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December 21, 2004

Commander
Naval Facilities Engineering Command
Atlantic Division
6506 Hampton Blvd., Bldg. A, Room 1306
Norfolk, VA 23508

Attention: EV23DC Mr. David Cleland, P.G.

Re: **FINAL Remedial Action Optimization & Revised Corrective Action Plan**
JP-5 Line Area
Marine Corps Base
Camp Lejeune, North Carolina
Navy Contract No. N62470-01-D-3009
Delivery Order No. 0079
CATLIN Project No. 203-063

Dear Mr. Cleland:

CATLIN Engineers and Scientists (CATLIN) are pleased to submit the FINAL Remedial Action Optimization & Revised Corrective Action Plan for the above referenced site. Please find enclosed one copy of the above referenced FINAL document. This document has been prepared to serve the dual purpose of providing both an optimization evaluation of the existing remediation system and recommendations for revising the corrective action strategy for this site. This document is intended to be submitted to the North Carolina Department of Natural Resources (NCDENR) and includes specific recommendations in order to enhance the current remedial system.

We have reviewed the comments to the referenced draft report and offer the following responses to the comments/concerns offered by Ms. Hall via a telephone conference call on December 7, 2004.

Executive Summary

- **5th paragraph - Add sentence that references that Shaw monitored and maintained the site between operations by J.A. Jones and E&E.**

Acknowledged. Added text accordingly.

Site History

- **2nd paragraph - change “on” to in and delete “17” in “October 17, 2000”.**

Acknowledged. Changed text accordingly.

- **Last paragraph - Add sentence that references that Shaw monitored and maintained the site between operations by J.A. Jones and E&E.**

Acknowledged. Added text accordingly.

4.2.1 Soil

- **First paragraph – Change wording to better reflect the TPH samples collected by Radian are from within the water table.**

Acknowledged. Changed paragraph accordingly.

6.3.1 Shallow Conditions

- **First paragraph – Reconsider the need for a monitoring well at the former monitoring well location OBG-1.**

Acknowledged. The text has been changed within the text to reflect that a new monitoring well is not needed in the vicinity of former monitoring well OBG-1 unless groundwater contamination is observed in the new OBG-3 monitoring well.

General Comment

- **Radian concluded that soil contamination had been cleaned up to the Industrial/Commercial Maximum Soil Contaminant Concentrations at the JP-5 Line Area project site. Therefore, it was agreed to edit the text throughout accordingly.**

Acknowledged. The following sections of the report have been edited accordingly.

1. Executive Summary, third paragraph, second sentence of draft report was deleted.
2. Executive Summary, third paragraph, last two sentences of draft report were revised.
3. Executive Summary, third paragraph, second sentence of draft report was revised.
4. Section 2.0 – Site History, fifth paragraph, last two sentences of draft report were modified to be one sentence.
5. Section 2.0 – Site History, seventh paragraph, last four sentences of draft report were modified to be one sentence.
6. Section 3.1 – Remedial System Objectives, second paragraph, last sentence of draft report was revised.

7. Section 4.2.1 - Soil, first paragraph, second and third sentences of draft report were modified to be one sentence.
8. Section 4.3.2 - Soil, entire section of draft report was revised.
9. Section 5.3.1 - Revised Target Cleanup Goals, first paragraph, entire paragraph of draft report was revised.
10. Section 5.4 - Alternative Remedial Technologies, first and last sentences of draft report were revised.
11. Section 6.2 - Soil, entire section of draft report was revised.
12. Section 7.1 - Implementation Plan; third, fifth and sixth bullets of draft report were revised.
13. Section 7.2 - Schedule for Implementation, first sentence of draft report was revised.
14. Table 5 of draft report was revised.
15. Figures 4 and 7 of draft report were deleted.

CATLIN Engineers and Scientists appreciate the opportunity to continue to provide services to LANTDIV and the MCB on your environmental projects.

Sincerely,



Michael E. Mason, P.E.
CATLIN Program Manager



Jeffery K. Becken, P.E.
Project Engineer

Attachments: FINAL Remedial Action Operation Optimization Plan

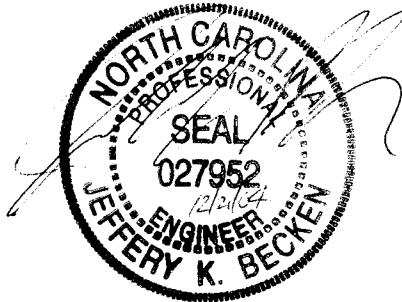
cc: Ms. Rochelle Lee - NC/CAR IPT, correspondence only
Commanding General, Attn: Director I&E/EMD/EQB (2 copies)
William C. Morris, P.G. - Engineering & Environment, Inc. (1 copy)

**REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
*JP-5 LINE AREA***

**MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA**

DECEMBER 21, 2004

**Navy Contract No.: N62470-01-D-3009
Delivery Order No.: 0079
CATLIN Project No.: 203-063**



Prepared by:

