.2	8.3	4.6	4	2.5
Mercury	0.037 U	0.039 U	0.036 U	0.037 U	0.036 U	0.04 U
Selenium	0.56 U	0.58 U	0.55 U	0.57 U	0.55 U	0.6 U
Silver	1.1 U	1.2 U	1.8	1.1 U	1.1 U	1.2 U

TABLE 1
DETECTION SUMMARY
SWMU 313
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1753 - O/W-AST, SMALL CRAFT CO HQ, BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU313-IS04-00	SWMU313-IS04-02
DATE SAMPLED	09-13-1997	09-13-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)		
Acetone	22 U	25
Methylene chloride	5.5 U	6 U
VOLATILES (ug/kg) (8020)		
1,4-Dichlorobenzene	1.1 U	4.2
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	85 J	310 J
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.6	1.2
Chromium	8.4	8.1
Lead	5.5	3.7
Mercury	0.039	0.04 U
Selenium	0.62	0.6 U
Silver	1.1 U	1.2 U

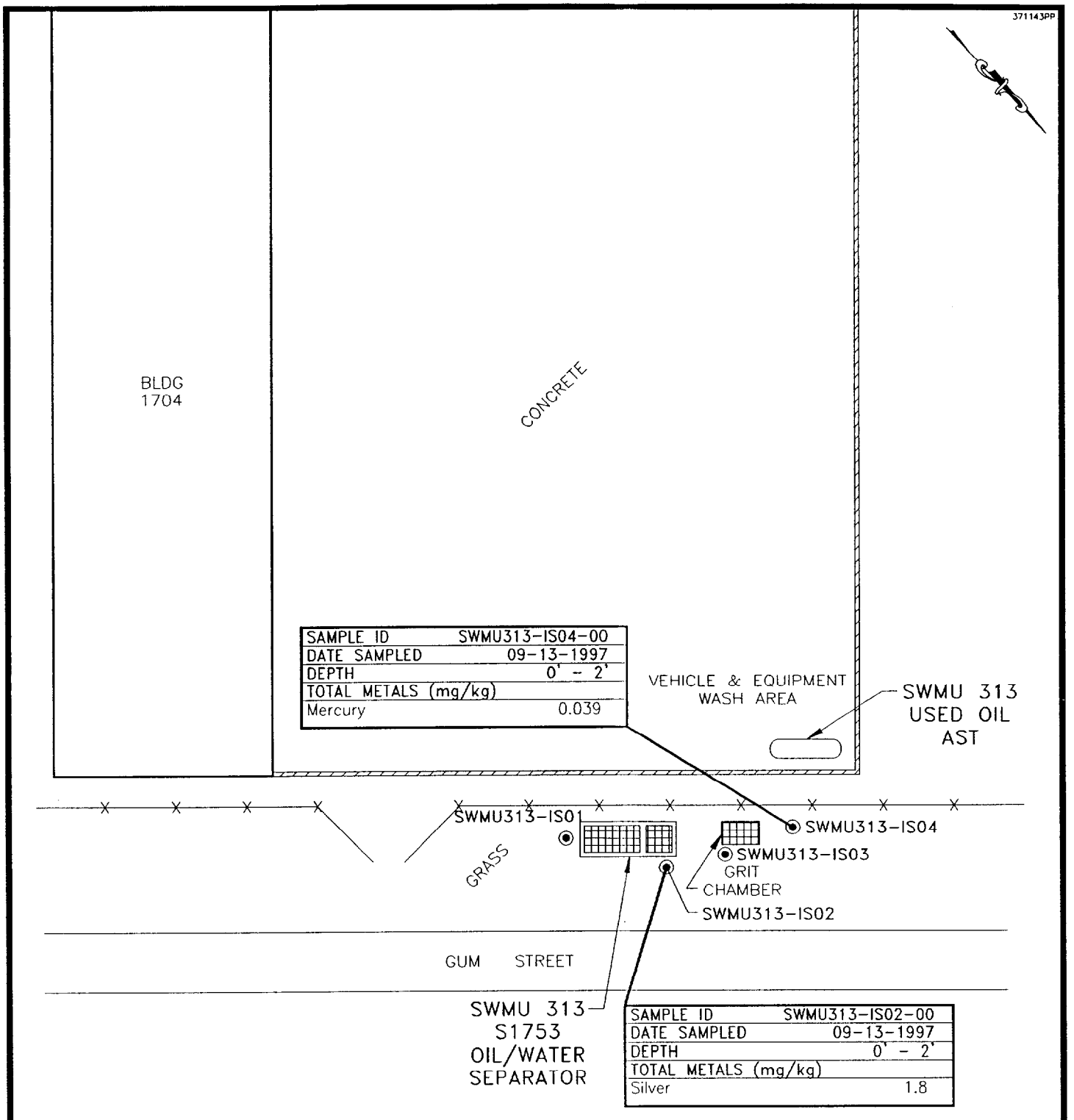
TABLE 1
DETECTION SUMMARY
SWMU 313
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1753 - O/W-AST, SMALL CRAFT CO HQ, BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	22 U	23 U	25	330	SWMU313-IS02-02	3/8	137.33	57
Methylene chloride	5.5 U	6 U	1.9 J	1.9 J	SWMU313-IS02-02	1/8	1.9	1.9
VOLATILES (ug/kg) (8020)								
1,4-Dichlorobenzene	1.1 U	1.2 U	4.2	4.2	SWMU313-IS04-02	1/8	4.2	4.2
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	67 J	310 J	SWMU313-IS04-02	8/8	115.88	88.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.1	1.6	SWMU313-IS02-00,SWMU313-IS04-00	5/8	1.36	1.3
Chromium	ND	ND	5.7	10.9	SWMU313-IS01-00	8/8	7.78	7.95
Lead	ND	ND	2.5	15.2	SWMU313-IS01-00	8/8	6.13	4.9
Mercury	0.036 U	0.04 U	0.039	0.039	SWMU313-IS04-00	1/8	0.04	0.04
Selenium	0.55 U	0.6 U	0.62	0.62	SWMU313-IS04-00	1/8	0.62	0.62
Silver	1.1 U	1.2 U	1.8	1.8	SWMU313-IS02-00	1/8	1.8	1.8

TABLE 2
STATISTICAL SUMMARY
SWMU 313
SWMU CONFIRMATORY SAMPLING (CTO-0371)
S1753 - O/W-AST, SMALL CRAFT CO HQ, BN, 2D MAR DIV
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
Acetone	25	330	SWMU313-IS02-02	200000000	40000000	2810	0	0	0
Methylene chloride	1.9 J	1.9 J	SWMU313-IS02-02	760000	760000	22.1	0	0	0
VOLATILES (ug/kg) (8020)									
1,4-Dichlorobenzene	4.2	4.2	SWMU313-IS04-02	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	67 J	310 J	SWMU313-IS04-02	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.1	1.6	SWMU313-IS02-00,SWMU313-IS04-00	3.8	3.8	26.2	0	0	0
Chromium	5.7	10.9	SWMU313-IS01-00	10000	2000	27.2	0	0	0
Lead	2.5	15.2	SWMU313-IS01-00	NE	400	270.06	0	0	0
Mercury	0.039	0.039	SWMU313-IS04-00	610	122	0.0154	0	0	1
Selenium	0.62	0.62	SWMU313-IS04-00	10000	2000	12.2	0	0	0
Silver	1.8	1.8	SWMU313-IS02-00	10000	2000	0.223	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER. (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

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⊙ SOIL BORING AND SAMPLE LOCATION

mg/kg MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 313
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.43 SWMU 314 - SM187 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.43.1 SWMU Description and History

SWMU 314 is a newly constructed concrete oil/water separator and vehicle wash rack located south/southwest of Montford Landing Road and just west/southwest of Northeast Creek at Camp Johnson. No evidence of stains, spills or releases were noted during Baker's site visit (October 1996). Water from the vehicle wash rack is transported to the oil/water separator (SWMU 314) by underground pipelines.

4.43.2 Confirmatory Investigation Activities

The soil investigation at SWMU 314 was developed to determine if the operation of the oil/water separator has impacted surface and subsurface soils in the area of the oil/water separator and the vehicle wash rack.

A total of four soil borings, SWMU314-IS01 through SWMU314-IS04, were installed on September 9, 1997. Figure 1 presents the locations of the soil borings. One surface soil and one subsurface soil sample were collected from each boring and submitted for analysis. Surface soil samples were collected from ground surface to 2.0 feet bgs and subsurface samples were collected from just above the water table at a depth of 4.0 to 6.0 feet bgs. Groundwater was encountered at a depth of 6.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Methods 8020 and 8260), SVOAs (EPA Method 8270), and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER02A, associated with September 9th sample collection, was collected from a split spoon sampler. Results from the rinsate blank is included in Appendix F. Trip blanks 371TB02, 371TB03 and 371TB04 were shipped with the VOA fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.43.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations
- North Carolina Risk Analysis Framework Method 1, Category S-3:G-3 (protective of groundwater which migrates to surface water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Five VOCs and eight SVOCs were detected in the sample set. No VOCs or SVOCs were detected above the comparison criteria.

Mercury was the only inorganic detected above comparison criteria. Sample SWMU314-IS02-00 exhibited a concentration of 0.058 mg/kg and sample SWMU314-IS04-00 exhibited a concentration of 0.038 mg/kg. Both of these concentrations are above the North Carolina Category S-3:G-1 Target Concentration (0.0154 mg/kg) and the North Carolina Category S-3:G-2 Target Concentration (0.00042 mg/kg). No metals were detected in the rinsate blank for this day's sampling.

Soil borings SWMU314-IS02, located south of the oil/water separator, and SWMU314-IS04, located between the oil/water separator and the vehicle wash rack and Northeast Creek, exhibited the only samples with inorganic concentrations above comparison criteria. Refer to Figure 1 for the location of these borings.

4.43.4 Recommendations

Based on the analytical results, no further actions are recommended for SWMU 314. The mercury detection is not expected to be site-related. No other contaminants were detected at levels exceeding the screening criteria.

TABLE 1
DETECTIVE SUMMARY
SWMU 314
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM187 - O/W, MARINE CAORPS SUPPORTED SERVICES SCHOOL GROUP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU314-IS01-00	SWMU314-IS01-02	SWMU314-IS02-00	SWMU314-IS02-02	SWMU314-IS03-00	SWMU314-IS03-02
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	4' - 6'	0' - 2'	4' - 6'	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)						
Acetone	23 U	23 U	21 U	27	21 U	42
Tetrachloroethene	5.7 U	5.8 U	1.9 J	3 J	5.4 U	6.1 U
Trichloroethene	5.7 U	2.5 J	2.2 J	3.7 J	1.7 J	6.1 U
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	1.1 U	6	4.5	5.3	7.3	1.2 U
1,4-Dichlorobenzene	1.1 U	1.8	1.1 U	1.2 U	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	1900 U	380 U	350 U	380 U	350 U	400 U
Benzo(a)pyrene	1900 U	380 U	350 U	380 U	350 U	400 U
Benzo(b)fluoranthene	1900 U	380 U	350 U	380 U	350 U	400 U
bis(2-Ethylhexyl) phthalate	640 J	1600 J	170 J	220 J	130 J	74 J
Butyl benzyl phthalate	7000	380 U	370	380 U	350 U	400 U
Chrysene	1900 U	380 U	350 U	380 U	350 U	400 U
Fluoranthene	1900 U	380 U	350 U	380 U	350 U	400 U
Pyrene	1900 U	380 U	350 U	380 U	350 U	400 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.2 U	1.1 U	1.2 U	2	1.3
Cadmium	1.3	0.74	2.2	0.58 U	0.54 U	0.61 U
Chromium	3.7	5.4	5.6	6.8	13.7	11.1
Lead	10.1	19.2	12.6	80.6	7.8	6.4
Mercury	0.038 U	0.038 U	0.058	0.038 U	0.035 U	0.04 U

TABLE 1
DETECTIVE SUMMARY
SWMU 314
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM187 - O/W, MARINE CAORPS SUPPORTED SERVICES SCHOOL GROUP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU314-IS04-00	SWMU314-IS04-02
DATE SAMPLED	09-09-1997	09-09-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)		
Acetone	23 U	14 J
Tetrachloroethene	5.8 U	6.1 U
Trichloroethene	2.1 J	6.1 U
VOLATILES (ug/kg) (8020)		
1,3-Dichlorobenzene	7.3	1.2 U
1,4-Dichlorobenzene	1.2 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)		
Benzo(a)anthracene	69 J	400 U
Benzo(a)pyrene	96 J	400 U
Benzo(b)fluoranthene	130 J	400 U
bis(2-Ethylhexyl) phthalate	120 J	350 J
Butyl benzyl phthalate	380 U	400 U
Chrysene	73 J	400 U
Fluoranthene	74 J	400 U
Pyrene	110 J	400 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.2 U	1.9
Cadmium	0.67	1.2
Chromium	6	9.5
Lead	24.9	38.9
Mercury	0.038	0.04 U

TABLE 1
DETECTIVE SUMMARY
SWMU 314
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM187 - O/W, MARINE CAORPS SUPPORTED SERVICES SCHOOL GROUP
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	21 U	23 U	14 J	42	SWMU314-IS03-02	3/8	27.67	27
Tetrachloroethene	5.4 U	6.1 U	1.9 J	3 J	SWMU314-IS02-02	2/8	2.45	2.45
Trichloroethene	5.7 U	6.1 U	1.7 J	3.7 J	SWMU314-IS02-02	5/8	2.44	2.2
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1.1 U	1.2 U	4.5	7.3	SWMU314-IS03-00,SWMU314-IS04-00	5/8	6.08	6
1,4-Dichlorobenzene	1.1 U	1.2 U	1.8	1.8	SWMU314-IS01-02	1/8	1.8	1.8
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	350 U	1900 U	69 J	69 J	SWMU314-IS04-00	1/8	69	69
Benzo(a)pyrene	350 U	1900 U	96 J	96 J	SWMU314-IS04-00	1/8	96	96
Benzo(b)fluoranthene	350 U	1900 U	130 J	130 J	SWMU314-IS04-00	1/8	130	130
bis(2-Ethylhexyl) phthalate	ND	ND	74 J	1600 J	SWMU314-IS01-02	8/8	413	195
Butyl benzyl phthalate	350 U	400 U	370	7000	SWMU314-IS01-00	2/8	3685	3685
Chrysene	350 U	1900 U	73 J	73 J	SWMU314-IS04-00	1/8	73	73
Fluoranthene	350 U	1900 U	74 J	74 J	SWMU314-IS04-00	1/8	74	74
Pyrene	350 U	1900 U	110 J	110 J	SWMU314-IS04-00	1/8	110	110
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.3	2	SWMU314-IS03-00	3/8	1.73	1.9
Cadmium	0.54 U	0.61 U	0.67	2.2	SWMU314-IS02-00	5/8	1.22	1.2
Chromium	ND	ND	3.7	13.7	SWMU314-IS03-00	8/8	7.73	6.4
Lead	ND	ND	6.4	80.6	SWMU314-IS02-02	8/8	25.06	15.9
Mercury	0.035 U	0.04 U	0.038	0.058	SWMU314-IS02-00	2/8	0.05	0.05