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LIST OF ACRONYMS

2000 Guidelines	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater
2001 Guidelines	Guidelines for Assessment and Corrective Action, North Carolina Underground Storage Tank Section (Effective July 1, 2001)
2L GWQS	NCAC T15A:02L Groundwater Quality Standards
ARO	Asheville Regional Office
AS	Air Sparge
AST	Aboveground Storage Tank
BDL	Below Detection Limit
BN	Base/Neutral (extractables)
BNA	Base/Neutral/Acid (extractables)
BQL	Below Quantitation Limit
BLS	Below Land Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAP	Corrective Action Plan
CATLIN	CATLIN Engineers and Scientists (Formerly RC&A)
CFR	Code of Federal Regulations
Cr	Chromium
CSA	Comprehensive Site Assessment
CNP	Carbon Nitrogen Phosphorous
CPT	Cone Penetrometer Test
DEM	Division of Environmental Management
DIPE	Diisopropyl Ether
DO	Dissolved Oxygen
DOD	Department of Defense
DPT	Direct Push Technology
DWQ	Division of Water Quality
DWM	Division of Waste Management
DTW	Depth to Water
EAD	Environmental Affairs Department
EDB	Ethylene di-bromide
EMD	Environmental Management Division
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
EQB	Environmental Quality Branch
Fe	Iron
FID	Flame Ionization Detector
FOD	Foreign Object Debris
FRO	Fayetteville Regional Office
FT	Feet
GCL	Gross Contaminant Level
GIS	Geographic Information System
GPS	Global Positioning System

Guidelines Vol. I	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other Than Petroleum Underground Storage Tanks (May 1998)
Guidelines Vol. II	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks (January 2, 1998)
HDPE	High Density Polyethylene
I/C	Industrial/Commercial
ID	Identification
I&E	Installations and Environment Department
IGWQS	Interim Groundwater Quality Standards
IPE	Isopropyl Ether
LSA	Limited Site Assessment
LUST	Leaking Underground Storage Tank
m-	meta
m	meter
MADEP	Massachusetts Department of Environmental Protection
MCALF	Marine Corps Auxiliary Landing Field
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCOLF	Marine Corps Outlying Landing Field
MDL	Method Detection Limit
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MRO	Mooresville Regional Office
MSCC	Maximum Soil Contaminant Concentration
MSL	Mean Sea Level
MTBE	Methyl tertiary butyl ether
µg/Kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
NA	Not Analyzed
N/A	Not Applicable
NAVFAC Atlantic	Naval Facilities Atlantic Division
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCDOC	North Carolina Department of Corrections
NCDOT	North Carolina Department of Transportation
NCSP	North Carolina State Plane
NCSPA	North Carolina State Ports Authority
NE	None Established
NM	Not Measured
NMT	No Measurable Thickness
NS	Not Sampled
o-	ortho
OVA	Organic Vapor Analyzer

p-	para
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
PPB	Parts Per Billion
PPM	Parts Per Million
PID	Photo Ionization Detector
PQL	Practical Quantitation Limit
PVC	Polyvinyl chloride
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
Res	Residential
ROI	Radius of Influence
RRO	Raleigh Regional Office
SOW	Scope of Work
STGW	Soil-to-Groundwater
SVE	Soil Vapor Extraction
SVOC	Semi Volatile Organic Compound
TDHF	Toxicologically Defined Hydrocarbons Fractions
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
US	United States
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbons
WaRO	Washington Regional Office
WiRO	Wilmington Regional Office
WSRO	Winston-Salem Regional Office

**REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN**

***JP-5 LINE AREA*
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA**

CATLIN PROJECT NO. 203-063

DECEMBER 21, 2004

EXECUTIVE SUMMARY

This report is intended to provide information relevant to address and review the effectiveness of current remedial actions being conducted at the JP-5 Line Area project site and to make revisions to the Corrective Action Plan (CAP) in order to move towards site closeout. The JP-5 Line Area project site is located along White Street aboard the Marine Corps Air Station (MCAS), New River in Onslow County, North Carolina. An underground pipeline that transports JP-5 fuel from the Campbell Street Fuel Farm to the flight line transects the project site.

Several site assessments in the early 1980's identified leaks within the JP-5 pipeline within the area of the project site. These assessments initiated the abandonment and replacement of the JP-5 pipeline. Upon discovery of the leaks, the extent of free-phase product, soil contamination and groundwater contamination, if applicable, were assessed. An interim recovery system was installed and operated from October 1986 to November 1987. A total of 4,034 gallon of JP-5 fuel was reportedly recovered during the operation of this interim recovery system.

O'Brien & Gere Engineers, Inc, (OBG) prepared and submitted a CAP for the subject site dated June 1991 that identified the measurable amounts of free-phase product and dissolved phase petroleum hydrocarbons within the groundwater. OBG reported that soil samples from the installation of monitoring well OBG-3 contained detectable levels of organics based on a field organic vapor analyzer (OVA). The remedial system proposed in the CAP consisted of a pump and treat system. It is our understanding that the remediation system pumped recovered groundwater/free-phase product from recovery wells to an oil/water separator followed by an air stripper, carbon adsorption units and then discharged to the Base Wastewater Treatment Plant (WWTP). The system reportedly began operation in February of 1994.