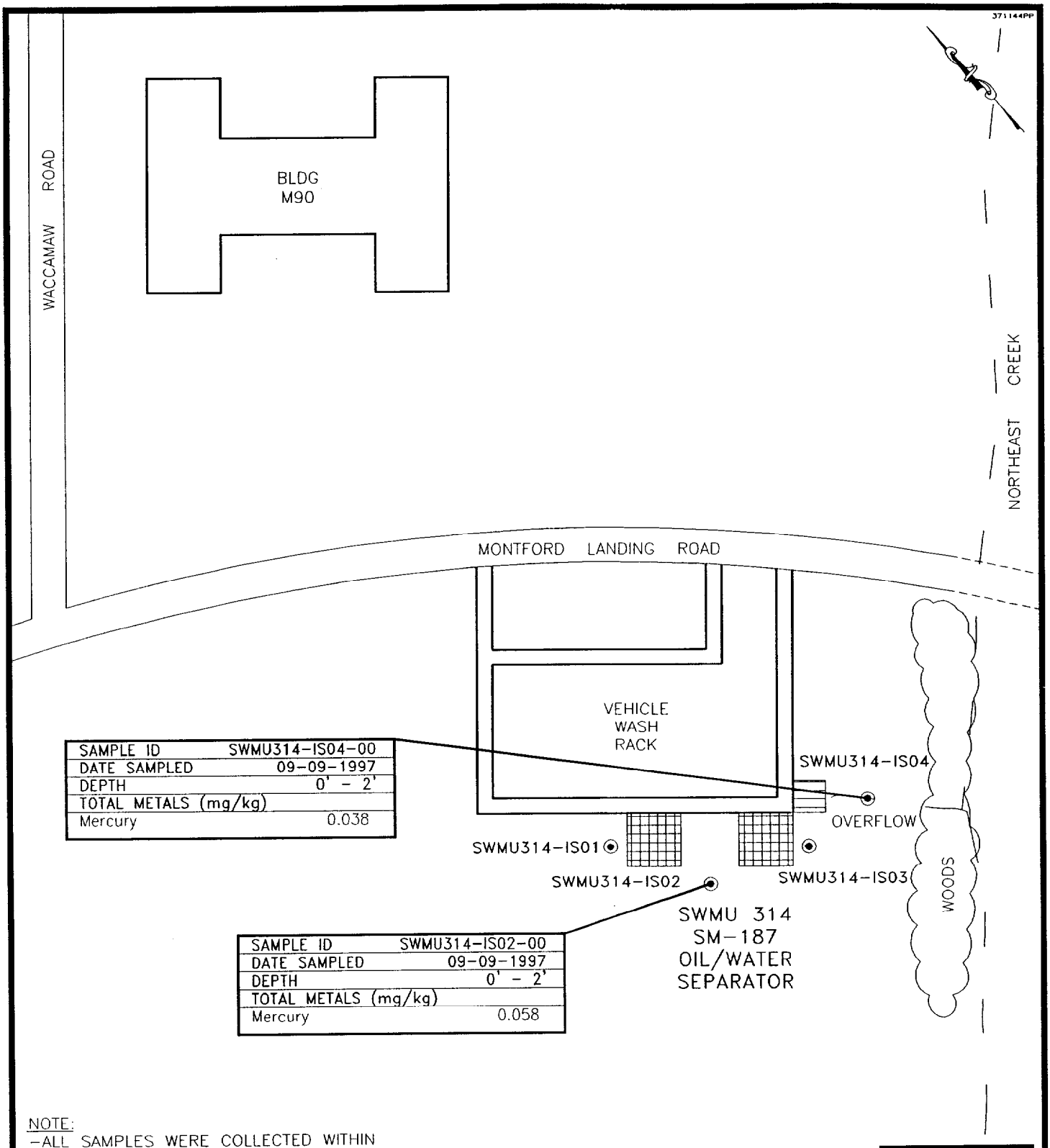
TABLE 2
STATISTICAL SUMMARY
SWMU 314
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM187 - O/W, MARINE CAORPS SUPPORTED SERVICES SCHOOL GROUP
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	NC Method I Category S3:G-3 Target Conc (250 ft)
VOLATILES (ug/kg) (8260A)							
Acetone	14 J	42	SWMU314-IS03-02	200000000	40000000	2810	NE
Tetrachloroethene	1.9 J	3 J	SWMU314-IS02-02	110000	110000	7.4	235
Trichloroethene	1.7 J	3.7 J	SWMU314-IS02-02	520000	520000	18.3	1510
VOLATILES (ug/kg) (8020)							
1,3-Dichlorobenzene	4.5	7.3	SWMU314-IS03-00,SWMU314-IS04-00	180000000	36000000	23700	248000
1,4-Dichlorobenzene	1.8	1.8	SWMU314-IS01-02	240000	240000	1240	NE
SEMIVOLATILES (ug/kg) (8270)							
Benzo(a)anthracene	69 J	69 J	SWMU314-IS04-00	7800	7800	343	878
Benzo(a)pyrene	96 J	96 J	SWMU314-IS04-00	780	780	NE	NE
Benzo(b)fluoranthene	130 J	130 J	SWMU314-IS04-00	7800	7800	NE	NE
bis(2-Ethylhexyl) phthalate	74 J	1600 J	SWMU314-IS01-02	410000	410000	6670	32900
Butyl benzyl phthalate	370	7000	SWMU314-IS01-00	410000000	82000000	27800	NE
Chrysene	73 J	73 J	SWMU314-IS04-00	780000	780000	38150	976
Fluoranthene	74 J	74 J	SWMU314-IS04-00	82000000	16400000	276080	131000
Pyrene	110 J	110 J	SWMU314-IS04-00	61000000	12264000	286440	109000
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.3	2	SWMU314-IS03-00	3.8	3.8	26.2	65.5
Cadmium	0.67	2.2	SWMU314-IS02-00	1000	200	2.72	2.72
Chromium	3.7	13.7	SWMU314-IS03-00	10000	2000	27.2	NE
Lead	6.4	80.6	SWMU314-IS02-02	NE	400	270.06	1130
Mercury	0.038	0.058	SWMU314-IS02-00	610	122	0.0154	0.00042

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 314
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM187 - O/W, MARINE CAORPS SUPPORTED SERVICES SCHOOL GROUP
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Region III Industrial RBCs Exceedance Count	NC Method I Category S-2 Target Conc Exceedance Count	NC Method I Category S3:G-1 Target Conc Exceedance Count	NC Method I Category S3:G-3 Target Conc (250 ft) Exceedance Count
VOLATILES (ug/kg) (8260A)				
Acetone	0	0	0	0
Tetrachloroethene	0	0	0	0
Trichloroethene	0	0	0	0
VOLATILES (ug/kg) (8020)				
1,3-Dichlorobenzene	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0
SEMIVOLATILES (ug/kg) (8270)				
Benzo(a)anthracene	0	0	0	0
Benzo(a)pyrene	0	0	0	0
Benzo(b)fluoranthene	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0
Butyl benzyl phthalate	0	0	0	0
Chrysene	0	0	0	0
Fluoranthene	0	0	0	0
Pyrene	0	0	0	0
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	0	0	0	0
Cadmium	0	0	0	0
Chromium	0	0	0	0
Lead	0	0	0	0
Mercury	0	0	2	2



NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

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⊙ SOIL BORING AND SAMPLE LOCATION

mg/kg MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 314
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.44 SWMU 315 - SM269 Oil/Water Separator Near Building M200

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.44.1 SWMU Description and History

SWMU 315 consists of an oil/water separator that is associated with a vehicle wash rack. The SWMU is located in Mumford Point, between Coolidge and Taft Roads, just west of Northeast Creek. The oil/water separator and vehicle wash rack are situated in a gravel area between Buildings M-200, M-201, and M-230. The separator is a concrete, in-ground unit that is still active. At the time of the investigation, the interior walls of the structure were significantly stained. Stains were also observed along the outside edge of the separator. It is suspected that the unit has been used for disposal of waste oil. During the October 1996 site visit, a dead animal was present within the unit.

4.44.2 Confirmatory Investigation Activities

The soil investigation for SWMU 315 was developed to determine if the presence of the oil/water separator and wash rack impacted surface and subsurface soils in the vicinity of the SWMU.

Four borings, SWMU315-IS01, SWMU315-IS02, and SWMU315-IS03, and SWMU315-IS04 were advanced at the SWMU on September 10, 1997, at the locations depicted on Figure 1. Two samples were collected from each boring. One sample from each boring was collected from the ground surface to 2.0 feet bgs (SWMU315-IS01-00, SWMU315-IS02-00, and SWMU315-IS03-00, and SWMU315-IS04-00). The following subsurface soil samples were collected: SWMU315-IS01-07 (14.0-16.0 feet bgs); SWMU315-IS02-07 (14.0-16.0 feet bgs); SWMU315-IS03-08 (16.0-18.0 feet bgs); and SWMU315-IS04-07 (14.0-16.0 feet bgs). Groundwater was encountered at a depth of approximately 17.5 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Method 8260), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER02B was collected from a split-spoon sampler which was used to collect soil samples from the SWMU. Results for the rinsate blank are included in Appendix F. Trip blank 371TB05 was shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.44.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Contaminants detected at concentrations which exceed the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Two VOCs were detected in the samples collected during the Confirmatory Sampling Investigation. Eleven SVOCs were detected. With the exception of bis(2-ethylhexyl)phthalate, each of the remaining detected organic compounds, which are primarily petroleum-related or PAHs, are most likely site-related. Seven metals were detected.

Only one detected organic compound was present at a level exceeding the aforementioned comparison criteria. The concentration of pentachlorophenol (120 J µg/kg) in one sample (SWMU315-IS03-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (23.1 µg/kg). Two metals were detected at concentrations exceeding the aforementioned screening criteria. The concentration of mercury (0.041 mg/kg 0.13 mg/kg) in two samples (SWMU315-IS01-00 and SWMU315-IS04-00, respectively) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (0.0154 mg/kg). The concentration of silver (1.1 mg/kg) in one sample (SWMU315-IS04-00) exceeded the North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 Target Concentration (0.223 mg/kg). No other criteria for the remaining analyzed organic compounds or metals were exceeded in any of the remaining samples.

4.44.4 Recommendations

Additional investigative activities are recommended for SWMU 315 to further characterize contamination which is apparently related to site operations/activities. This recommendation is predicated on the prevalence of (potentially site-related) SVOCs and metals, and the exceedence of applicable screening criteria. It is recommended that a minimum of three temporary monitoring well borings (with soil sample acquisition) be advanced with subsequent collection of groundwater samples. Soil and groundwater samples should be analyzed for SVOAs and metals.

Just silver

Seems excessive.

how about 2 or just 1 in between IS03 & IS04?

TABLE 1
DETECTION SUMMARY
SWMU 315
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM269 - O/W, NEAR BUILDING M200
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU315-IS01-00	SWMU315-IS01-07	SWMU315-IS02-00	SWMU315-IS02-07	SWMU315-IS03-00	SWMU315-IS03-08
DATE SAMPLED	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997	09-10-1997
DEPTH	0' - 2'	14' - 16'	0' - 2'	14' - 16'	0' - 2'	16' - 18'
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	1 U	1.1 U	1 U	1 U	3.8	1 U
1,4-Dichlorobenzene	2.2	1.1 U	1.9	1 U	1 U	2.9
SEMIVOLATILES (ug/kg) (8270)						
2-Methylnaphthalene	340 U	350 U	340 U	340 U	340 U	340 U
Anthracene	340 U	350 U	340 U	340 U	36 J	340 U
Benzo(a)anthracene	340 U	350 U	340 U	340 U	44 J	340 U
Benzo(b)fluoranthene	340 U	350 U	340 U	340 U	42 J	340 U
bis(2-Ethylhexyl) phthalate	64 J	1500 J	76 J	83 J	83 J	94 J
Chrysene	37 J	350 U	340 U	340 U	51 J	340 U
Fluoranthene	52 J	350 U	43 J	340 U	98 J	340 U
Naphthalene	340 U	350 U	340 U	340 U	340 U	340 U
Pentachlorophenol	1600 U	1700 U	1700 U	1600 U	120 J	1700 U
Phenanthrene	44 J	350 U	340 U	340 U	59 J	340 U
Pyrene	340 U	350 U	340 U	340 U	59 J	340 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	3.6	1.1 U	1.8	1 U	1.3	1 U
Barium	20.4 U	21.1 U	20.6 U	20.6 U	20.6 U	20.9 U
Chromium	5.2	6.2	6.3	2.3	4.7	1.4
Lead	14.9	2.4	11.8	1.3	5.7	1.4
Mercury	0.041	0.035 U	0.034 U	0.034 U	0.034 U	0.034 U
Selenium	0.51	0.53 U	0.52 U	0.51 U	0.51 U	0.52 U
Silver	1 U	1.1 U	1 U	1 U	1 U	1 U

TABLE 1
DETECTION SUMMARY
SWMU 315
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM269 - O/W, NEAR BUILDING M200
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU315-IS04-00	SWMU315-IS04-07
DATE SAMPLED	09-10-1997	09-10-1997
DEPTH	0' - 2'	14' - 16'
VOLATILES (ug/kg) (8020)		
1,3-Dichlorobenzene	2.8	1.1 U
1,4-Dichlorobenzene	1 U	1.1 U
SEMIVOLATILES (ug/kg) (8270)		
2-Methylnaphthalene	150 J	350 U
Anthracene	340 U	350 U
Benzo(a)anthracene	21 J	350 U
Benzo(b)fluoranthene	340 U	350 U
bis(2-Ethylhexyl) phthalate	130 J	84 J
Chrysene	46 J	350 U
Fluoranthene	53 J	350 U
Naphthalene	61 J	350 U
Pentachlorophenol	1600 U	1700 U
Phenanthrene	95 J	350 U
Pyrene	340 U	350 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1 U	1.1 U
Barium	35	21.4 U
Chromium	6.6	2.2
Lead	13.1	1.7
Mercury	0.13	0.035 U
Selenium	0.51 U	0.53 U
Silver	1.1	1.1 U

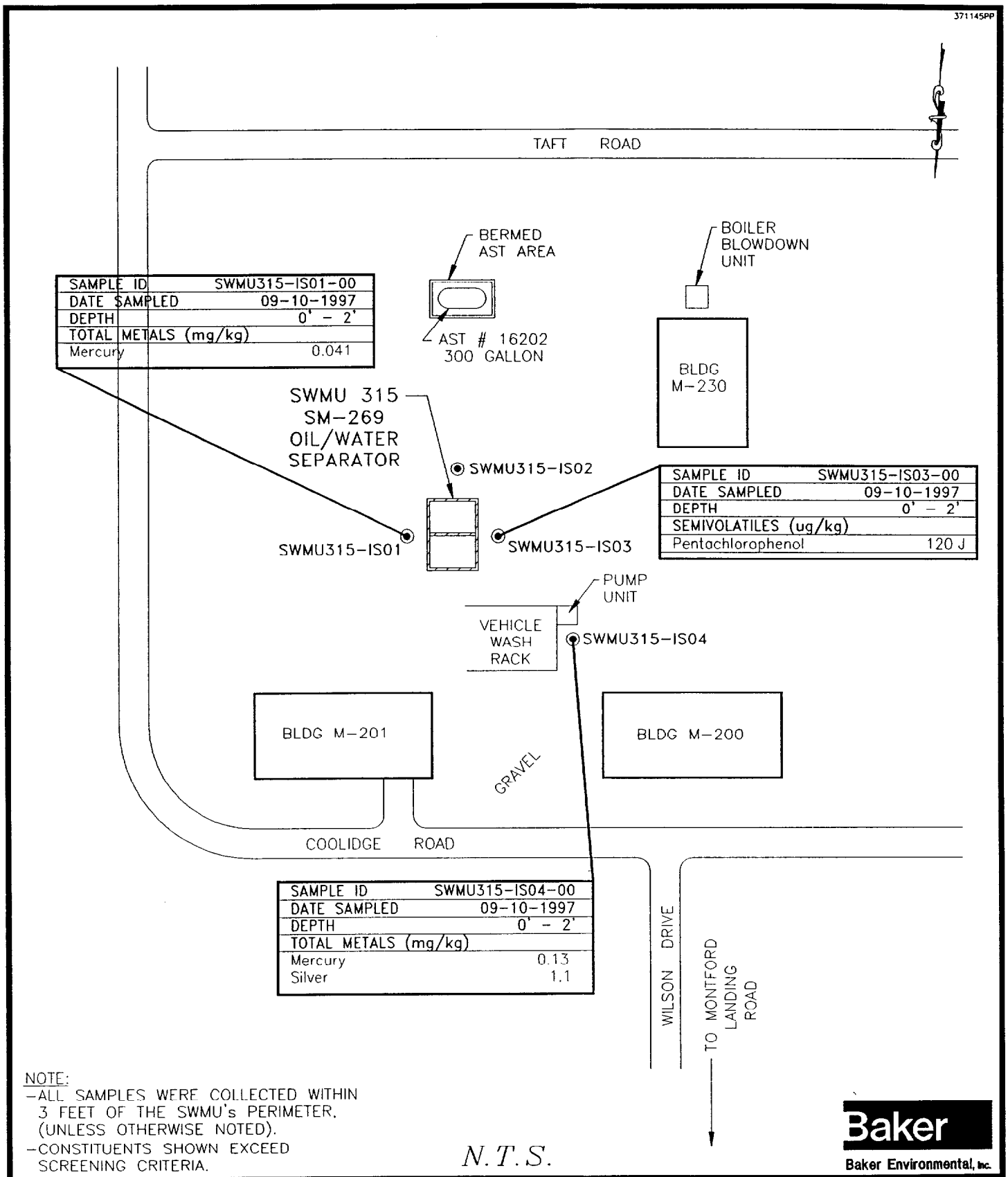
TABLE 1
DETECTION SUMMARY
SWMU 315
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM269 - O/W, NEAR BUILDING M200
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1 U	1.1 U	2.8	3.8	SWMU315-IS03-00	2/8	3.3	3.3
1,4-Dichlorobenzene	1 U	1.1 U	1.9	2.9	SWMU315-IS03-08	3/8	2.33	2.2
SEMIVOLATILES (ug/kg) (8270)								
2-Methylnaphthalene	340 U	350 U	150 J	150 J	SWMU315-IS04-00	1/8	150	150
Anthracene	340 U	350 U	36 J	36 J	SWMU315-IS03-00	1/8	36	36
Benzo(a)anthracene	340 U	350 U	21 J	44 J	SWMU315-IS03-00	2/8	32.5	32.5
Benzo(b)fluoranthene	340 U	350 U	42 J	42 J	SWMU315-IS03-00	1/8	42	42
bis(2-Ethylhexyl) phthalate	ND	ND	64 J	1500 J	SWMU315-IS01-07	8/8	264.25	83.5
Chrysene	340 U	350 U	37 J	51 J	SWMU315-IS03-00	3/8	44.67	46
Fluoranthene	340 U	350 U	43 J	98 J	SWMU315-IS03-00	4/8	61.5	52.5
Naphthalene	340 U	350 U	61 J	61 J	SWMU315-IS04-00	1/8	61	61
Pentachlorophenol	1600 U	1700 U	120 J	120 J	SWMU315-IS03-00	1/8	120	120
Phenanthrene	340 U	350 U	44 J	95 J	SWMU315-IS04-00	3/8	66	59
Pyrene	340 U	350 U	59 J	59 J	SWMU315-IS03-00	1/8	59	59
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1 U	1.1 U	1.3	3.6	SWMU315-IS01-00	3/8	2.23	1.8
Barium	20.4 U	21.4 U	35	35	SWMU315-IS04-00	1/8	35	35
Chromium	ND	ND	1.4	6.6	SWMU315-IS04-00	8/8	4.36	4.95
Lead	ND	ND	1.3	14.9	SWMU315-IS01-00	8/8	6.54	4.05
Mercury	0.034 U	0.035 U	0.041	0.13	SWMU315-IS04-00	2/8	0.09	0.09
Selenium	0.51 U	0.53 U	0.51	0.51	SWMU315-IS01-00	1/8	0.51	0.51
Silver	1 U	1.1 U	1.1	1.1	SWMU315-IS04-00	1/8	1.1	1.1