A Remedial Action Operation Optimization Case Study Report dated May 2000 was prepared for the JP-5 Line Area project site by Radian International (Radian). Radian recommended discontinuing the pump and treat product recovery system and implementing the use of Aggressive Fluid Vapor Recovery (AFVR) events for recovering the remaining free-phase product. Radian concluded that soil contamination had been cleaned up to the Industrial/Commercial (I/C) Maximum Soil Contamination Concentrations (MSCCs).

It is our understanding that from February 1998 through March 2002, J.A. Jones Environmental Services Company (J.A. Jones) operated, maintained and monitored the JP-5 Line Area project site. Based on the recommendations proposed in the Radian Remedial Action Operation Optimization Case Study Report, J.A. Jones shut down the pump and treat remediation system on July 19, 2000. AFVR techniques were subsequently implemented and are currently being performed on an as needed basis when free-phase product thickness is measured to be equal to or greater than 0.1 feet in the recovery wells. A passive free-phase product skimmer has reportedly been used in recovery well RW-1 on occasion between AFVR events. Engineering & Environment, Inc. (E&E) has monitored and maintained the JP-5 Line Area project site since early 2003. Shaw monitored and maintained the JP-5 Line Area project site between operations by J.A. Jones and E&E.

Current applicable remedial requirements are defined by the Risk Based Corrective Action (RBCA) rules for Petroleum Underground Storage Tanks (USTs) per 15A NCAC 2L .0115 effective date January 2, 1998 and document entitled "*Guidelines for Assessment and Corrective Action*" (2001 Guidelines) as released by the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Waste Management, UST Section, effective July 1, 2001. A risk classification, as presented in the 2001 Guidelines was completed as part of this work to present the data necessary to allow NCDENR to assess the site's applicable risk classification. Based on the findings, CATLIN Engineers and Scientist (CATLIN) concludes that the subject site meets the criteria for classification as an Intermediate Risk and Industrial/Commercial (I/C) Land Use site. The Intermediate Risk is based on the unknown deep groundwater conditions and the presence of the free-phase product.

In order to effectively evaluate the current remediation system suitability, additional investigations are required. Based on CATLIN's optimization work, the extent of the free-phase product need to be delineated, the horizontal extent of groundwater contaminations needs to be better defined, and the vertical extent of groundwater contamination needs to be established. Specific recommendations are included within Section 6.0 of this report.

**REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN**

***JP-5 LINE AREA*
MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA**

CATLIN PROJECT NO. 203-063

DECEMBER 21, 2004

1.0 BACKGROUND

1.1 PURPOSE OF REPORT

The purpose of this report is to provide information relevant to address and review the effectiveness of current remedial actions being conducted at the JP-5 Line Area project site located on the MCAS, New River. Additionally, this report revises the CAP and provides recommendation for continuing remediation activities in order to achieve site closure. This report has been formatted according to the Naval Facilities Engineering Command (NAVFACENGCOM) "Guidance for Optimizing Remedial Action Operation" document prepared by Radian International and dated April 2001 with the ultimate purpose to "achieve environmentally protective site closeout at the least cost."

The work conducted herein was conducted in general accordance with the Workplan titled Remediation System Optimization Plans at the Various Sites, Marine Corps Base, Camp Lejeune, North Carolina dated July 16, 2003. CATLIN was authorized to perform this investigation by the Atlantic Division (LANTDIV) NAVFACENGCOM in accordance with the Order of Supplies Contract Number N62470-01-D-3009, Delivery Order Number 0079.

1.2 SCOPE OF WORK

This Remedial Action Optimization (RAO) & Revised Corrective Action Plan (RCAP) was developed in general accordance with the NAVFACENGCOM "Guidance for Optimizing Remedial Action Operation" document dated April 2001 and the 2001 Guidelines. Specific methods utilized to develop the RAO & RCAP included a thorough collection and review of available reports and field data. Data was then reviewed and the RAO & RCAP was developed.

2.0 SITE HISTORY

The JP-5 Line Area project site is located aboard the MCAS, New River in Onslow County, North Carolina. The site vicinity is presented on Figure 1. The area consists of several parking lots and a helicopter hangar. The site is located along White Street, as shown on the site location map on Figure 1.

An underground pipeline that transports JP-5 fuel from the Campbell Street Fuel Farm to the flight line transects the project site. Several site assessments in the early 1980's identified leaks within the JP-5 pipeline within the area of the project site. Upon discovery of the leaks the pipeline was reportedly shut down and replaced with a new line in the summer of 1984. The inactive pipeline was reportedly drained and abandoned in-place in 1985. As a result of the leaks, an unknown amount of JP-5 fuel was released into the area of the current project site. J.A. Jones completed the closure of the abandoned fuel line in October 2000, and a closure report was completed on February 13, 2001.

Various site assessments were conducted in the 1980's to delineate the extent, if applicable, of free-phase product, soil contamination and groundwater contamination from the JP-5 fuel released from the former JP-5 pipeline. The findings of the previous assessments have been summarized in reports submitted to NCDENR, Division of Waste Management, UST Section in the Wilmington Regional Office (WiRO). It is our understanding that the monitoring wells identified with a "W" prefix on the attached Figure 2 were installed as part of the initial site assessment activities.

Upon discovery of free-phase product at the site, an interim recovery system was installed and operated from October 1986 to November 1987. A total of 4,034 gallon of JP-5 fuel was reportedly recovered during the operation of this interim recovery system.