TABLE 2
STATISTICAL SUMMARY
SWMU 315
SWMU CONFIRMATORY SAMPLING (CTO-0371)
SM269 - O/W, NEAR BUILDING M200
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,3-Dichlorobenzene	2.8	3.8	SWMU315-IS03-00	180000000	36000000	23700	0	0	0
1,4-Dichlorobenzene	1.9	2.9	SWMU315-IS03-08	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
2-Methylnaphthalene	150 J	150 J	SWMU315-IS04-00	82000000	NE	NE	0	0	0
Anthracene	36 J	36 J	SWMU315-IS03-00	610000000	122000000	995000	0	0	0
Benzo(a)anthracene	21 J	44 J	SWMU315-IS03-00	7800	7800	343	0	0	0
Benzo(b)fluoranthene	42 J	42 J	SWMU315-IS03-00	7800	7800	NE	0	0	0
bis(2-Ethylhexyl) phthalate	64 J	1500 J	SWMU315-IS01-07	410000	410000	6670	0	0	0
Chrysene	37 J	51 J	SWMU315-IS03-00	780000	780000	38150	0	0	0
Fluoranthene	43 J	98 J	SWMU315-IS03-00	82000000	16400000	276080	0	0	0
Naphthalene	61 J	61 J	SWMU315-IS04-00	200000000	16400000	584	0	0	0
Pentachlorophenol	120 J	120 J	SWMU315-IS03-00	48000	48000	23.1	0	0	1
Phenanthrene	44 J	95 J	SWMU315-IS04-00	NE	NE	59640	0	0	0
Pyrene	59 J	59 J	SWMU315-IS03-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.3	3.6	SWMU315-IS01-00	3.8	3.8	26.2	0	0	0
Barium	35	35	SWMU315-IS04-00	140000	28000	848	0	0	0
Chromium	1.4	6.6	SWMU315-IS04-00	10000	2000	27.2	0	0	0
Lead	1.3	14.9	SWMU315-IS01-00	NE	400	270.06	0	0	0
Mercury	0.041	0.13	SWMU315-IS04-00	610	122	0.0154	0	0	2
Selenium	0.51	0.51	SWMU315-IS01-00	10000	2000	12.2	0	0	0
Silver	1.1	1.1	SWMU315-IS04-00	10000	2000	0.223	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU315-IS01-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Mercury	0.041

SAMPLE ID	SWMU315-IS03-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Pentachlorophenol	120 J

SAMPLE ID	SWMU315-IS04-00
DATE SAMPLED	09-10-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Mercury	0.13
Silver	1.1

NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER. (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

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LEGEND

◉	SOIL BORING AND SAMPLE LOCATION
mg/kg	MILLIGRAM/KILOGRAM
ug/kg	MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 315
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.45 SWMU 316 - TC773 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.45.1 SWMU Description and History

SWMU 316 is a concrete oil/water separator and vehicle wash rack located east of Buildings TC-771 and TC-773 and between these buildings and Building TC-773's 90 Day Hazardous Waste Storage Facility. Water from the wash rack is transported to the oil/water separator (SWMU 316) by underground pipelines.

4.45.2 Confirmatory Investigation Activities

The soil investigation at SWMU 316 was developed to determine if the operation of the oil/water separator has impacted the surface and subsurface soils in the area of the oil/water separator and vehicle wash rack.

A total of four soil borings, SWMU316-IS01 through SWMU316-IS04, were installed on September 9, 1997. Figure 1 presents the locations of the soil borings. One surface soil and one subsurface soil sample were collected from each boring and submitted for analysis. Surface soil samples were collected from ground surface to 2.0 feet bgs. Three subsurface soil samples were collected from above the water table at a depth of 4.0 to 6.0 feet bgs. The fourth subsurface soil sample was collected from an approximate depth of 6.0 to 8.0 feet bgs. Groundwater was encountered at a depth of 7.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8070), and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER02A, associated with September 9th sample collection, was collected from a split spoon sampler. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB02, 371TB03 and 371TB04 were shipped with the VOA fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.45.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

One VOC, 13 SVOCs (primarily PAHs) and three metals were detected in the sample set. No VOCs, SVOCs or metals were detected above the comparison criteria.

4.45.4 Recommendations

No further action is recommended for SWMU 316 since no compounds were detected at levels above screening criteria.

TABLE 1
DETECTION SUMMARY
SWMU 316
SWMU CONFIRMATORY SAMPLING (CTO-0371)
TC773 - O/W, SCHOOL OF INFANTRY
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU316-IS01-00	SWMU316-IS01-04	SWMU316-IS02-00	SWMU316-IS02-02	SWMU316-IS03-00	SWMU316-IS03-02
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	8' - 10'	0' - 2'	4' - 6'	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8020)						
1,3-Dichlorobenzene	2.8	1.2 U	1.2 U	1.2 U	1.1 U	1.3 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	250 J	410 U	81 J	410 U	370 U	94 J
Benzo(a)pyrene	280 J	410 U	100 J	410 U	370 U	100 J
Benzo(b)fluoranthene	410	410 U	140 J	410 U	370 U	200 J
Benzo(ghi)perylene	180 J	410 U	68 J	410 U	370 U	71 J
Benzo(k)fluoranthene	150 J	410 U	60 J	410 U	370 U	70 J
bis(2-Ethylhexyl) phthalate	380 U	120 J	390 U	46 J	370 U	390 J
Carbazole	43 J	410 U	390 U	410 U	370 U	440 U
Chrysene	370 J	410 U	140 J	410 U	370 U	150 J
Dibenz(a,h)anthracene	44 J	410 U	390 U	410 U	370 U	440 U
Fluoranthene	690	410 U	300 J	410 U	370 U	220 J
Indeno(1,2,3-cd)pyrene	160 J	410 U	62 J	410 U	370 U	77 J
Phenanthrene	230 J	410 U	150 J	410 U	370 U	46 J
Pyrene	480	410 U	200 J	410 U	370 U	180 J
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U	1.9
Chromium	5.3	12.4	7.8	5.9	4.7	8.7
Lead	4.4	4.7	2.9	4.8	5.4	5

TABLE 1
DETECTION SUMMARY
SWMU 316
SWMU CONFIRMATORY SAMPLING (CTO-0371)
TC773 - O/W, SCHOOL OF INFANTRY
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU316-IS04-00	SWMU316-IS04-03
DATE SAMPLED	09-09-1997	09-09-1997
DEPTH	0' - 2'	6' - 8'
VOLATILES (ug/kg) (8020)		
1,3-Dichlorobenzene	1.1 U	1.2 U
SEMIVOLATILES (ug/kg) (8270)		
Benzo(a)anthracene	370 U	390 U
Benzo(a)pyrene	370 U	390 U
Benzo(b)fluoranthene	370 U	390 U
Benzo(ghi)perylene	370 U	390 U
Benzo(k)fluoranthene	370 U	390 U
bis(2-Ethylhexyl) phthalate	370 U	390 U
Carbazole	370 U	390 U
Chrysene	370 U	390 U
Dibenz(a,h)anthracene	370 U	390 U
Fluoranthene	62 J	390 U
Indeno(1,2,3-cd)pyrene	370 U	390 U
Phenanthrene	370 U	390 U
Pyrene	54 J	390 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.1 U	1.2 U
Chromium	15.2	3.3
Lead	4.5	2

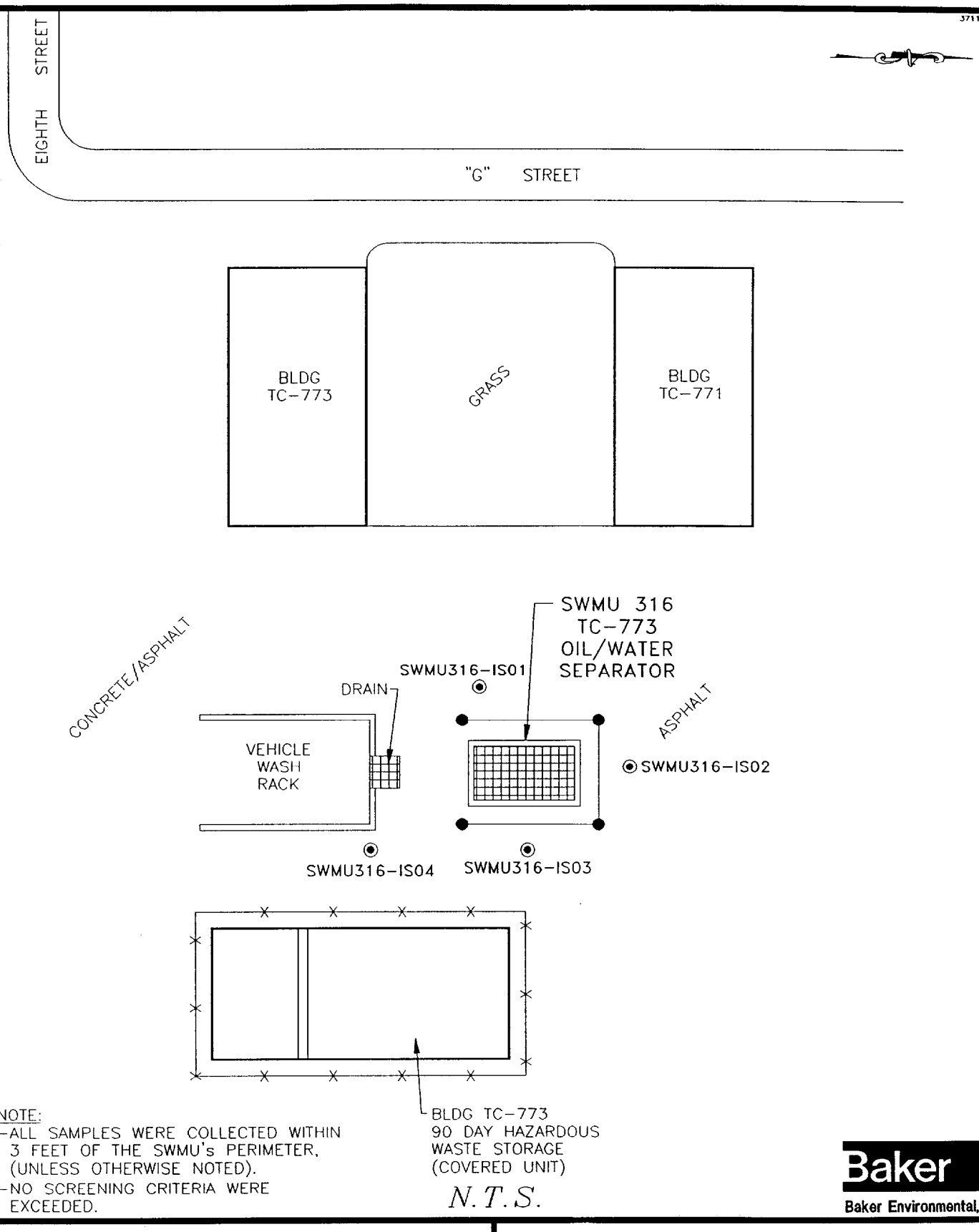
TABLE 1
DETECTION SUMMARY
SWMU 316
SWMU CONFIRMATORY SAMPLING (CTO-0371)
TC773 - O/W, SCHOOL OF INFANTRY
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,3-Dichlorobenzene	1.1 U	1.3 U	2.8	2.8	SWMU316-IS01-00	1/8	2.8	2.8
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	370 U	410 U	81 J	250 J	SWMU316-IS01-00	3/8	141.67	94
Benzo(a)pyrene	370 U	410 U	100 J	280 J	SWMU316-IS01-00	3/8	160	100
Benzo(b)fluoranthene	370 U	410 U	140 J	410	SWMU316-IS01-00	3/8	250	200
Benzo(ghi)perylene	370 U	410 U	68 J	180 J	SWMU316-IS01-00	3/8	106.33	71
Benzo(k)fluoranthene	370 U	410 U	60 J	150 J	SWMU316-IS01-00	3/8	93.33	70
bis(2-Ethylhexyl) phthalate	370 U	390 U	46 J	390 J	SWMU316-IS03-02	3/8	185.33	120
Carbazole	370 U	440 U	43 J	43 J	SWMU316-IS01-00	1/8	43	43
Chrysene	370 U	410 U	140 J	370 J	SWMU316-IS01-00	3/8	220	150
Dibenz(a,h)anthracene	370 U	440 U	44 J	44 J	SWMU316-IS01-00	1/8	44	44
Fluoranthene	370 U	410 U	62 J	690	SWMU316-IS01-00	4/8	318	260
Indeno(1,2,3-cd)pyrene	370 U	410 U	62 J	160 J	SWMU316-IS01-00	3/8	99.67	77
Phenanthrene	370 U	410 U	46 J	230 J	SWMU316-IS01-00	3/8	142	150
Pyrene	370 U	410 U	54 J	480	SWMU316-IS01-00	4/8	228.5	190
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.2 U	1.9	1.9	SWMU316-IS03-02	1/8	1.9	1.9
Chromium	ND	ND	3.3	15.2	SWMU316-IS04-00	8/8	7.91	6.85
Lead	ND	ND	2	5.4	SWMU316-IS03-00	8/8	4.21	4.6

TABLE 2
STATISTICAL SUMMARY
SWMU 316
SWMU CONFIRMATORY SAMPLING (CTO-0371)
TC773 - O/W, SCHOOL OF INFANTRY
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,3-Dichlorobenzene	2.8	2.8	SWMU316-IS01-00	180000000	36000000	23700	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Benzo(a)anthracene	81 J	250 J	SWMU316-IS01-00	7800	7800	343	0	0	0
Benzo(a)pyrene	100 J	280 J	SWMU316-IS01-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	140 J	410	SWMU316-IS01-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	68 J	180 J	SWMU316-IS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	60 J	150 J	SWMU316-IS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	46 J	390 J	SWMU316-IS03-02	410000	410000	6670	0	0	0
Carbazole	43 J	43 J	SWMU316-IS01-00	290000	290000	NE	0	0	0
Chrysene	140 J	370 J	SWMU316-IS01-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	44 J	44 J	SWMU316-IS01-00	780	780	NE	0	0	0
Fluoranthene	62 J	690	SWMU316-IS01-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	62 J	160 J	SWMU316-IS01-00	7800	7800	NE	0	0	0
Phenanthrene	46 J	230 J	SWMU316-IS01-00	NE	NE	59640	0	0	0
Pyrene	54 J	480	SWMU316-IS01-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.9	1.9	SWMU316-IS03-02	3.8	3.8	26.2	0	0	0
Chromium	3.3	15.2	SWMU316-IS04-00	10000	2000	27.2	0	0	0
Lead	2	5.4	SWMU316-IS03-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



N.T.S.

NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER, (UNLESS OTHERWISE NOTED).
- NO SCREENING CRITERIA WERE EXCEEDED.

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LEGEND

- SOIL BORING AND SAMPLE LOCATION
- FENCE AND BOLLARDS

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 316
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.46 SWMU 317 - TT2453 Release

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.46.1 SWMU Description and History

SWMU 317 is an area near a used antifreeze AST near Building TT-2453 (auto care facility) where the RFA Report (EnSafe, 1996) noted that a release had occurred. During the site visit by Baker (October 1996), no evidence of stains, spills or releases were observed.

4.46.2 Confirmatory Investigation Activities

The soil investigation at SWMU 317 was confined to one soil boring located west of the used antifreeze AST to confirm the apparent absence of impact on the soils in the area.

The one soil boring, SWMU317-IS01, was installed on September 9, 1997. Figure 1 presents the location of the soil boring. One surface and one subsurface soil sample were collected and submitted for analysis. The surface soil sample was collected from ground surface to 2.0 feet bgs and the subsurface soil sample was collected from just above the water table at a depth of 8.0 to 10.0 feet bgs. Groundwater was encountered at a depth of 10.0 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Methods 8020 and 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER02A, associated with September 9th sample collection, was collected from a split spoon sampler. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB02, 371TB03 and 371TB04 were shipped with the VOA fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.46.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Three VOCs and one SVOC were detected in the sample set. No VOCs or SVOCs were detected above the comparison criteria.

Metals which exceeded comparison criteria included lead and mercury. Lead was detected in sample SWMU317-IS01-00 (348 mg/kg) and exceeded the North Carolina Category S-3:G-1 Target Concentration (270.06 mg/kg). Mercury was detected in sample SWMU317-IS01-00 (0.039 mg/kg), exceeding the North Carolina Category S-3:G-1 Target Concentration (0.0154 mg/kg). No metals were detected in the rinsate blank for this day's sampling.

Soil boring SWMU317-IS01, located south of the existing AST, exhibited metal constituents in exceedence of the North Carolina Category S-3:G-1 Target Concentration comparison criteria. Refer to Figure 1 for the location of boring SWMU317-IS01.

4.46.4 Recommendations

An additional investigation be is recommended for SWMU 317. This investigation would consist of soil borings north, east and south of boring SWMU317-IS01(further out than the Phase I soil borings) and west of the used antifreeze AST to confirm and define the contamination. Additionally, a minimum of two temporary groundwater monitoring wells would be installed. One monitoring well would be south of soil boring SWMU317-IS01, which is the apparent groundwater downgradient direction, and the second well would be west of the antifreeze AST. Soil and groundwater samples collected during this additional investigation would be analyzed for metals.

TABLE 1
DETECTION SUMMARY
SWMU 317
SWMU CONFIRMATORY SAMPLING (CTO-0371)
TT2453 - RELEASE, NEAR BUILDING TT2453
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU317-IS01-00	SWMU317-IS01-04
DATE SAMPLED	09-09-1997	09-09-1997
DEPTH	0' - 2'	8' - 10'
VOLATILES (ug/kg) (8260A)		
1,2-Dichloroethane	1.6 J	6.1 U
Acetone	12 J	13 J
Methylene chloride	5.8 U	2.5 J
VOLATILES (ug/kg) (8020)	ND	ND
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	3800 U	110 J
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	2.3	2.6
Barium	59.8	24.4 U
Cadmium	2.1	0.61 U
Chromium	10.2	13.8
Lead	348	9
Mercury	0.039	0.04 U

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 317
SWMU CONFIRMATORY SAMPLING (CTO-0371)
TT2453 - RELEASE, NEAR BUILDING TT2453
MCB, CAMP LEJUENE, NORTH CAROLINA

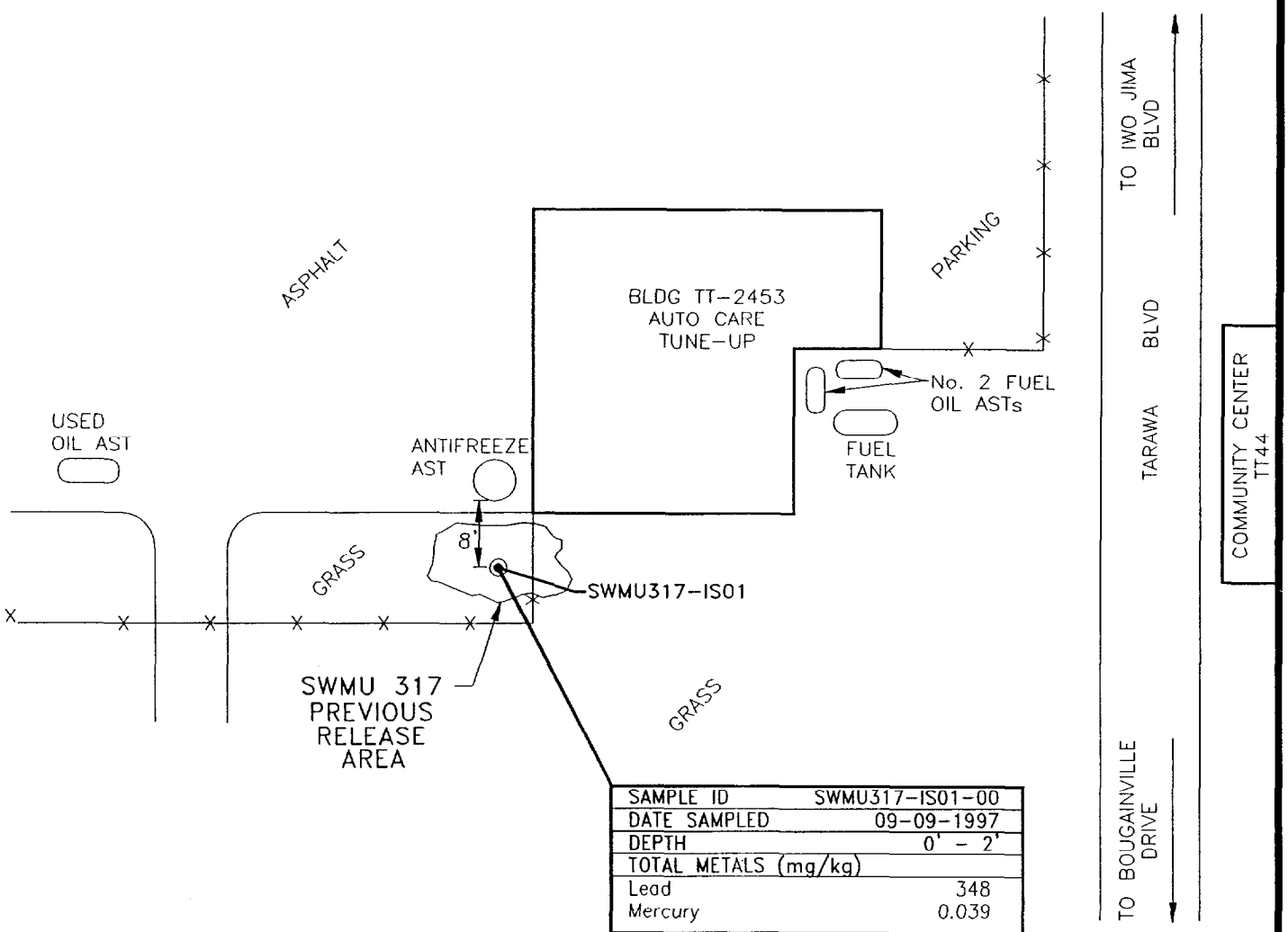
SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
1,2-Dichloroethane	6.1 U	6.1 U	1.6 J	1.6 J	SWMU317-IS01-00	1/2	1.6	1.6
Acetone	ND	ND	12 J	13 J	SWMU317-IS01-04	2/2	12.5	12.5
Methylene chloride	5.8 U	5.8 U	2.5 J	2.5 J	SWMU317-IS01-04	1/2	2.5	2.5
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/2	ND	ND
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	3800 U	3800 U	110 J	110 J	SWMU317-IS01-04	1/2	110	110
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	ND	ND	2.3	2.6	SWMU317-IS01-04	2/2	2.45	2.45
Barium	24.4 U	24.4 U	59.8	59.8	SWMU317-IS01-00	1/2	59.8	59.8
Cadmium	0.61 U	0.61 U	2.1	2.1	SWMU317-IS01-00	1/2	2.1	2.1
Chromium	ND	ND	10.2	13.8	SWMU317-IS01-04	2/2	12	12
Lead	ND	ND	9	348	SWMU317-IS01-00	2/2	178.5	178.5
Mercury	0.04 U	0.04 U	0.039	0.039	SWMU317-IS01-00	1/2	0.04	0.04

Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 317
SWMU CONFIRMATORY SAMPLING (CTO-0371)
TT2453 - RELEASE, NEAR BUILDING TT2453
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
1,2-Dichloroethane	1.6 J	1.6 J	SWMU317-IS01-00	63000	63000	1.84	0	0	0
Acetone	12 J	13 J	SWMU317-IS01-04	200000000	40000000	2810	0	0	0
Methylene chloride	2.5 J	2.5 J	SWMU317-IS01-04	760000	760000	22.1	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	110 J	110 J	SWMU317-IS01-04	410000	410000	6670	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	2.3	2.6	SWMU317-IS01-04	3.8	3.8	26.2	0	0	0
Barium	59.8	59.8	SWMU317-IS01-00	140000	28000	848	0	0	0
Cadmium	2.1	2.1	SWMU317-IS01-00	1000	200	2.72	0	0	0
Chromium	10.2	13.8	SWMU317-IS01-04	10000	2000	27.2	0	0	0
Lead	9	348	SWMU317-IS01-00	NE	400	270.06	0	0	1
Mercury	0.039	0.039	SWMU317-IS01-00	610	122	0.0154	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



SAMPLE ID	SWMU317-IS01-00
DATE SAMPLED	09-09-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Lead	348
Mercury	0.039

NOTE:
-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

N.T.S.

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LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

mg/kg MILLIGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 317
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.47 SWMU 318 - AS515 Oil/Water Separator

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.47.1 SWMU Description and History

SWMU 318 is a concrete oil/water separator and grit chamber located at MCAS, New River, in the vicinity of Buildings AS-515 and AS-528 (Figure 1). The muti-chambered oil/water separator is located near the helicopter wash pad located at the northern end of the air field. The primary function of the SWMU is to collect water, soap, oil, grease and dirt from the concrete wash pad, separate the solids from the liquids, and then segregate the oil and grease from the remaining liquids (Figure 1). The helicopter wash pad and the airfield covered with concrete, however the area surrounding the SWMU is covered with grass. Adjacent to the oil/water separator is a drainage ditch which collects stormwater run-off from the surrounding area.

4.47.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 318 was developed to determine if the operations pertaining to the wash area and the oil/water separator have impacted surface and subsurface soils surrounding the SWMU.

A total of three soil borings, SWMU318-IS01 through SWMU318-IS03, and one surface soil sample location were sampled during the Confirmatory Sampling Investigation. The borings were advanced on September 14, 1997 and the surface soil sample was collected on September 17, 1997. As depicted on Figure 1, a soil boring was advanced on three of the four sides of the oil/water separator. The borings were strategically positioned to determine if contamination resides in the soils surrounding the SWMU. Because of shallow groundwater conditions at the site, only one sample (instead of two as originally proposed) was collected from each of the borings. The samples were collected from ground surface to 2.0 feet bgs. Groundwater was encountered at 2.0 feet bgs.

A surface soil sample was collected from the soils within the drainage ditch, adjacent to the oil/water separator (Figure 1). The sample was collected from ground surface to one foot bgs.

All samples were collected in accordance with procedures outlined in the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8020), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). A duplicate sample was collected from surface soil sample SWMU318-SS01-00 and the results are presented in Appendix E. Equipment rinsate blanks 371ER06B and 371ER08B were collected from a stainless steel spatula and a stainless steel sampling spoon used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB10, 371TB11, 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.47.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1, and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the previously listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs.

Two VOCs were detected at concentrations that exceed the North Carolina, Category S-3:G-1 Target Concentrations. Compounds 1,2-dichlorobenzene and 1,4-dichlorobenzene were detected in the surface soil sample SWMU318-SS01-00 at a concentration of 9,200 µg/kg and 4,300 µg/kg, respectively. These concentrations exceed the target concentration for 1,2-dichlorobenzene (7,270 µg/kg) and 1,4-dichlorbenzene (1,240 µg/kg). The sample collected from soil boring SWMU318-IS01 also contained 1,2-dichlorobenzene but not at a concentration that exceeded the comparison criteria.

The following SVOCs were detected in samples collected at the site: 2-methylnaphthtalene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(ghi)perylene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; butyl benzyl phthalate; chrysene; dibenz(a,h)anthracene; di-n-butyl phthalate; fluoranthene; indeno(1,2,3-cd)pyrene; naphthalene; and pyrene. Of these compounds, only benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, dibenz(a, h)anthracene and naphthalene were detected at concentrations exceeding the comparison criteria. All of the exceedences were detected in sample SMWU318-SS01-00, the surface soil sample collected from the drainage ditch.

Five metals were detected in excess of comparison criteria. Arsenic was detected in sample SWMU318-IS02-00 at a concentration of 14.3 mg/kg, exceeding the Region III RBCs and the North Carolina, Category S-2 Target Concentration. Cadmium and chromium were each detected in two samples (SWMU318-IS02-00 and SWMU318-SS01-00) at concentrations exceeding the North Carolina, Category S-3:G-1 Target Concentrations. Mercury concentrations were in excess of the North Carolina, Category S-3:G-1 Target Concentrations in each of the four soil samples collected at the site. Surface soil sample SWMU318-SS01-00 possessed silver concentrations in excess of the North Carolina, Category S-3:G-1 Target Concentrations.

4.47.4 Recommendations

Additional investigations at SWMU 318 are recommended. Soil sample SWMU318-SS01-00 was the most contaminated sample collected at the site containing detectable levels of VOCs, SVOCs and metals. Additional surface and subsurface soil samples would be collected from the soils within the ditch, around the wash pad and the oil/water separator. In addition, groundwater samples would be collected within the vicinity of the oil/water separator to determine if groundwater beneath the SWMU has been contaminated by the same constituents as the soils. Soil and groundwater samples would be analyzed for VOAs, SVOAs and metals.

TABLE 1
DETECTION SUMMARY
SWMU 318
SWMU COMFIRMATORY SAMPLING (CTO-0371)
AS515 - O/W, NEAR BUILDING AS515
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU318-IS01-00	SWMU318-IS02-00	SWMU318-IS03-00	SWMU318-SS01-00
DATE SAMPLED	09-14-1997	09-14-1997	09-14-1997	09-17-1997
DEPTH	0' - 2'	0' - 2'	0' - 2'	0' - 2'
VOLATILES (ug/kg) (8020)				
1,2-Dichlorobenzene	1.2 U	1.4 U	1.2 U	9200
1,4-Dichlorobenzene	1.8	1.4 U	1.2 U	4300
SEMIVOLATILES (ug/kg) (8270)				
2-Methylnaphthalene	410 U	470 U	410 U	2600 J
Benzo(a)anthracene	56 J	470 U	410 U	4100 J
Benzo(a)pyrene	110 J	470 U	410 U	5000 J
Benzo(b)fluoranthene	110 J	470 U	410 U	5900 J
Benzo(ghi)perylene	99 J	470 U	410 U	5000 J
Benzo(k)fluoranthene	410 U	470 U	410 U	6900 J
bis(2-Ethylhexyl) phthalate	230 J	1400 J	180 J	22000 J
Butyl benzyl phthalate	410 U	470 U	410 U	2000 J
Chrysene	69 J	470 U	410 U	6700 J
Dibenz(a,h)anthracene	45 J	470 U	410 U	2300 J
Di-n-butyl phthalate	410 U	470 U	410 U	2400 J
Fluoranthene	69 J	470 U	410 U	7700 J
Indeno(1,2,3-cd)pyrene	91 J	470 U	410 U	4700 J
Naphthalene	410 U	470 U	410 U	17000 J
Pyrene	71 J	470 U	410 U	7800 J
TOTAL METALS (mg/kg) (6010/7410)				
Arsenic	3.1	14.3	3.7	1.3 U
Barium	50.3	44	25 U	396
Cadmium	1.6	3	0.62 U	57.2
Chromium	24.6	48.2	18.2	91.1
Lead	30.7	45.8	21.9	110
Mercury	0.067	0.14	0.052	0.045
Selenium	0.81	0.85	0.62 U	0.67 U
Silver	1.2 U	1.4 U	1.2 U	7.2

TABLE 1
DETECTION SUMMARY
SWMU 318
SWMU COMFIRMATORY SAMPLING (CTO-0371)
AS515 - O/W, NEAR BUILDING AS515
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8020)								
1,2-Dichlorobenzene	1.2 U	1.4 U	9200	9200	SWMU318-SS01-00	1/4	9200	9200
1,4-Dichlorobenzene	1.2 U	1.4 U	1.8	4300	SWMU318-SS01-00	2/4	2150.9	2150.9
SEMIVOLATILES (ug/kg) (8270)								
2-Methylnaphthalene	410 U	470 U	2600 J	2600 J	SWMU318-SS01-00	1/4	2600	2600
Benzo(a)anthracene	410 U	470 U	56 J	4100 J	SWMU318-SS01-00	2/4	2078	2078
Benzo(a)pyrene	410 U	470 U	110 J	5000 J	SWMU318-SS01-00	2/4	2555	2555
Benzo(b)fluoranthene	410 U	470 U	110 J	5900 J	SWMU318-SS01-00	2/4	3005	3005
Benzo(ghi)perylene	410 U	470 U	99 J	5000 J	SWMU318-SS01-00	2/4	2549.5	2549.5
Benzo(k)fluoranthene	410 U	470 U	6900 J	6900 J	SWMU318-SS01-00	1/4	6900	6900
bis(2-Ethylhexyl) phthalate	ND	ND	180 J	22000 J	SWMU318-SS01-00	4/4	5952.5	815
Butyl benzyl phthalate	410 U	470 U	2000 J	2000 J	SWMU318-SS01-00	1/4	2000	2000
Chrysene	410 U	470 U	69 J	6700 J	SWMU318-SS01-00	2/4	3384.5	3384.5
Dibenz(a,h)anthracene	410 U	470 U	45 J	2300 J	SWMU318-SS01-00	2/4	1172.5	1172.5
Di-n-butyl phthalate	410 U	470 U	2400 J	2400 J	SWMU318-SS01-00	1/4	2400	2400
Fluoranthene	410 U	470 U	69 J	7700 J	SWMU318-SS01-00	2/4	3884.5	3884.5
Indeno(1,2,3-cd)pyrene	410 U	470 U	91 J	4700 J	SWMU318-SS01-00	2/4	2395.5	2395.5
Naphthalene	410 U	470 U	17000 J	17000 J	SWMU318-SS01-00	1/4	17000	17000
Pyrene	410 U	470 U	71 J	7800 J	SWMU318-SS01-00	2/4	3935.5	3935.5
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.3 U	1.3 U	3.1	14.3	SWMU318-IS02-00	3/4	7.03	3.7
Barium	25 U	25 U	44	396	SWMU318-SS01	3/4	163.43	50.3
Cadmium	0.62 U	0.62 U	1.6	57.2	SWMU318-SS01	3/4	20.6	3
Chromium	ND	ND	18.2	91.1	SWMU318-SS01	4/4	45.53	36.4
Lead	ND	ND	21.9	110	SWMU318-SS01	4/4	52.1	38.25
Mercury	ND	ND	0.045	0.14	SWMU318-IS02-00	4/4	0.08	0.06
Selenium	0.62 U	0.67 U	0.81	0.85	SWMU318-IS02-00	2/4	0.83	0.83
Silver	1.2 U	1.4 U	7.2	7.2	SWMU318-SS01	1/4	7.2	7.2

TABLE 2
STATISTICAL SUMMARY
SWMU 318
SWMU COMFIRMATORY SAMPLING (CTO-0371)
AS515 - O/W, NEAR BUILDING AS515
MCB, CAMP LEJUENE, NORTH CAROLINA