The reports from the various site assessments were utilized by OBG to develop a CAP dated June 1991. OBG installed an additional six monitoring wells, identified with an OBG prefix on the attached Figure 2, to assist with further delineation of the potential contamination. OBG identified measurable amounts of free-phase product and dissolved phase petroleum hydrocarbons within the groundwater in the monitoring wells located at the JP-5 Line Area project site. OBG reported that soil samples from the installation of monitoring well OBG-3 contained detectable levels of organics based on a field organic vapor analyzer.

The recommended remediation strategy within the CAP for site restoration was a treatment system consisting of a petroleum hydrocarbon recovery system, intended to replace the interim recovery system previously discontinued. The system proposed in the CAP consisted of two recovery wells, an oil/water separator, an air stripper tower and carbon contactors. Each well was proposed to contain a pneumatic drawdown pump and a pneumatic product ejector pump. It is our understanding that the remediation system installed consisted of a pump and treat system that pumped recovered groundwater/free-phase product from recovery wells to an oil/water separator, followed by an air stripper, carbon adsorption units, and then discharged to the Base WWTP. The system reportedly began operation in February of 1994.

A Remedial Action Operation Optimization Case Study Report dated May 2000 was prepared for the JP-5 Line Area project site by Radian. This report, referred to herein as the Radian Optimization Report, evaluated and assessed the on-going remedial action operation program at the JP-5 Line Area project site as of early 2000. Radian performed additional assessment activities as part of their optimization study that indicated the presence of discrete pockets of free-phase product present along the east side of White Street, rather than a continuous lens of free-phase product across the entire site. Radian recommended discontinuing the pump and treat product recovery system and implementing the use of AFVR events for the remedial action for recovering the remaining free-phase product. Radian also stated that residual fuel exists within the soil; however, it is no longer contributing to groundwater contamination. Radian concluded that soil contamination had been cleaned up to the I/C MSCCs.

It is our understanding that from February 1998 through March 2002, J.A. Jones operated, maintained and monitored the JP-5 Line Area project site. Based on the recommendations proposed in the Radian Optimization Report, J.A. Jones shut down the pump and treat remediation system on July 19, 2000. AFVR techniques were subsequently implemented and are currently being performed on an as needed basis when free-phase product thickness is measured to be equal to or greater than 0.1 feet in the recovery wells. A passive free-phase product skimmer has reportedly been used in recovery well RW-1 on occasion between AFVR events.

E&E has monitored and maintained the JP-5 Line Area project site since early 2003. E&E has provided some of the 2003 and 2004 data referenced within this report. Shaw Environmental, Inc. (Shaw) prepared an Annual Monitoring Report dated January 2004 that documented JA Jones' activities between 1998 and April 2002, which has also been referenced in preparation of this report. Shaw monitored and maintained the JP-5 Line Area project site between operations by J.A. Jones and E&E.

2.1 CONCEPTUAL SITE MODEL (BASED ON RADIAN OPTIMIZATION REPORT)

This conceptual site model is based on the information utilized in the development of the Radian Optimization Report. As previously discussed, the remedial system proposed within the CAP and subsequently installed consisted of a pump and treat system that was shut down on July 19, 2000 based on recommendations by the Radian Optimization Report.

2.1.1 Site Geology

The topography of the project site is relatively flat. Soils in the vicinity of the site were documented to be sand, silt, and clay. Generally, materials in the first 10 feet BLS were observed to be predominantly sand, while soils below 10 feet BLS were observed to be predominantly a silty clay layer that extends

to a depth of 16 feet BLS. The silty clay layer is underlain by a coarse sand layer that extends to an unknown depth.

2.1.2 Groundwater Flow Direction and Velocity

Radian reported that groundwater flow direction was predominately toward the northeast. Depth to groundwater has historically ranged from approximately 3 to 8 feet below land surface (BLS). Radian reported that according to OBG, groundwater flow velocity at the site was determined to be approximately 18 ft/year based on an effective porosity of 0.40, an average hydraulic conductivity of 7.4 gallons per day per square feet, and a hydraulic gradient of 0.02 ft/ft. The average hydraulic conductivity was based on in-situ permeability tests performed by OBG.

2.1.3 Potential Receptors

Radian reported one potential receptor, water supply well AS-4140, however, this well was scheduled for demolition as of the Radian Optimization Report.

2.1.4 Contaminants of Concern

The contaminants of concern reported within the Radian Optimization Report included the following:

- Free-phase product
- Groundwater contamination consisting of the following compounds and site rehabilitation concentrations:
 - Benzene – 1 µg/L
 - Toluene – 1,000 µg/L
 - Ethylbenzene – 29 µg/L
 - Xylenes (Total) – 530 µg/L
 - Bis(2-ethylhexyl)phthalate – 3 µg/L
 - Pyrene – 210 µg/L
 - Fluoranthene – 280 µg/L
 - Naphthalene – 21 µg/L
 - 1-Methylnaphthalene – Detection Limit
 - 2-Methylnaphthalene – 28 µg/L

3.0 REMEDIAL ACTION REVIEW

3.1 REMEDIAL SYSTEM OBJECTIVES

As previously discussed, the remedial system proposed within the CAP and subsequently installed consisted of a pump and treat system that was shut down on July 19, 2000 based on recommendations within the Radian Optimization Report.

Herein, the remedial action review will be based on the implemented changes after July 19, 2000.

As detailed in the Radian Optimization Report, the remedial objectives were to recover the remaining free-phase product and reduce any remaining groundwater contamination levels. The Radian Optimization Report concluded that soil contamination had been cleaned up to the risk based I/C MSCC levels.

3.2 RECOMMENDED REMEDIAL SYSTEM

The Radian Optimization Report recommended the use of AFVR techniques in lieu of the pump and treat system to recover the remaining free-phase product and natural attenuation to reduce the remaining groundwater contamination levels.

Radian recommended that recovery wells RW-1 and RW-2 be gauged on a weekly basis for the presence of free-phase product. In the event that well gauging measurements indicate a thickness greater than or equal to 0.1 feet of free-phase product then an AFVR event was recommended to be conducted. Each AFVR event was recommended to be conducted for an eight-hour period or until the capacity of the tank on the vacuum truck was achieved.

Radian stated that natural attenuation processes are occurring at the site and will naturally attenuate any remaining groundwater contamination at the JP-5 Line Area project site. Therefore, the recommended remedial method for the remaining groundwater contamination was natural attenuation. The Radian Optimization Report did not recommend a frequency for monitoring natural attenuation; therefore, we are assuming the frequency recommended within the CAP of quarterly sampling was assumed to be sufficient monitoring for natural attenuation.

3.3 IMPLEMENTED REMEDIAL SYSTEM

Subsequent to the Radian Optimization Report, J.A. Jones implemented the proposed remedial approach of the use of AFVR events for the recovery of free-phase product and natural attenuation of contaminated groundwater on July 19, 2000.

3.4 REMEDIAL SYSTEM STATUS

Currently, AFVR events are being conducted at the JP-5 Line Area project site by E&E. Additionally, a passive free-phase product skimmer has reportedly been used in recovery well RW-1 on occasion between AFVR events. Since the pump and treat system was shut down on July 19, 2000, J.A. Jones, Shaw, and E&E have reported that 14 AFVR events have been conducted at the site.

Based on Shaw's Annual Monitoring Report dated January 2004, it appears that laboratory samples are collected on a quarterly basis to monitor the effectiveness of natural attenuation of the contaminated groundwater.

3.5 MONITORING STATUS

According to E&E, recovery well RW-1 is currently gauged on a weekly basis while selected monitoring wells and the additional recovery well RW-2 is gauged on a monthly basis. Groundwater sampling and analysis are currently collected on a quarterly basis from selected Type II (shallow) monitoring wells (OBG-4, OBG-5, W-7, W-8, W-10 and W-13). Type III (deep) monitoring wells are not located on the JP-5 Line Area project site. A number of monitoring wells (OBG-1, OBG-3, OBG-6 and W-2) have not been sampled since shut down of the pump and treat system in July 2000 due to the fact that they were previously destroyed, unable to locate, or inaccessible. Please refer to Table 2 for the groundwater sampling history of each individual monitoring well.

Groundwater samples are currently analyzed for Volatile Aromatic Hydrocarbons per EPA Method 602 and Semi-Volatile Organic Compounds per EPA Method 625. These sampling events are summarized in an annual monitoring report and are on file in the WiRO.

4.0 REMEDIATION EFFECTIVENESS EVALUATION

4.1 CONTAMINANT LEVELS

4.1.1 Free-Phase Product

Free-phase product has not been observed in any of the existing monitoring wells since 1998. Free-phase product has historically been present in only the recovery wells (RW-1 and RW-2) since the CAP. As previously stated, at least 14 AFVR events have been conducted at the site since July 19, 2000. These AFVR events have recovered an estimated 35,775 gallons of free-phase product/groundwater mixture. As illustrated in Table 3 and Figure 3, it appears that the thickness of free-phase product within recovery well RW-1 has decreased but remained present since implementation of the AFVR events. However, please note that a portion of the JP-5 Line Area (under the

hangar) appears to not have been assessed. Additionally, the closest monitoring point is RW-2, which is 110 feet up gradient of RW-1. Therefore, the extent of free-phase product as of April 2004 may not be representative of actual conditions. Based on a review of the historical free-phase product thicknesses in Appendix E, typically it appears that a thickness of greater than 1 foot is present in recovery well RW-1 immediately prior to an AFVR event. Following an AFVR event, the free-phase product thickness in recovery well RW-1 is typically not observed. However, on occasion, product has remained in RW-1 following an AFVR event and continues to reappear typically within a month. A measurable quantity of free-phase product has not been observed in recovery well RW-2 since 2001.

4.2 CONTAMINANT CONCENTRATIONS

4.2.1 Soil

As previously stated, the Radian Optimization Report concluded that soil contamination had been cleaned up to the risk-based I/C MSCC levels. Please note that Radian collected soil samples from the "smear" zone (within the water table) for TPH analysis in order to assess the extent of free-phase product rather than delineate soil contamination. These "smear" zone soil analyses indicate TPH values ranging from non-detect to 4,620 mg/kg. No additional soil assessments have been conducted at the JP-5 Line Area project site. A summary of the historical soil laboratory analytical results have been provided in Appendix A.