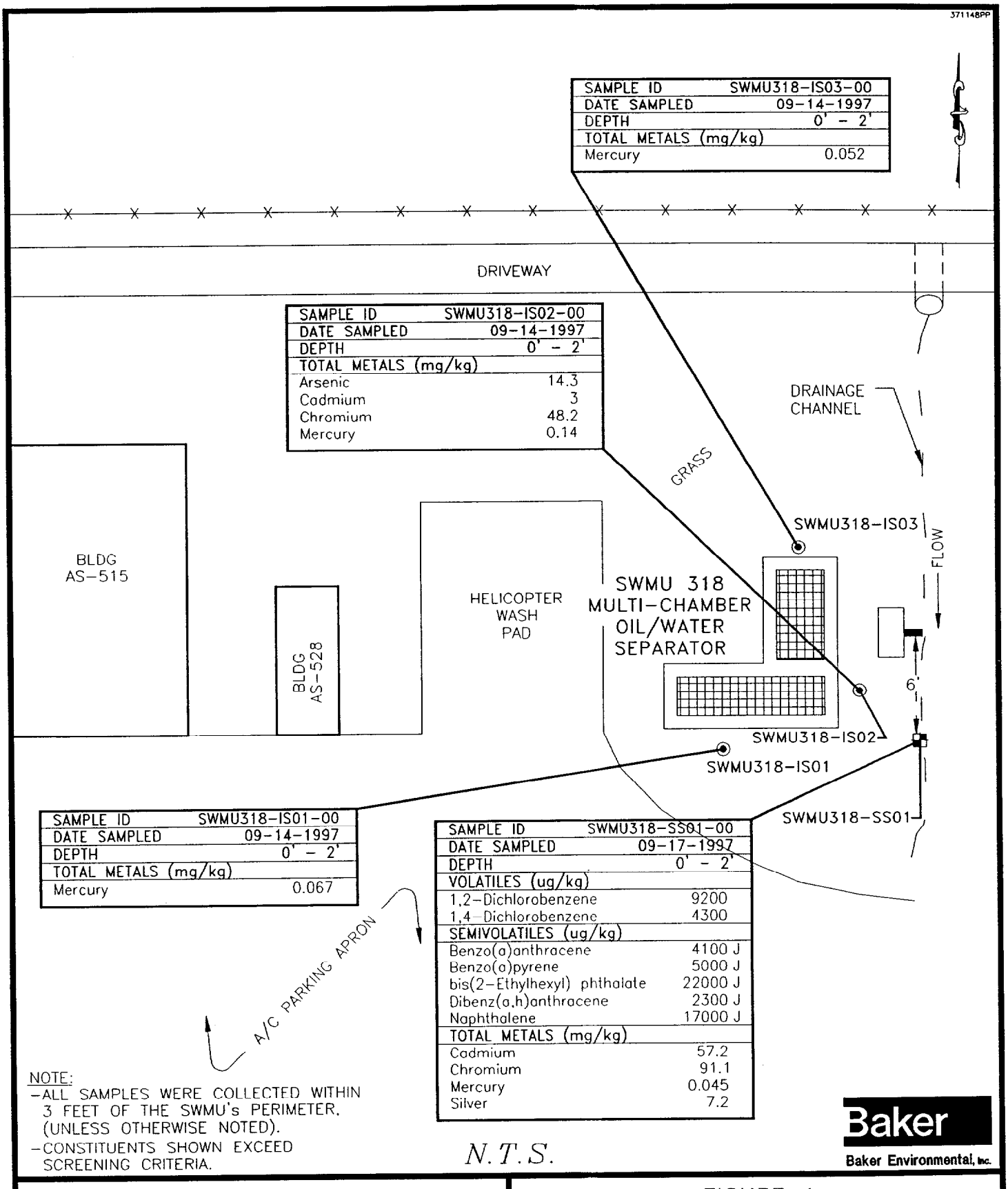
CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8020)									
1,2-Dichlorobenzene	9200	9200	SWMU318-SS01-00	180000000	36000000	7270	0	0	1
1,4-Dichlorobenzene	1.8	4300	SWMU318-SS01-00	240000	240000	1240	0	0	1
SEMIVOLATILES (ug/kg) (8270)									
2-Methylnaphthalene	2600 J	2600 J	SWMU318-SS01-00	82000000	NE	NE	0	0	0
Benzo(a)anthracene	56 J	4100 J	SWMU318-SS01-00	7800	7800	343	0	0	1
Benzo(a)pyrene	110 J	5000 J	SWMU318-SS01-00	780	780	NE	1	1	0
Benzo(b)fluoranthene	110 J	5900 J	SWMU318-SS01-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	99 J	5000 J	SWMU318-SS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	6900 J	6900 J	SWMU318-SS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	180 J	22000 J	SWMU318-SS01-00	410000	410000	6670	0	0	1
Butyl benzyl phthalate	2000 J	2000 J	SWMU318-SS01-00	410000000	82000000	27800	0	0	0
Chrysene	69 J	6700 J	SWMU318-SS01-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	45 J	2300 J	SWMU318-SS01-00	780	780	NE	1	1	0
Di-n-butyl phthalate	2400 J	2400 J	SWMU318-SS01-00	NE	NE	NE	0	0	0
Fluoranthene	69 J	7700 J	SWMU318-SS01-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	91 J	4700 J	SWMU318-SS01-00	7800	7800	NE	0	0	0
Naphthalene	17000 J	17000 J	SWMU318-SS01-00	200000000	16400000	584	0	0	1
Pyrene	71 J	7800 J	SWMU318-SS01-00	61000000	12264000	286440	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 2
STATISTICAL SUMMARY
SWMU 318
SWMU COMFIRMATORY SAMPLING (CTO-0371)
AS515 - O/W, NEAR BUILDING AS515
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	3.1	14.3	SWMU318-IS02-00	3.8	3.8	26.2	1	1	0
Barium	44	396	SWMU318-SS01	140000	28000	848	0	0	0
Cadmium	1.6	57.2	SWMU318-SS01	1000	200	2.72	0	0	2
Chromium	18.2	91.1	SWMU318-SS01	10000	2000	27.2	0	0	2
Lead	21.9	110	SWMU318-SS01	NE	400	270.06	0	0	0
Mercury	0.045	0.14	SWMU318-IS02-00	610	122	0.0154	0	0	4
Selenium	0.81	0.85	SWMU318-IS02-00	10000	2000	12.2	0	0	0
Silver	7.2	7.2	SWMU318-SS01	10000	2000	0.223	0	0	1

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
- ALL SAMPLES WERE COLLECTED WITHIN 3 FEET OF THE SWMU's PERIMETER. (UNLESS OTHERWISE NOTED).
- CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

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LEGEND

- ◉ SOIL BORING AND SAMPLE LOCATION
- ◘ SURFACE SOIL SAMPLE LOCATION
- mg/kg MILLIGRAM/KILOGRAM
- ug/kg MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 318
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.48 SWMU 319 - Camp Geiger Wastewater Treatment Plant

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.48.1 SWMU Description and History

SWMU 319 was identified in the RFA Report (EnSafe, 1996) as an AST at the Camp Geiger Wastewater Treatment Plant. During Baker's site visit in October 1996, the only AST that existed at the site was one installed within the last year. No evidence of stains or releases were noted and no map showing the location of the previous AST was presented in the RFA Report.

4.48.2 Confirmatory Investigation Activities

The soil investigation at SWMU 319 was developed to determine the condition of the surface and subsurface soils within the Wastewater Treatment Plant at Camp Geiger.

A total of six soil borings, SWMU319-IS01 through SWMU319-IS06, were installed on September 9, 1997. Figure 1 presents the locations of the soil borings. One surface soil sample was collected from each of the soil borings and submitted for analysis. Surface soil samples were collected from the ground surface to a depth of 2.0 feet bgs. One subsurface soil sample was collected from five of the six soil borings (no subsurface soil sample was collected from SWMU319-IS06) and submitted for analysis. The subsurface soil samples were collected from just above the water table at depths ranging from 2.0 to approximately 10.0 feet bgs. Groundwater was encountered to depths of 10.5 feet bgs.

All samples were collected in accordance with the Project Plans (Baker, 1997). Samples were submitted to Quanterra Laboratories and analyzed for VOAs (EPA Methods 8020 and 8260), SVOAs (EPA Method 8270) and RCRA metals (EPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER02A, associated with September 9th sample collection, was collected from a split spoon sampler. Results from the rinsate blank is included in Appendix F of this report. Trip blanks 371TB02, 371TB03 and 371TB04 were shipped with the VOA fraction of the soil samples. The results of the trip blanks are included in Appendix F.

4.48.3 Investigation Findings

The detected analytical results for the surface and subsurface soil samples are summarized in Table 1 and compared to a specific set of screening criteria in Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

The contaminants whose concentrations exceeded the listed criteria are presented on Figure 1 and discussed in the following paragraphs.

Two VOCs were detected in the sample set but at levels below the comparison criteria.

Twelve SVOCs were detected in the sample set (primarily all PAHs). The only SVOC which exceeded comparison criteria was benzo(a)anthracene (SWMU319-IS01-00; 360 µg/kg). This compound exceeded the North Carolina Category S-3:G-1 Target Concentrations of 343 µg/kg. This compound were not detected in the rinsate blank for the day's sampling.

Four metals were detected in the sample set. Mercury exceeded comparison criteria in three samples. Mercury was detected in samples SWMU319-IS01-00 (0.071 mg/kg), SWMU319-IS01-01 (0.08 mg/kg) and SWMU319-IS03-00 (0.17 mg/kg), exceeding the North Carolina Category S-3:G-1 Target Concentration (0.0154 mg/kg). No metals were detected in the rinsate blank for this day's sampling.

Soil boring SWMU319-IS01, located in the northern portion of the treatment plant, and soil boring SWMU319-IS03, located in the eastern portion of the facility, exhibited organic and/or inorganic constituents in exceedence of one or more comparison criteria. Refer to Figure 1 for the location of borings SWMU319-IS01 and SWMU319-IS03.

4.48.4 Recommendations

Based on the analytical results, a limited additional investigation is recommended for SWMU 319 to confirm the presence of PAH contamination near boring SWMU319-IS01. One additional soil boring would be advanced at the SWMU. Surface and subsurface soil samples would be collected from the boring and analyzed for SVOAs.

TABLE 1
DETECTION SUMMARY
SWMU 319
SWMU CONFIRMATORY SAMPLING (CTO-0371)
CAMP GEIGER WASTEWATER TREATMENT PLANT
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU319-IS01-00	SWMU319-IS01-01	SWMU319-IS02-00	SWMU319-IS02-05	SWMU319-IS03-00	SWMU319-IS03-05
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	2' - 4'	0' - 2'	10' - 12'	0' - 2'	10' - 12'
VOLATILES (ug/kg) (8260A)						
Acetone	21 U	28	21 U	18 J	22 U	51
Methylene chloride	1.7 J	6 U	5.3 U	5.7 U	1.9 J	1.8 J
VOLATILES (ug/kg) (8020)						
1,4-Dichlorobenzene	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	8.8
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	360	220 J	350 U	380 U	370 U	360 U
Benzo(a)pyrene	660	410	350 U	380 U	370 U	360 U
Benzo(b)fluoranthene	740	420	350 U	380 U	370 U	360 U
Benzo(ghi)perylene	510	260 J	350 U	380 U	370 U	360 U
Benzo(k)fluoranthene	250 J	170 J	350 U	380 U	370 U	360 U
bis(2-Ethylhexyl) phthalate	110 J	470	350 U	380 U	370 U	570
Chrysene	450	270 J	350 U	380 U	370 U	360 U
Dibenz(a,h)anthracene	110 J	88 J	350 U	380 U	370 U	360 U
Fluoranthene	520	280 J	350 U	380 U	370 U	360 U
Indeno(1,2,3-cd)pyrene	420	220 J	350 U	380 U	370 U	360 U
Phenanthrene	190 J	130 J	350 U	380 U	370 U	360 U
Pyrene	400	300 J	350 U	380 U	370 U	360 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.6	1.1 U	1.1 U	1.1 U	1.1 U
Chromium	5.7	11.3	7.7	5.3	6.1	6.4
Lead	16.7	16.4	13.3	4	15.1	4.6
Mercury	0.071	0.08	0.035 U	0.038 U	0.17	0.036 U

TABLE 1
DETECTION SUMMARY
SWMU 319
SWMU CONFIRMATORY SAMPLING (CTO-0371)
CAMP GEIGER WASTEWATER TREATMENT PLANT
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	SWMU319-IS04-00	SWMU319-IS04-05	SWMU319-IS05-00	SWMU319-IS05-04	SWMU319-IS06-00	SWMU319-IS06-04
DATE SAMPLED	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997	09-09-1997
DEPTH	0' - 2'	10' - 12'	0' - 2'	8' - 10'	0' - 2'	8' - 10'
VOLATILES (ug/kg) (8260A)						
Acetone	23	16 J	100	17 J	21 U	120
Methylene chloride	2.2 J	5.8 U	1.8 J	6.2 U	5.2 U	1.9 J
VOLATILES (ug/kg) (8020)						
1,4-Dichlorobenzene	1.1 U	5.8	1.1 U	1.2 U	1.6	1.2 U
SEMIVOLATILES (ug/kg) (8270)						
Benzo(a)anthracene	360 U	380 U	360 U	410 U	340 U	380 U
Benzo(a)pyrene	360 U	380 U	360 U	410 U	340 U	380 U
Benzo(b)fluoranthene	360 U	380 U	360 U	410 U	340 U	380 U
Benzo(ghi)perylene	360 U	380 U	360 U	410 U	340 U	380 U
Benzo(k)fluoranthene	360 U	380 U	360 U	410 U	340 U	380 U
bis(2-Ethylhexyl) phthalate	360 U	95 J	360 U	410 U	340 U	120 J
Chrysene	360 U	380 U	360 U	410 U	340 U	380 U
Dibenz(a,h)anthracene	360 U	380 U	360 U	410 U	340 U	380 U
Fluoranthene	360 U	380 U	360 U	410 U	340 U	380 U
Indeno(1,2,3-cd)pyrene	360 U	380 U	360 U	410 U	340 U	380 U
Phenanthrene	360 U	380 U	360 U	410 U	340 U	380 U
Pyrene	360 U	380 U	360 U	410 U	340 U	380 U
TOTAL METALS (mg/kg) (6010/7410)						
Arsenic	1.1 U	1.2 U	1.1 U	1.2 U	1 U	1.2 U
Chromium	5.2	7.4	4.2	6.9	2.1	3.5
Lead	7.1	2.2	3.1	8.2	1.6	2
Mercury	0.036 U	0.038 U	0.036 U	0.041 U	0.034 U	0.038 U

TABLE 1
DETECTION SUMMARY
SWMU 319
SWMU CONFIRMATORY SAMPLING (CTO-0371)
CAMP GEIGER WASTEWATER TREATMENT PLANT
MCB, CAMP LEJEUNE, NORTH CAROLINA

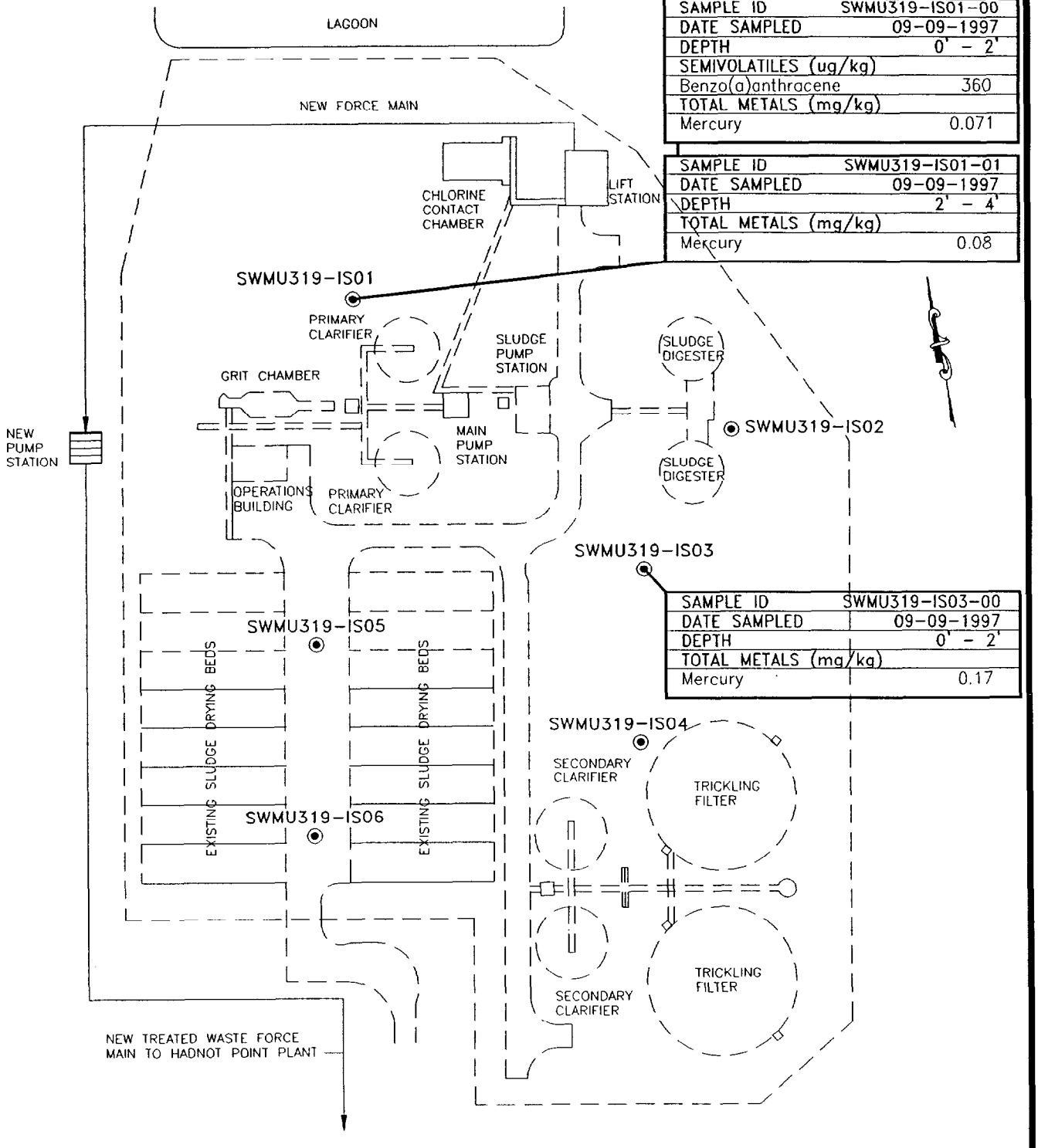
SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	21 U	22 U	16 J	120	SWMU319-IS06-04	8/12	46.63	25.5
Methylene chloride	5.2 U	6.2 U	1.7 J	2.2 J	SWMU319-IS04-00	6/12	1.88	1.85
VOLATILES (ug/kg) (8020)								
1,4-Dichlorobenzene	1.1 U	1.2 U	1.6	8.8	SWMU319-IS03-05	3/12	5.4	5.8
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	340 U	410 U	220 J	360	SWMU319-IS01-00	2/12	290	290
Benzo(a)pyrene	340 U	410 U	410	660	SWMU319-IS01-00	2/12	535	535
Benzo(b)fluoranthene	340 U	410 U	420	740	SWMU319-IS01-00	2/12	580	580
Benzo(ghi)perylene	340 U	410 U	260 J	510	SWMU319-IS01-00	2/12	385	385
Benzo(k)fluoranthene	340 U	410 U	170 J	250 J	SWMU319-IS01-00	2/12	210	210
bis(2-Ethylhexyl) phthalate	340 U	410 U	95 J	570	SWMU319-IS03-05	5/12	273	120
Chrysene	340 U	410 U	270 J	450	SWMU319-IS01-00	2/12	360	360
Dibenz(a,h)anthracene	340 U	410 U	88 J	110 J	SWMU319-IS01-00	2/12	99	99
Fluoranthene	340 U	410 U	280 J	520	SWMU319-IS01-00	2/12	400	400
Indeno(1,2,3-cd)pyrene	340 U	410 U	220 J	420	SWMU319-IS01-00	2/12	320	320
Phenanthrene	340 U	410 U	130 J	190 J	SWMU319-IS01-00	2/12	160	160
Pyrene	340 U	410 U	300 J	400	SWMU319-IS01-00	2/12	350	350
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1 U	1.2 U	1.6	1.6	SWMU319-IS01-01	1/12	1.6	1.6
Chromium	ND	ND	2.1	11.3	SWMU319-IS01-01	12/12	5.98	5.9
Lead	ND	ND	1.6	16.7	SWMU319-IS01-00	12/12	7.86	5.85
Mercury	0.034 U	0.041 U	0.071	0.17	SWMU319-IS03-00	3/12	0.11	0.08