4.2.2 Groundwater

Groundwater contamination data since shut down of the pump and treat system on July 19, 2000, has been provided on the attached Figures 5 and 6. The Radian Optimization Report identified benzene, ethylbenzene, toluene, total xylenes, naphthalene, bis(2-ethylhexyl)phthalate, 1-methylnaphthalene, 2-methylnaphthalene, pyrene and fluoranthene as the target contaminants of concern and clean-up concentrations based on the 2L Groundwater Quality Standards (GWQS).

The Radian Optimization Report did not distinguish between the shallow conditions and the deep conditions. In order to effectively evaluate the current remediation system, a discussion of the shallow conditions (Type II monitoring wells) and the deep conditions (Type III monitoring wells) is provided in the following sections.

4.2.2.1 Shallow Conditions

The most recent estimated plume boundaries of the shallow groundwater conditions from the March/April 2004 sampling event along with the conditions from prior to shutdown of the pump and treat system on July 19, 2000 (June 20, 2000 sampling event) are shown for BTEX and naphthalene on Figures 4 and 5. As can be seen, the estimated horizontal extent and concentrations of shallow groundwater contamination remains below the laboratory quantitation limits for the monitoring wells sampled. Please note that a portion of the shallow monitoring well network has not been sampled since the shutdown of the pump and treat system. Therefore, the March/April 2004 conditions may not be representative of actual conditions. Based on the March/April 2004 groundwater sampling data, contaminant concentrations remain in excess of the 2L GWQS only at monitoring well W-10 and only for bis(2-ethylhexyl)phthalate. Table 4 summarizes the historical groundwater contaminants of concern for the Type II shallow monitoring wells and Table 2 summarizes the last date an individual monitoring well exhibited groundwater contaminant concentrations above the 2L GWQS.

4.2.2.2 Deep Conditions

As previously stated, deep (Type III) monitoring wells are not located on the JP-5 Line Area project site.

4.3 SYSTEM SUITABILITY

4.3.1 Free-Phase Product

As previously stated, free-phase product has historically been reported present within recovery well RW-1. Due to the continual presence of free-phase product within recovery well RW-1, it appears that AFVR events are not a suitable method for the elimination of free-phase product at the JP-5 Line Area project site. However, it is important to note that the spatial extent of free-phase product may extend beyond the limits of the influence of the AFVR technology.

4.3.2 Soil

As previously stated, the Radian Optimization Report concluded that soil contamination had been cleaned up to the risk based I/C MSCC levels.

4.3.3 Groundwater

As previously stated, a portion of the monitoring well network has been destroyed, unable to locate, or inaccessible. Therefore, the suitability of the implemented remedial approach, natural attenuation, cannot be determined as of preparation of the RAO and RCAP. However, the implemented remedial approach is a method that has historically been successful in restoring groundwater to the 2L GWQS if the contaminant levels and site conditions are favorable.

5.0 REMEDIATION MODIFICATIONS AND ALTERNATIVES

5.1 REGULATORY FRAMEWORK EVALUATION

The remedial goals for the site were based on the regulations current at the time and presented in the Radian Optimization Report. Current applicable remedial requirements for the contamination associated with the JP-5 Line Area project site are based on the corrective action requirements per 15A NCAC 2L.0115 which became effective on January 2, 1998 and the requirements in the NCDENR 2001 Guidelines. As such, reclassification of the site based on current risk factors was necessary.

A Risk Classification and Land Use Form, as presented in the 2001 Guidelines was completed as part of this work to present the data necessary to allow NCDENR to assess the site's applicable risk classification. The completed form is included in Appendix D. Based on the findings of this Risk Classification and Land Use Form, CATLIN concludes that the subject site meets the criteria for classification as an Intermediate Risk and Industrial/Commercial Land Use site. The Intermediate Risk is based on the unknown deep groundwater conditions and the presence of the free-phase product.

5.2 REVISED CONCEPTUAL SITE MODEL

5.2.1 Groundwater Depth and Flow Direction

J.A. Jones, Shaw and E&E obtained depth to groundwater measurements from selected Type II (shallow) monitoring wells during the numerous sampling and gauging events that have been conducted at the subject site. Since the pump and treat system was shutdown on July 19, 2000, groundwater elevation contours for the shallow monitoring wells, as interpreted and reported by J.A. Jones and Shaw, have historically indicated a general groundwater flow direction toward the northeast. Therefore, no change to the groundwater flow characteristics is necessary in the revised conceptual model.

5.2.2 Potential Receptors

Potential receptors have been re-evaluated during the preparation of this RAO & RCAP using the Risk Classification and Land Use Form in Appendix D. The receptor survey performed as part of this plan identified the following receptors within 1,500 feet of the site:

- The Wellhead Protection Plan Update (2002) indicated no active water supply wells within 1,500 feet of the site. However, water supply wells listed as “closed” within the latest database provided by Camp Lejeune are present within 1,500 feet of the subject site.
- Free-phase product has historically been present at the site.
- The site is located within the Coastal Plain and recharge to an unconfined or semi-confined deeper aquifer is a possibility.
- There are numerous surface water bodies located outside of 500 feet and within 1,500 feet of the source area.
- Numerous underground utilities are present throughout the site.
- Athletic fields are located within 1,500 feet of the site.
- A playground is located approximately 1,200 feet west of the site

Based on information provided by MCB, Camp Lejeune, these potential receptors have not been reported to have been impacted by the potentially contaminated soils and/or groundwater. The potential receptors are presented on the Site Location Map on Figure 1.