TABLE 2
STATISTICAL SUMMARY
SWMU 319
SWMU CONFIRMATORY SAMPLING (CTO-0371)
CAMP GEIGER WASTEWATER TREATMENT PLANT
MCB, CAMP LEJEUNE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
Acetone	16 J	120	SWMU319-IS06-04	200000000	40000000	2810	0	0	0
Methylene chloride	1.7 J	2.2 J	SWMU319-IS04-00	760000	760000	22.1	0	0	0
VOLATILES (ug/kg) (8020)									
1,4-Dichlorobenzene	1.6	8.8	SWMU319-IS03-05	240000	240000	1240	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
Benzo(a)anthracene	220 J	360	SWMU319-IS01-00	7800	7800	343	0	0	1
Benzo(a)pyrene	410	660	SWMU319-IS01-00	780	780	NE	0	0	0
Benzo(b)fluoranthene	420	740	SWMU319-IS01-00	7800	7800	NE	0	0	0
Benzo(ghi)perylene	260 J	510	SWMU319-IS01-00	NE	NE	6720000	0	0	0
Benzo(k)fluoranthene	170 J	250 J	SWMU319-IS01-00	78000	78000	NE	0	0	0
bis(2-Ethylhexyl) phthalate	95 J	570	SWMU319-IS03-05	410000	410000	6670	0	0	0
Chrysene	270 J	450	SWMU319-IS01-00	780000	780000	38150	0	0	0
Dibenz(a,h)anthracene	88 J	110 J	SWMU319-IS01-00	780	780	NE	0	0	0
Fluoranthene	280 J	520	SWMU319-IS01-00	82000000	16400000	276080	0	0	0
Indeno(1,2,3-cd)pyrene	220 J	420	SWMU319-IS01-00	7800	7800	NE	0	0	0
Phenanthrene	130 J	190 J	SWMU319-IS01-00	NE	NE	59640	0	0	0
Pyrene	300 J	400	SWMU319-IS01-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.6	1.6	SWMU319-IS01-01	3.8	3.8	26.2	0	0	0
Chromium	2.1	11.3	SWMU319-IS01-01	10000	2000	27.2	0	0	0
Lead	1.6	16.7	SWMU319-IS01-00	NE	400	270.06	0	0	0
Mercury	0.071	0.17	SWMU319-IS03-00	610	122	0.0154	0	0	3

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

371158PP



SAMPLE ID	SWMU319-IS01-00
DATE SAMPLED	09-09-1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)anthracene	360
TOTAL METALS (mg/kg)	
Mercury	0.071

SAMPLE ID	SWMU319-IS01-01
DATE SAMPLED	09-09-1997
DEPTH	2' - 4'
TOTAL METALS (mg/kg)	
Mercury	0.08

SAMPLE ID	SWMU319-IS03-00
DATE SAMPLED	09-09-1997
DEPTH	0' - 2'
TOTAL METALS (mg/kg)	
Mercury	0.17

NOTE:
-CONSTITUENTS SHOWN EXCEED SCREENING CRITERIA.

SOURCE:
-FINAL RCRA FACILITY ASSESSMENT REPORT, MARINE CORPS BASE CAMP LEJEUNE (ENSAFE, JULY 25, 1996)

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

◉	SOIL BORING AND SAMPLE LOCATION
mg/kg	MILLIGRAM/KILOGRAM
ug/kg	MICROGRAM/KILOGRAM

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 319
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.49 SWMU 336 - AS4106 Paint Stripper

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.49.1 SWMU Description and History

SWMU 336 is a pair of paint stripping vats located in a separate room within Building AS-4106 at MCAS New River. Spills that occur at this SWMU are properly contained and cleaned up according to Base personnel. The floor beneath the vats is concrete with two floor drains located on either side of the vat (see Figure 1). A spill kit is located near the exit doors with a set of sinks and an eye wash station located on the opposite side of the room.

4.49.2 Confirmatory Investigation Activities

Baker proposed sampling the floor drains located on either side of the paint stripping vats as the method of investigation for this SWMU. The rationale was that if a spill was to occur at this SWMU, the contaminated material would most likely exit the SWMU via the floor drains. However, upon arriving at the SWMU on September 18, 1997, the field crew discovered that the floor drains contained no sediment that could be sampled. It was determined that a sample could not be collected at this SWMU to determine if the environment was impacted by the operations of this SWMU.

4.49.3 Recommendations

No further investigation is recommended for SWMU 336. Baker could neither confirm or deny that the environment has been impacted by operations conducted at this SWMU. It is believed that it is inappropriate to cut through a concrete floor, which is acting as a barrier to contamination, and collect a sample of the soils beneath it, possibly providing a pathway for contamination and causing unnecessary destruction. In addition, it is unlikely that contamination would be able to pass through the concrete and contaminate the soils beneath. Sampling the soils beneath the floor drains would mean destroying the drainage system and creating a migration pathway for contamination. To collect a sample outside the SWMU, in the parking lot, would not be the most likely pathway for contamination from the SWMU. If in the future this building is demolished or the concrete floor replaced, then a sample should be collected in the area of the floor drains and the vats. Otherwise, it is recommended that no further investigation of this SWMU be taken.

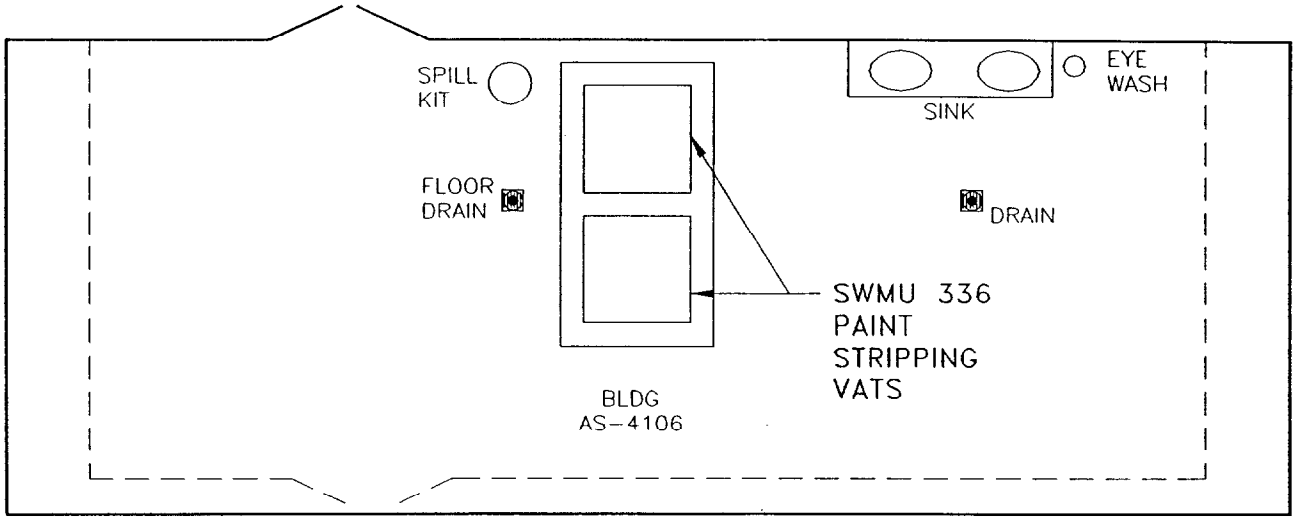
don't rec. sample on dismantling? want to close out SWMU? no other indication?

371149PP

WHITE STREET

TO CAMPBELL STREET

PARKING LOT



N.T.S.

Baker

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LEGEND

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 336
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.50 SWMU 337 - AS518 Paint Stripper

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.50.1 SWMU Description and History

SWMU 337 consists of a pair of paint stripping vats located within an organic stripping room inside of Building AS-518. The two metal vats, each of 5.5 gallon capacity, are elevated approximately 5 feet above the floor. One container holds methylene chloride used in stripping paint. The other container holds water and residual methylene chloride. The contents of both containers are periodically transferred to 55-gallon drums and disposed of as hazardous waste. The unit has been in operation since at least 1991. The SWMU is located east of White Street, and south of Campbell Street in the MCAS. No evidence of contamination/spills were observed at the SWMU during the investigation.

4.50.2 Confirmatory Investigation Activities

The soil investigation established for SWMU 337 was developed to determine if the presence of the paint stripper and associated storage containers has impacted surface and subsurface soils surrounding the SWMU.

One boring, SWMU337-IS01 was advanced at the SWMU on September 8, 1997. As depicted on Figure 1, the soil boring was advanced immediately adjacent to the organic stripping room. Two samples were collected from the boring. The samples were collected from the ground surface to 2.0 feet bgs (SWMU337-IS01-00), and from just above the water table at a depth of 4.0 to 6.0 feet bgs (SWMU337-IS01-02). Groundwater was encountered at a depth of approximately 6.0 feet bgs during drilling.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories, and analyzed for VOAs (USEPA Methods 8020 and 8260A), SVOAs (USEPA Method 8270), and RCRA metals (USEPA Method SW846 6010/7410). Analytical results are presented in Appendix D. Equipment rinsate blank 371ER01B was collected from a stainless steel sampling spatula used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F. Trip blanks 371TB01 and 371TB03, and 371TB04 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.50.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Table 1 and compared to a specific set of screening criteria on Table 2. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations

Four VOCs were detected in the samples collected during the Confirmatory Sampling Investigation including acetone, methylene chloride, tetrachloroethene, and trichloroethene. Three SVOCs (bis[2-ethylhexyl]phthalate, fluoranthene, and pyrene) were detected in the samples. Three metals (arsenic, chromium, and lead) were detected in the sample set. None of the detected compounds/analytes were present at levels exceeding the aforementioned comparison criteria.

4.50.4 Recommendations

No further action is recommended for SWMU 337. All detected compounds that were detected at the SWMU were present at levels significantly below the screening criteria listed on Table 2.

TABLE 1
DETECTION SUMMARY
SWMU 337
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS518 - PAINT STRIPPER, MALS 26 MAINTENANCE, MAG-26, 2ND, MARINE AIRCRAFT WING
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU337-IS01-00	SWMU337-IS01-02
DATE SAMPLED	09-09-1997	09-09-1997
DEPTH	0' - 2'	4' - 6'
VOLATILES (ug/kg) (8260A)		
Acetone	30	25 U
Methylene chloride	5.6 U	2.7 J
Tetrachloroethene	5.6 U	2.3 J
Trichloroethene	5.6 U	3.1 J
VOLATILES (ug/kg) (8020)	ND	ND
SEMIVOLATILES (ug/kg) (8270)		
bis(2-Ethylhexyl) phthalate	79 J	360 J
Fluoranthene	52 J	410 U
Pyrene	45 J	410 U
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.1 U	1.5
Chromium	6.5	12.8
Lead	15.1	20.3

Notes:
ND = Compound analyzed but not detected.

TABLE 1
DETECTION SUMMARY
SWMU 337
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS518 - PAINT STRIPPER, MALS 26 MAINTENANCE, MAG-26, 2ND, MARINE AIRCRAFT WING
MCB, CAMP LEJUENE, NORTH CAROLINA

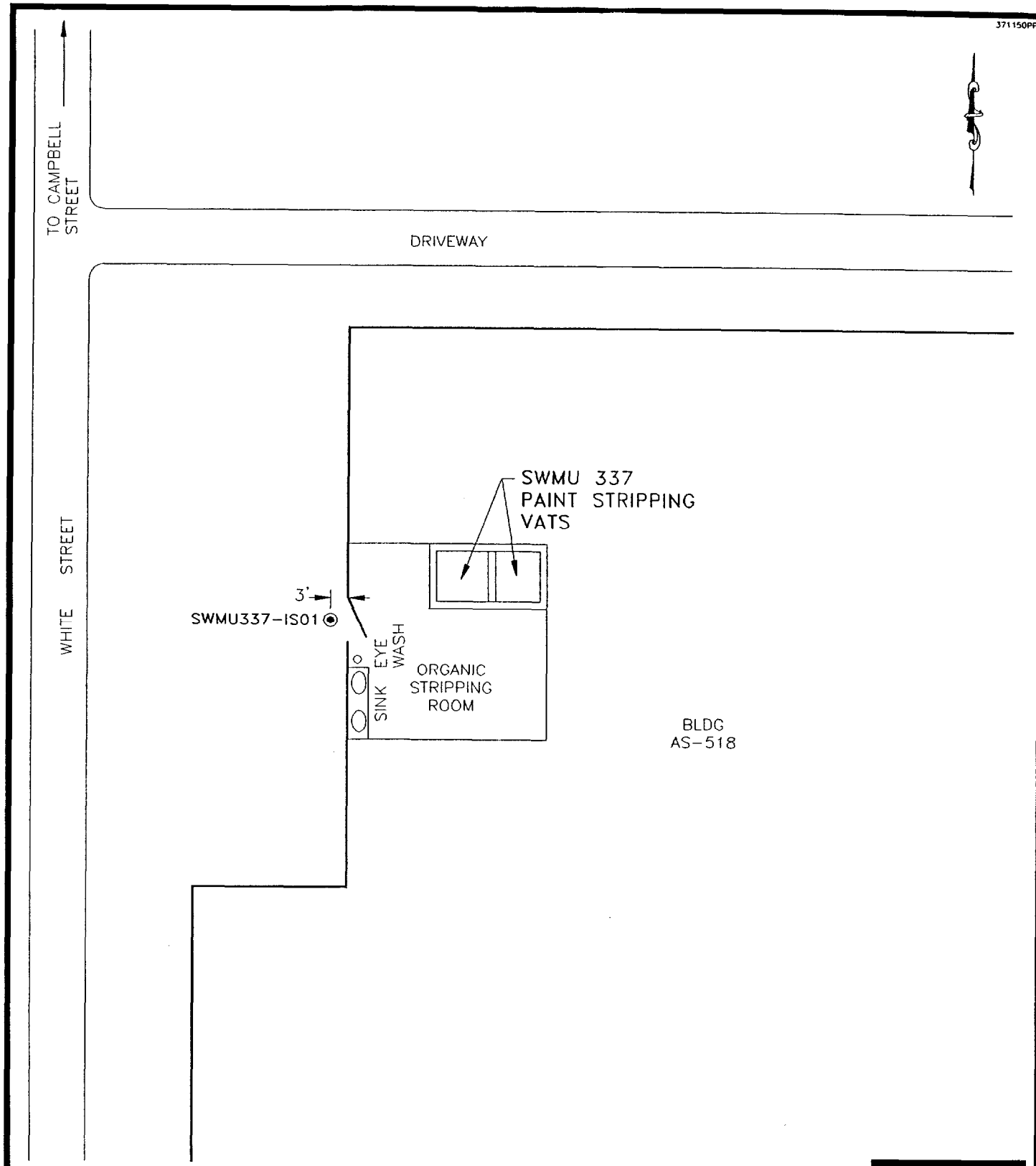
SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260A)								
Acetone	25 U	25 U	30	30	SWMU337-IS01-00	1/2	30	30
Methylene chloride	5.6 U	5.6 U	2.7 J	2.7 J	SWMU337-IS01-02	1/2	2.7	2.7
Tetrachloroethene	5.6 U	5.6 U	2.3 J	2.3 J	SWMU337-IS01-02	1/2	2.3	2.3
Trichloroethene	5.6 U	5.6 U	3.1 J	3.1 J	SWMU337-IS01-02	1/2	3.1	3.1
VOLATILES (ug/kg) (8020)	ND	ND	ND	ND		0/2	ND	ND
SEMIVOLATILES (ug/kg) (8270)								
bis(2-Ethylhexyl) phthalate	ND	ND	79 J	360 J	SWMU337-IS01-02	2/2	219.5	219.5
Fluoranthene	410 U	410 U	52 J	52 J	SWMU337-IS01-00	1/2	52	52
Pyrene	410 U	410 U	45 J	45 J	SWMU337-IS01-00	1/2	45	45
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.1 U	1.1 U	1.5	1.5	SWMU337-IS01-02	1/2	1.5	1.5
Chromium	ND	ND	6.5	12.8	SWMU337-IS01-02	2/2	9.65	9.65
Lead	ND	ND	15.1	20.3	SWMU337-IS01-02	2/2	17.7	17.7

Notes:
ND = Compound analyzed but not detected.

TABLE 2
STATISTICAL SUMMARY
SWMU 337
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS518 - PAINT STRIPPER, MALS 26 MAINTENANCE, MAG-26, 2ND, MARINE AIRCRAFT WING
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260A)									
Acetone	30	30	SWMU337-IS01-00	200000000	40000000	2810	0	0	0
Methylene chloride	2.7 J	2.7 J	SWMU337-IS01-02	760000	760000	22.1	0	0	0
Tetrachloroethene	2.3 J	2.3 J	SWMU337-IS01-02	110000	110000	7.4	0	0	0
Trichloroethene	3.1 J	3.1 J	SWMU337-IS01-02	520000	520000	18.3	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
bis(2-Ethylhexyl) phthalate	79 J	360 J	SWMU337-IS01-02	410000	410000	6670	0	0	0
Fluoranthene	52 J	52 J	SWMU337-IS01-00	82000000	16400000	276080	0	0	0
Pyrene	45 J	45 J	SWMU337-IS01-00	61000000	12264000	286440	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.5	1.5	SWMU337-IS01-02	3.8	3.8	26.2	0	0	0
Chromium	6.5	12.8	SWMU337-IS01-02	10000	2000	27.2	0	0	0
Lead	15.1	20.3	SWMU337-IS01-02	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms



NOTE:
-NO SCREENING CRITERIA WERE EXCEEDED.

N.T.S.

Baker
Baker Environmental, Inc.

LEGEND

◉ SOIL BORING AND SAMPLE LOCATION

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 337
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

4.51 SWMU 339 - AS4146 Sandblasting Area

The following sections present the SWMU description and history, the investigation activities conducted during the Confirmatory Investigation, investigation findings, and recommendations.

4.51.1 SWMU Description and History

SWMU 339 is a covered sandblasting area located near Building AS-4146 at MCAS New River (Figure 1). Building AS-4146 is located along White Street, and the SWMU is positioned behind the building. The area between the SWMU and Building AS-4146 is covered with concrete. Behind the sandblasting structure, the equipment storage area is covered with asphalt. The SWMU is a 10 feet by 15 feet enclosed tarp which has sandblast equipment, spent sand and grit inside. Paint (possibly containing lead) is removed from various aircraft equipment and parts inside the enclosed tarp. Personnel working inside the enclosure wear protective clothing and respiratory protection during sandblasting activities. The used sand and grit is shoveled into 55-gallon drums and disposed as hazardous waste.

A stormwater collection system surrounds the Building AS-4146 and eventually drains into the main collection system for MCAS. One of the stormwater collection drains is located approximately 10 feet from SWMU 339 and collects stormwater run-off from the general area around the SWMU.

4.51.2 Confirmatory Investigation Activities

The investigation conducted at SWMU 339 was developed to determine if the lead-based paint chips removed from aircraft equipment and parts during sandblasting operations have impacted surface and subsurface soils in the vicinity of the SWMU. In addition, the investigation will determine if the lead-based paint chips have been transported away from the SWMU via the stormwater collection system, contaminating sediments within the system.

As depicted on Figure 1, a single soil boring (SWMU339-IS01) was advanced on September 8, 1997 approximately 20 feet west of the SWMU. Soil samples were collected from ground surface to 2.0 feet bgs and just above the soil/groundwater interface at a depth of 2.0 to 4.0 feet bgs. Groundwater was encountered at 4.0 feet bgs.

In addition, a single sediment sample was collected from the stormwater drain located approximately 10 feet east of the SWMU. The sample was collected from the sandy sediment accumulating within the drain.

All samples were collected in accordance with the Project Plans (Baker, 1997), submitted to Quanterra Laboratories and analyzed for VOAs (EPA Method 8260), SVOAs (EPA Method 8270), and RCRA metals (EPA Method SW846 6010/7410). Equipment rinsate blanks 371ER01B and 371ER08B were collected from a stainless steel sample spatula and a stainless steel sampling spoon used to collect soil samples from the SWMU. Results from the rinsate blanks are included in Appendix F of this report. Trip blanks 371TB02, 371TB03, 371TB04, 371TB12 and 371TB13 were shipped with the volatile fraction of the soil samples. The results are included in Appendix F.

4.51.3 Investigation Findings

The detected analytical results for the soil samples are summarized on Tables 1 and 3, and compared to a specific set of screening criteria on Tables 2 and 4. The criteria include:

- USEPA Region III Industrial Risk Based Criteria (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure) Target Concentrations
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water) Target Concentrations
- USEPA Region IV Sediment Effects, Effects-Range Low (ER-L) Screening Values
- USEPA Region IV Sediment Effects, Effects-Range Medium (ER-M) Screening Values

for soil & sediment.

The contaminants whose concentrations exceeded the previously-listed criteria are illustrated on Figure 1 and discussed in detail in the following paragraphs.

With respect to the soil samples four VOCs, one SVOC, and three metals were detected in the sample set. Only one VOC was detected at a concentration exceeding the screening criteria.

As shown on Table 1, acetone was detected in soil samples SWMU339-IS01-00 and -01. The North Carolina, Category S-3:G-1 Target Concentration for acetone (2,810 µg/kg) was exceeded by the concentration detected in soil sample SWMU339-IS01-01 (3,200 µg/kg). The remaining VOCs were not detected at concentrations which exceed the comparison criteria. Table 2 presents the comparison of the soil data to the screening criteria.

Acetone was detected in equipment rinsate sample 371ER01B at a concentration of 19J µg/kg. The detection of acetone in the samples collected from soil boring SWMU339-IS01 is not believed to be the result of activities conducted at the site. Instead, it is suspected that the detection of acetone is the result of improper drying time for a recently decontaminated split-spoon or stainless steel sampling spatula.

I don't think so! too far apart

With respect to the sediment sample, seven VOCs, six SVOCs, and six metals were detected. Four of the SVOCs and four of the metals had concentrations exceeding the screening criteria. As shown on Tables 3 and 4, compounds such as benzo(a)anthracene, chrysene, fluoranthene, and pyrene were detected at concentrations which exceeded the ER-L in sample SWMU339-SD01-00. The compounds were detected at concentrations which are two to three times the ER-L screening value.

not nec. appropriate to compare.

Cadmium, chromium, lead and silver were detected in sample SWMU339-SD01-00 at levels exceeding the screening criteria. Detected concentrations of chromium (208 mg/kg) and silver (1.6 mg/kg) exceeded the ER-L and cadmium and lead concentrations (54.9 mg/kg and 46.7 mg/kg, respectively) exceeded the ER-L and ER-M.

4.51.4 Recommendations

In summary, the soil samples collected from soil boring SWMU339-IS01 contained very little contamination and only one compound (acetone) exceeded the North Carolina, Category S-3:G-1 Target Concentration. The acetone concentrations are not suspected to be site-related and should not warrant additional investigation.

The sediment sample collected from the stormwater drain contained elevated concentrations of SVOCs and metals. The concentrations of chromium, silver, cadmium and lead detected in sample SWMU339-SD01-00 were in excess of the comparison criteria. The concentrations of metals detected in this sample indicates that stormwater run-off may be transporting contaminated sand from the blasting area into the stormwater system. The SVOCs may be attributable to other operations not related to SWMU 339.

in the drain sample

An additional investigation is not recommended at this SWMU. Instead, it is recommended that the Base institute some type of control to mitigate the potential for the migration of contaminated sand and grit into the stormwater collection system.

TABLE 1
DETECTION SUMMARY
SWMU 339 - SOIL
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4146 - SANDBLASTER, MALS 26
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU339-IS01-00	SWMU339-IS01-01
DATE SAMPLED	09-09-1997	09-09-1997
DEPTH	0' - 2'	2' - 4'
VOLATILES (ug/kg) (8260)		
2-Butanone	17 J	240 U
Acetone	300	3200
Ethylbenzene	4.7 J	59 U
Toluene	9.7	59 U
SEMIVOLATILES (ug/kg) (8270)		
4-Methylphenol	410 U	2600
TOTAL METALS (mg/kg) (6010/7410)		
Arsenic	1.5	1.2 U
Chromium	12.7	3.1
Lead	9.7	8

TABLE 1
DETECTION SUMMARY
SWMU 339 - SOIL
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4146 - SANDBLASTER, MALS 26
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
2-Butanone	240 U	240 U	17 J	17 J	SWMU339-IS01-00	1/2	17	17
Acetone	ND	ND	300	3200	SWMU339-IS01-01	2/2	1750	1750
Ethylbenzene	59 U	59 U	4.7 J	4.7 J	SWMU339-IS01-00	1/2	4.7	4.7
Toluene	59 U	59 U	9.7	9.7	SWMU339-IS01-00	1/2	9.7	9.7
SEMIVOLATILES (ug/kg) (8270)								
4-Methylphenol	410 U	410 U	2600	2600	SWMU339-IS01-01	1/2	2600	2600
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	1.2 U	1.2 U	1.5	1.5	SWMU339-IS01-00	1/2	1.5	1.5
Chromium	ND	ND	3.1	12.7	SWMU339-IS01-00	2/2	7.9	7.9
Lead	ND	ND	8	9.7	SWMU339-IS01-00	2/2	8.85	8.85

TABLE 2
STATISTICAL SUMMARY
SWMU 339 - SOIL
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4146 - SANDBLASTER, MALS 26
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	Region III Industrial RBCs	NC Method I Category S-2 Target Conc	NC Method I Category S3:G-1 Target Conc	Region III Industrial RBCs Exceed Count	NC Method I Category S-2 Target Conc Exceed Count	NC Method I Category S3:G-1 Target Conc Exceed Count
VOLATILES (ug/kg) (8260)									
2-Butanone	17 J	17 J	SWMU339-IS01-00	1000000000	200000000	692	0	0	0
Acetone	300	3200	SWMU339-IS01-01	200000000	40000000	2810	0	0	1
Ethylbenzene	4.7 J	4.7 J	SWMU339-IS01-00	200000000	40000000	241	0	0	0
Toluene	9.7	9.7	SWMU339-IS01-00	410000000	82000000	7275	0	0	0
SEMIVOLATILES (ug/kg) (8270)									
4-Methylphenol	2600	2600	SWMU339-IS01-01	10000000	2000000	NE	0	0	0
TOTAL METALS (mg/kg) (6010/7410)									
Arsenic	1.5	1.5	SWMU339-IS01-00	3.8	3.8	26.2	0	0	0
Chromium	3.1	12.7	SWMU339-IS01-00	10000	2000	27.2	0	0	0
Lead	8	9.7	SWMU339-IS01-00	NE	400	270.06	0	0	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 3
DETECTION SUMMARY
SWMU 339 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4146 - SANDBLASTER, MALS 26
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID	SWMU339-SD01-00
DATE SAMPLED	09-17-1997
DEPTH	0 - 6"
VOLATILES (ug/kg) (8260)	
1,1-Dichloroethene	4 J
2-Butanone	5 J
Acetone	15 J
Carbon disulfide	1.6 J
Methylene chloride	3.5 J
Toluene	4.3 J
Xylenes (total)	15
SEMIVOLATILES (ug/kg) (8270)	
Benzo(a)anthracene	980 J
bis(2-Ethylhexyl) phthalate	41000 J
Butyl benzyl phthalate	4700 J
Chrysene	1100 J
Fluoranthene	2100 J
Pyrene	1800 J
TOTAL METALS (mg/kg) (6010/7410)	
Arsenic	1.3
Barium	67.9
Cadmium	54.9
Chromium	208
Lead	269
Silver	1.6

TABLE 3
DETECTION SUMMARY
SWMU 339 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4146 - SANDBLASTER, MALS 26
MCB, CAMP LEJUENE, NORTH CAROLINA

SAMPLE ID DATE SAMPLED DEPTH	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Arithmatic Mean Positive Detects	Median Positive Detects
VOLATILES (ug/kg) (8260)								
1,1-Dichloroethene	ND	ND	4 J	4 J	SWMU339-SD01-00	1/1	4	4
2-Butanone	ND	ND	5 J	5 J	SWMU339-SD01-00	1/1	5	5
Acetone	ND	ND	15 J	15 J	SWMU339-SD01-00	1/1	15	15
Carbon disulfide	ND	ND	1.6 J	1.6 J	SWMU339-SD01-00	1/1	1.6	1.6
Methylene chloride	ND	ND	3.5 J	3.5 J	SWMU339-SD01-00	1/1	3.5	3.5
Toluene	ND	ND	4.3 J	4.3 J	SWMU339-SD01-00	1/1	4.3	4.3
Xylenes (total)	ND	ND	15	15	SWMU339-SD01-00	1/1	15	15
SEMIVOLATILES (ug/kg) (8270)								
Benzo(a)anthracene	ND	ND	980 J	980 J	SWMU339-SD01-00	1/1	980	980
bis(2-Ethylhexyl) phthalate	ND	ND	41000 J	41000 J	SWMU339-SD01-00	1/1	41000	41000
Butyl benzyl phthalate	ND	ND	4700 J	4700 J	SWMU339-SD01-00	1/1	4700	4700
Chrysene	ND	ND	1100 J	1100 J	SWMU339-SD01-00	1/1	1100	1100
Fluoranthene	ND	ND	2100 J	2100 J	SWMU339-SD01-00	1/1	2100	2100
Pyrene	ND	ND	1800 J	1800 J	SWMU339-SD01-00	1/1	1800	1800
TOTAL METALS (mg/kg) (6010/7410)								
Arsenic	ND	ND	1.3	1.3	SWMU339-SD01-00	1/1	1.3	1.3
Barium	ND	ND	67.9	67.9	SWMU339-SD01-00	1/1	67.9	67.9
Cadmium	ND	ND	54.9	54.9	SWMU339-SD01-00	1/1	54.9	54.9
Chromium	ND	ND	208	208	SWMU339-SD01-00	1/1	208	208
Lead	ND	ND	269	269	SWMU339-SD01-00	1/1	269	269
Silver	ND	ND	1.6	1.6	SWMU339-SD01-00	1/1	1.6	1.6

TABLE 4
STATISTICAL SUMMARY
SWMU 339 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4146 - SANDBLASTER, MALS 26
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values Exceedance Count	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values Exceedance Count
VOLATILES (ug/kg) (8260)							
1,1-Dichloroethene	4 J	4 J	SWMU339-SD01-00	NE	NE	0	0
2-Butanone	5 J	5 J	SWMU339-SD01-00	NE	NE	0	0
Acetone	15 J	15 J	SWMU339-SD01-00	NE	NE	0	0
Carbon disulfide	1.6 J	1.6 J	SWMU339-SD01-00	NE	NE	0	0
Methylene chloride	3.5 J	3.5 J	SWMU339-SD01-00	NE	NE	0	0
Toluene	4.3 J	4.3 J	SWMU339-SD01-00	NE	NE	0	0
Xylenes (total)	15	15	SWMU339-SD01-00	NE	NE	0	0
SEMIVOLATILES (ug/kg) (8270)							
Benzo(a)anthracene	980 J	980 J	SWMU339-SD01-00	261	1600	1	0
bis(2-Ethylhexyl) phthalate	41000 J	41000 J	SWMU339-SD01-00	NE	NE	0	0
Butyl benzyl phthalate	4700 J	4700 J	SWMU339-SD01-00	NE	NE	0	0
Chrysene	1100 J	1100 J	SWMU339-SD01-00	384	2800	1	0
Fluoranthene	2100 J	2100 J	SWMU339-SD01-00	600	5100	1	0
Pyrene	1800 J	1800 J	SWMU339-SD01-00	665	2600	1	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

TABLE 4
STATISTICAL SUMMARY
SWMU 339 - SEDIMENT
SWMU CONFIRMATORY SAMPLING (CTO-0371)
AS4146 - SANDBLASTER, MALS 26
MCB, CAMP LEJUENE, NORTH CAROLINA

CONSTITUENTS	Minimum Detected	Maximum Detected	Location of Maximum Detect	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values	NOAA ER-L USEPA Region IV Sediment Effects Effects-Range Medium Screening Values Exceedance Count	NOAA ER-M USEPA Region IV Sediment Effects Effects-Range Low Screening Values Exceedance Count
TOTAL METALS (mg/kg) (6010/7410)							
Arsenic	1.3	1.3	SWMU339-SD01-00	8.2	70	0	0
Barium	67.9	67.9	SWMU339-SD01-00	NE	NE	0	0
Cadmium	54.9	54.9	SWMU339-SD01-00	1.2	9.6	1	1
Chromium	208	208	SWMU339-SD01-00	81	370	1	0
Lead	269	269	SWMU339-SD01-00	46.7	218	1	1
Silver	1.6	1.6	SWMU339-SD01-00	1	3.7	1	0

Notes:
J = Estimated value
NE = No criteria established
RBC = Risk based concentration
ug/kg = micrograms per kilograms
mg/kg = milligrams per kilograms

FIGURE 1
SWMU INVESTIGATION PLAN
SWMU 339
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

5.0 SUMMARY AND RECOMMENDATIONS

Baker conducted a Confirmatory Sampling Investigation of 62 SWMUs located at MCB, Camp Lejeune. The focus of this investigation was to determine which units need additional investigation and which require no further action. The results are discussed in detail in Section 4.0 of this report and summarized on Table 5-1.