5.2.3 Contaminants of Concern

The groundwater contaminants of concern (COC) as established in the Radian Optimization Report are still relevant; however, JA Jones and Shaw have historically reported additional contaminants in their annual monitoring reports above the 2L GWQS. Therefore, the COCs have been expanded to include the additional contaminants reported by J.A. Jones and Shaw. The revised COCs have been summarized on Table 5.

5.3 ALTERNATIVE REGULATORY MECHANISMS

5.3.1 Revised Target Cleanup Goals

As previously stated, the Radian Optimization Report concluded that soil contamination had been cleaned up to the risk-based I/C MSCC levels. As such, additional soil sampling for risk-based analysis is not recommended at this time.

Additionally, based on the intermediate risk classification, groundwater quality must be restored to levels protective of surface water, wellhead protection areas and aquifers that could be used for drinking water. If these requirements are met then the RBCA Gross Contaminant Levels (GCLs) are applicable. Surface waters are not considered a risk for this site based on the historical surficial groundwater contaminant plume location. However, the deeper groundwater conditions have not been delineated as of this RAO and RCAP. Therefore, based on the unknown conditions of the deeper aquifer and the unknown extent of free-phase product, the applicable clean-up concentration for groundwater has not been determined as part of this RAO and RCAP. Clean-up concentrations will likely be either the 2L GWQS or GCLs as shown on Table 5. Upon removal of the free-phase product and the confirmation of no deep groundwater contamination, then the risk-based corrective actions (GCLs) will be applicable and the site can be re-classified as low risk.

5.3.2 Notice of Residual Petroleum

A Notice of Residual Petroleum (NRP) is not required at this time for this site. However, upon reclassification of the site as low risk, a NRP may be required as part of a request for No Further Action (NFA).

Marine Corps Base, Camp Lejeune is currently in the process of developing a legal document designated as a Land Use Restriction (LUR) that is being designed as an acceptable document to both State and Federal Government agencies to accomplish the intent of the NRP.

5.4 ALTERNATIVE REMEDIAL TECHNOLOGIES

As previously stated, the implemented remedial approach of natural attenuation has been effective in reducing the contaminant levels for the shallow groundwater contamination. However, the use of AFVR events has not been an effective remedial approach of the elimination of free-phase product. Therefore, an alternative remedial technology may be necessary to eliminate free-phase product, if present. This alternative remedial technology will be based on the approval and results of the optimization recommendations presented within the Section 6.0 of this report. It is

important to note that the presence of free-phase product and deep groundwater contamination has not been fully delineated in the area of the JP-5 Line Area site as of this report.

5.5 *COST EFFICIENCY EVALUATION*

A detailed cost efficiency evaluation was not performed for this site based on the recommendations within Section 6.0 of this report because the current approach is not achieving the remedial goals and a new technology has not been selected. Upon completion of the delineation activities then an evaluation of alternative remedial approaches will be necessary. During this additional evaluation, a cost efficiency evaluation may be necessary.

6.0 OPTIMIZATION RECOMMENDATIONS

6.1 *FREE-PHASE PRODUCT*

As previously stated, the spatial extent of free-phase product has not been fully delineated around recovery well RW-1. CATLIN recommends the following to delineate the free-phase product, if present:

- Install temporary piezometers around recovery well RW-1 by use of DPT at locations illustrated on Figure 6.
- Gauge temporary piezometers monthly for three months.
- If the free-phase product plume is not delineated from the installation of the suggested temporary piezometers, then additional delineation activities should be completed. Upon delineation of the free-phase product plume, a Report of Findings (ROF) should be submitted. The soil and groundwater assessment activities discussed in Sections 6.2 and 6.3 should be included within the ROF.

6.2 *SOIL*

As previously stated, the Radian Optimization Report concluded that soil contamination had been cleaned up to the risk-based I/C MSCC levels. Therefore, no additional assessment or remediation activities are recommended for the soils at the JP-5 Line Area project site.

6.3 GROUNDWATER

6.3.1 Shallow Conditions

Based on the Remedial Effectiveness Evaluation and the Revised Target Cleanup Concentrations discussed within Sections 4.2.2.1 and 5.3.1, respectively of this report, CATLIN recommends the continual use of natural attenuation until the 2L GWQS are met or the site is reclassified as low risk. Monitoring wells OBG-1 and OBG-3 were destroyed shortly after installation in 1989. CATLIN recommends that monitoring well OBG-3 be replaced immediately. This well will be used in the delineation of free-phase product and current groundwater conditions. CATLIN does not recommend the replacement of OBG-1 unless groundwater contamination is observed in the new OBG-3 monitoring well. This recommendation is based on the historical groundwater conditions in this area being below the 2L GWQS.