The sample results were compared to the following comparison criteria:

- USEPA Region III Industrial Risk Based Concentrations (RBCs)
- North Carolina Risk Analysis Framework, Method I, Category S-2 (industrial/commercial exposure), Target Concentrations (soil)
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-1 (protective of non-drinking and drinking water), Target Concentrations (soil)
- North Carolina Risk Analysis Framework, Method I, Category S-3:G-3 (protective of surface water within 250 feet), Target Concentrations (soil)
- North Carolina Water Quality Standards (surface water)
- Camp Lejeune Reference Station Results for Webb Creek (surface water)
- USEPA Region IV Sediment Effects, Effects-Range Low (ER-L) Screening Values (sediment)
- USEPA Region IV Sediment Effects, Effects-Range Medium (ER-M) Screening Values (sediment)

The sample results from each SWMU was compared to three or more of the previously mentioned criteria. The comparison criteria selected for each SWMU depended on the type(s) of media sampled and the proximity of the SWMU to a surface water body. If contaminant concentrations exceeded the comparison criteria, further investigation activities were recommended.

Common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene and phthalate esters were observed in a large number of samples collected during the investigation. In most cases, the concentrations observed in the samples were below the comparison criteria for the SWMU. Only at a few SWMUs did one (or more) of these compounds exceed criteria. If the compound was detected at a concentration exceeding comparison criteria, the exceedence was noted and was evaluated as to its relevance given the SWMUs operation and waste stream. For instance, if toluene was detected at levels exceeding comparison criteria at an oil/water separator, it is likely that the contamination is the result of operations at the SWMU because the unit is expected to handle petroleum-based waste. However, if acetone is detected in the vicinity of a concrete coal storage pad at levels exceeding comparison criteria, it would be reasoned that the presence of acetone was not SWMU-related since the compound is not used in the operations conducted at the unit. In cases where non-SWMU related compounds were the only compounds that exceeded the comparison criteria, additional investigation activities were not proposed.

Mercury contamination was prevalent at most of the SWMUs at very low levels of contamination (typically less than 1 mg/kg). Because the North Carolina Risk Analysis Framework, Category S-3:G-1 Target Concentration for mercury is 0.0154 mg/kg, any detection of mercury in soil resulted in an exceedence of these criteria. Upon evaluation of the analytical data for the SWMUs, it was observed that mercury was detected in most SWMUs at relatively equal concentrations. As depicted in Section 1.0, the SWMUs are located throughout MCB, Camp Lejeune and all SWMUs do not handle the same type of waste. Therefore, it is suspected that the levels of mercury detected in the samples may be indicative of background conditions and not the result of SWMU related contamination. Typically, the concentrations detected in the soil samples were less than 1 mg/kg. Baker did not recommend additional investigation activities at SWMUs where only mercury exceeded the comparison criteria. Any supplemental investigation is recommended to include the analysis of metals to confirm the detections of mercury.

Of the 62 SWMUs, it was recommended that 38 SWMUs require no further action, one SMWU requires institutional controls, and 23 SWMUs require additional investigation. The activities suggested for these SWMUs range from a single boring to confirm analytical results, to multiple borings and/or temporary groundwater monitoring wells to further delineate/define contamination. The types of facilities (and number of each facility) requiring further investigation are as follows:

- Oil/Water Separators (11 of 28)
- Above Ground Storage Tanks (4 of 14)
- Pest Control Shop (1 of 1)
- Historic Dump Site (1 of 1)
- Solid Waste Dumpster (1 of 5)
- Underground Storage Tank (1 of 3)
- Unidentified Container (1 of 1)
- Areas of Documented Releases (2 of 3)
- Wastewater Treatment Plant (1 of 1)

The 23 SWMUs requiring additional investigation include:

- SWMU 43
- SWMU 46
- SWMU 89
- SWMU 254
- SMWU 255
- SWMU 256
- SWMU 261
- SWMU 264
- SWMU 272
- SWMU 285
- SWMU 291
- SWMU 293
- SWMU 295
- SMWU 297
- SWMU 299
- SWMU 300
- SWMU 303
- SWMU 306
- SWMU 311
- SWMU 315
- SWMU 317
- SWMU 318
- SWMU 319

Specific details regarding the recommendations for each of the previously described SWMUs are included in Table 5-1.

TABLES

TABLE 5-1

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 2 1700 Pond A	Concrete neutralization/settling pond associated with the Steam Plant. Receives runoff from coal pile	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 5 575 Rack	Wash water collection structure and oil/water separator associated with vehicle wash racks	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 43 Pest Control Shop (IR Site No. 11)	Oil/water separator associated with wash area for pesticide-carrying vehicles	One SVOC--benzo(a)pyrene, two pesticides--4,4'-DDT and chlordane, and these metals--arsenic, chromium, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance additional soil borings and install temporary monitoring wells. Analyze soil and groundwater samples for SVOAs, pesticides and metals.
SWMU 46 Montford Point Dump Site (IR Site No. 15)	Potential sewage treatment plant sludge disposal area	Four metals--arsenic, cadmium, lead, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. In the vicinity of boring SWMU46-IS02, advance one soil boring and install a temporary monitoring well. Analyze soil and groundwater samples for metals.
SWMU 53 Coal Storage Area (IR Site No. 26)	Concrete coal storage area associated with the Steam Plant	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 89 SLCH785 Basin	Oil/water separator associated with a vehicle wash rack	Eleven VOCs, 10 SVOCs, and four metals detected. Four organic compounds detected at concentrations exceeding criteria.	Further investigation recommended. Install a minimum of three temporary monitoring wells with soil and groundwater sampling. Analyze samples for VOAs and SVOAs. Re-sample existing monitoring wells if practicable.
SWMU 253 1205 Above Ground Storage Tank	Former location of a 500-gallon used oil AST	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 254 1408 Dumpster	Solid waste dumpster that at one point reportedly contained paint cans and a 1-gallon container of Citrakleen	The SVOCs benzo(a)anthracene, benzo(a)pyrene, benzo(a)fluoranthene, and dibenzo(ah)anthracene, and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of four soil borings and install a minimum of two temporary monitoring wells. Analyze soil and groundwater samples for SVOAs and RCRA metals.
SWMU 255 1502 Oil/Water Separator No. 1	Oil/water separator and grit chamber associated with vehicle maintenance facility	The SVOC pentachlorophenol and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Collect soil samples from just above the water table and install monitoring wells. Analyze soil samples for SVOAs.

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 256 1700 Oil/Water Separator No. 1	Oil/water separator associated with an AST at the Steam Plant	Sixteen SVOCs detected. Benzo(a)anthracene detected at concentration exceeding criteria.	Further investigation recommended. Advance one soil boring in the vicinity of boring SWMU256-IS02 and collect a surface and subsurface soil sample. Analyze samples for SVOAs.
SWMU 257 1700 Oil/Water Separator No. 2	Oil/water separator associated with an AST at the Steam Plant	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 258 S1745 Oil/Water Separator	Oil/water separator and grit chamber associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 260 1780 Oil/Water Separator No. 1	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 261 1780 Underground Storage Tank No. 1	550-gallon UST. Stores oil, grease and water associated with an oil/water separator (SWMU 297)	For SWMUs 261 and 297, 13 VOCs, four SVOCs, and six metals detected. One VOC-- chloroethane, and four metals--cadmium, chromium, lead, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Collect additional soil samples. Analyze samples for VOAs and metals.

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 262 1780 Underground Storage Tank No. 2	550-gallon UST. Stores oil, grease and water associated with an oil/water separator (SWMU 298)	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 264 2611 Container	Once tar-stained area that was subsequently covered with wood chips. Wood chips and tar no longer present	One SVOC--pentachloro-phenol, one pesticide--chlordane, and one metal--arsenic detected at concentrations exceeding criteria.	Further investigation recommended. Advance soil borings and install a minimum of one temporary monitoring well. Analyze soil and groundwater samples for SVOAs, pesticides and metals.
SWMU 265 2615 Oil/Water Separator	Oil/water separator associated with No. 6 fuel oil loading area	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 268 522 Dumpster	Solid waste dumpster	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 269 816 Oil/Water Separator	Former location of a oil/water separator and vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 272 AS137 Oil/Water Separator	Recently replaced oil/water separator	Two VOCs -- methylene chloride and 1,4 dichlorobenzene, three SVOCs--2-chlorophenol, naphthalene, and pentachlorophenol, and two metals--arsenic and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of three soil borings and install a minimum of two temporary monitoring wells. Re-sample the existing monitoring well located southwest of the separator. Analyze soil and groundwater samples for VOAs, SVOAs and metals.
SWMU 273 BA128/BA105 Dumpster	Former solid waste dumpster location. Reportedly had a one-time release of petroleum or oil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 275 BB48 Dumpster	Solid waste dumpster which at one time reportedly showed evidenced of a spill	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 276 BB49 Dumpster	Solid waste dumpster which at one time reportedly showed evidenced of a POL spill	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 277 FC120 Oil/Water Separator	Oil/water separator associated with a wash rack and adjacent to IR Site No. 1	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 279 FC200 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 280 FC285 Above Ground Storage Tank	Former location of a used oil AST	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 283 FC279 Release	Small area adjacent to a materials storage area with distressed vegetation	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 284 S947 Container	Former location of roll-off box which contained POL-contaminated soil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 285 S947 Oil/Water Separator	Oil/water separator associated with a storm water containment system	One VOC -- methylene chloride, two SVOCs--benzo(a)pyrene and benzo(a)anthracene, and one metal--arsenic detected at concentrations exceeding criteria.	Further investigation recommended. Advance several soil borings and install temporary monitoring wells. Re-sample the existing monitoring well located southwest of the separator. Analyze soil samples for SVOAs and metals, and groundwater samples for SVOAs.
SWMU 286 S947 Pile	Recently regraded and paved area in which POL-contaminated soils were once stored	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 291 034 Ditch	Storm water drainage ditch and scour area that historically received runoff from an oil/water separator and wash rack	For soil, arsenic and chromium detected above screening criteria. For surface water, tetrachloroethene detected above screening criteria. For sediment, acenaphthene, 4-4'-DDE, cadmium and chromium detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring in the vicinity of boring 291SWMU-IS01 to confirm the presence/concentration of arsenic and chromium. Collect one surface and subsurface sample from this boring. Analyze soil samples for metals. Collect additional surface water and sediment samples from the ditch to confirm/define VOC, SVOC, pesticide and metals contamination. Analyze surface water and sediment samples for VOAs, SVOAs, pesticides and metals.
SWMU 292 1106/1107 Above Ground Storage Tank	500-gallon AST that stores waste oil and antifreeze	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 293 1106/1107 Oil/Water Separator	Oil/water separator contains oil filters, waste oil, antifreeze, and possibly solvents	Lead and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring to confirm the presence/concentration of lead. Analyze soil samples for metals.
SWMU 294 1203 Oil/Water Separator	Oil/water separator and grit chamber associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 295 1601 Above Ground Storage Tank	AST in an area of known TCE groundwater contamination	The SVOC naphthalene detected at concentration exceeding criteria.	Further investigation recommended. Advance a minimum of three soil borings and install a minimum of two temporary monitoring wells. Collect groundwater samples from temporary wells and existing well 78GW09-1. Analyze samples for SVOAs.
SWMU 296 1700 Basin B	Collection basin that receives runoff from coal pile	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 297 1780 Oil/Water Separator No. 2	Oil/water separator associated with SWMU 261. Contains oil, grease and water	For SWMUs 261 and 297, 13 VOCs, four SVOCs, and six metals detected. One VOC-- chloroethane, and four metals--cadmium, chromium, lead, and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Collect additional soil samples. Analyze samples for VOAs and metals.
SWMU 298 1780 Oil/Water Separator No. 3	Oil/water separator associated with SWMU 262. Contains oil, grease and water	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 299 AS114 Above Ground Storage Tank	Used oil AST. Significant staining noted on tank exterior	Five VOCs, 22 SVOCs, and six metals detected. Six organic compounds and five metals detected at concentrations exceeding criteria.	Further investigation recommended. Install a minimum of three temporary monitoring wells with soil and groundwater sampling. Analyze samples for VOAs and SVOAs, and metals. Implement engineering/institutional controls to mitigate/eliminate overfills.
SWMU 300 AS118 Above Ground Storage Tank	Used motor oil AST	The SVOC benzo(a)pyrene, and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of two soil borings and install a minimum of two temporary monitoring wells. Analyze soil and groundwater samples for SVOAs and metals.
SWMU 301 AS4115 Above Ground Storage Tank	Two ASTs that contain POLs	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 302 AS563 Above Ground Storage Tank	AST that contains used engine, hydraulic and transmission oil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 303 AS515 Above Ground Storage Tank	Two ASTs that are labeled as "Hydraulic Fluid, Engine and Transmission Oils Only, No Solvents or Other Chemicals"	The SVOC benzo(a)anthracene, and the metals arsenic and chromium detected at concentrations exceeding criteria.	Further investigation recommended. Advance soil borings to confirm the presence/concentrations of the detected constituents. Analyze soil samples for SVOAs, and metals.

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 304 BA103 Oil/Water Separator	Oil/water separator connected to a drain field	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 305 BB224 Pile	Former location of soil pile which reportedly contained grease and contaminated soil	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 306 FC230 Oil/Water Separator	Oil/water separator associated with vehicle wash area	Silver and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring to confirm the presence/concentration of silver. Analyze the soil samples for metals.
SWMU 307 G649 Wash Rack	Oil/water separator and vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 308 GP109 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 309 NH118 Underground Storage Tank	Waste oil UST and AST	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 310 PT33 Pond Oil/Water Separator	Several earthen impoundments used for dewatering of cooking grease	No SWMU-related constituents detected above any screening criteria.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 311 S1619 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	Six VOCs, 11 SVOCs, and five metals detected. The VOC chlorobenzene and four metals detected at concentrations exceeding criteria. Site soils may be influenced by runoff from Michael Road.	Further investigation recommended. Install three temporary monitoring wells with soil and groundwater sampling. Collect surface soil/sediment samples in swale. Analyze samples for VOAs, SVOAs, and metals.
SWMU 312 Oil Water Separator S-1735 (S-1698)	Oil/water separator that receives steam condensate from the Steam Plant (Building 1700)	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 313 S1753 Oil/Water Separator	Oil/water separator associated with a vehicle and equipment wash area	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 314 SM187 Oil/Water Separator	Oil/water separator associated with a vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 315 SM269 Oil/Water Separator Near Building M200	Oil/water separator associated with a vehicle wash rack. Unit may have been used for disposal of waste oil	Two VOCs, 11 SVOCs, and seven metals detected. The SVOC pentachlorophenol and two metals detected at concentrations exceeding criteria.	Further investigation recommended. Install three temporary monitoring wells with soil and groundwater sampling. Analyze samples for SVOAs and metals.

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 316 TC773 Oil/Water Separator	Oil/water separator and vehicle wash rack	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 317 TT2453 Release	Area near a used antifreeze AST where a release had reportedly occurred	Lead and mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance a minimum of four soil borings and a minimum of two temporary monitoring wells with soil and groundwater sampling. Analyze samples for metals.
SWMU 318 AS515 Oil/Water Separator	Oil/water separator and grit chamber associated with a helicopter wash pad	Seven organic compounds and five metals detected at concentrations exceeding criteria.	Further investigation recommended. Install temporary monitoring wells with soil and groundwater sampling. Also, collect additional soil samples from the ditch receiving runoff from the SWMU. Analyze samples for VOAs, SVOAs, and metals.
SWMU 319 Camp Geiger Wastewater Treatment Plant	An AST at the Camp Geiger Wastewater Treatment Plant	Two VOCs, 12 SVOCs, and four metals detected. The SVOC benzo(a)anthracene and the metal mercury detected at concentrations exceeding criteria.	Further investigation recommended. Advance one soil boring in the vicinity of boring SWMU319-IS01 and collect one surface and subsurface soil sample. Analyze samples for SVOAs.
SWMU 336 AS4106 Paint Stripper	Two paint stripping vats.	The floor drains located on either side of the vats contained no sediments. No samples were collected from this SWMU.	No further action

TABLE 5-1 (Continued)

SWMU INVESTIGATION SUMMARY
MCB CAMP LEJEUNE, NORTH CAROLINA
SWMU CONFIRMATORY SAMPLING INVESTIGATION, CTO - 0371

SWMU Identification	SWMU Description	Summary of Results	Recommendations
SWMU 337 AS518 Paint Stripper	Two paint stripping vats in an organic stripping room	No SWMU-related constituents detected above any screening criteria.	No further action
SWMU 339 AS4146 Sand Blasting Area	Covered sand blasting area	For soil, no SWMU-related constituents detected above any screening criteria. For sediment, seven VOCs, six SVOCs, and six metals detected. Four SVOCs and four metals detected at concentrations exceeding criteria.	No further investigative action. Implement controls to reduce the potential for migration of contaminated sand and grit into the storm water system.

Notes:

AST = aboveground storage tank
IR = Installation Restoration
POL = Petroleum, Oil and Lubricants
SVOA = semivolatile organic analysis
SVOC = semivolatile organic compounds
SWMU = Solid Waste Management Unit
UST = underground storage tank
VOA = volatile organic analysis
VOC = volatile organic compound