Specific details to meet the 2L GWQS are as follows:

- As previously stated, the groundwater contamination plume does not appear to have been delineated under the hangar. An additional monitoring well is recommended northeast of RW-1 inside the hangar as illustrated on Figure 7.
- The following shallow monitoring wells have not indicated the presence of groundwater contamination in excess of the 2L GWQS for at least four sampling events over a period greater than one year: OBG-4, OBG-5, W-7, W-8, and W-13. Therefore, CATLIN recommends that these monitoring wells be eliminated from the periodic monitoring efforts.
- The remaining shallow monitoring wells (OBG-3, OBG-6, W-2, W-10 and the proposed monitoring wells) should be sampled on a semi-annual basis until groundwater concentrations are below 2L GWQS for one year for the COCs listed in Table 5 by use of the following methods: EPA Method 602 with xylenes, EPA Method 625 for PAH compounds only and Standard Prep Method 3030C for lead. At the conclusion of this one-year time frame, a site closure should be requested.
- The groundwater samples collected for lead should be collected using low-flow sampling techniques.
- The results of the sampling should be presented within an Annual Groundwater Monitoring Report. The site closure request should also be summarized in this report. This report should also evaluate the lateral extent of groundwater contamination beneath the hangar. The following scenarios should be evaluated during the assessment of the groundwater conditions beneath the hangar:

1. If the concentrations of the COCs are below the 2L GWQS, then the monitoring well should be evaluated for abandonment or retained for plume delineation purposes until the site receives NFA. Upon receipt of NFA the monitoring wells may be abandoned.
2. If the concentrations of the COCs are above the 2L GWQS, then additional delineation of the shallow groundwater contamination should be evaluated along with the necessity of an active remedial approach.

Specific details to meet the Risk Based Corrective Action or GCLs are as follows:

- Upon removal of the free-phase product, the groundwater contaminant levels should be evaluated and the site should be reclassified, if applicable. If the site is classified as low risk, then site closure with LUR should be requested.
- Until site closure is requested, the following monitoring wells should be sampled on a semi-annual basis for the test methods referenced above: OBG-3, OBG-6, W-2, W-10 and the proposed monitoring wells.
- The groundwater samples collected for lead should be collected using low-flow sampling techniques.
- The results of the sampling should be presented within an Annual Groundwater Monitoring Report. The site closure request should also be summarized in this report.

6.3.2 Deep Conditions

CATLIN recommends the installation of a deep Type III groundwater monitoring well in the vicinity of the source area to evaluate deep groundwater conditions. Refer to Figure 7 for approximate location. Upon installation of the proposed deep monitoring well, CATLIN recommends the following to assess the potential deep groundwater contamination.

- The proposed deep monitoring well should be sampled on a semi-annual basis for one year for the COCs listed in Table 5 by use of the following methods: EPA Method 602 with xylenes, EPA Method 625 for PAH compounds only and Standard Prep Method 3030C for lead. The detection limits for all compounds should be below the 2L GWQS. The basis for the one-year time frame is to evaluate potential deep groundwater contamination. At the conclusion of this one-year time frame the following scenarios should be evaluated:

1. If the concentrations of the COCs are below the 2L GWQS,

then the monitoring well should be evaluated for abandonment or retained for plume delineation purposes until the site receives NFA. Upon receipt of NFA the monitoring wells may be abandoned.

2. If the concentrations of the COCs are above the 2L GWQS, then additional delineation of the deep groundwater contamination should be evaluated along with the necessity of an active remedial approach.

- The groundwater samples collected for lead should be collected using low-flow sampling techniques.
- The results of the sampling should be presented within an Annual Groundwater Monitoring Report.

7.0 IMPLEMENTATION

7.1 IMPLEMENTATION PLAN

The following is a suggested implementation plan for obtaining site closure:

- Submittal of this RAO & RCAP to the UST Sections of NCDENR for approval of recommendations.
- Initiate the investigation of the free-phase product plume.
- Installation of the recommended monitoring wells.
- Preparation of a ROF. This report will include the findings of the free-phase product assessment activities.
- Pending the findings of the free-phase product assessment activities, evaluate the remedial approach.
- Implementation of the recommended sampling strategy for the shallow groundwater and deep groundwater conditions.
- Preparation of the Annual Groundwater Monitoring Reports.

7.2 SCHEDULE FOR IMPLEMENTATION

Free-phase product delineation, installation of the recommended monitoring wells, and implementation of the groundwater sampling strategy are recommended to commence immediately upon plan approval by NCDENR. The semi-annual sampling activities should begin at the time of the next scheduled sampling event. The Annual Monitoring reports should be submitted following the December operation period.

8.0 LIMITATIONS

The field and groundwater data evaluated as part of this report provide isolated data points and may not represent conditions at every location in the project area. Analyses and conclusions of this report, being based on interpolation between data points at the project area, may not be completely representative of all site conditions. Conclusions and recommendations from this report are based on the best available data in an effort to comply with current regulatory requirements.

9.0 REFERENCES

- AH Environmental Consultants, *Final Report, Wellhead Protection Plan – 2002 Update, Marine Corps Base, Camp Lejeune*. August 2002.
- North Carolina Department of Environment and Natural Resources, Division of Waste Management, UST Section, 2001, *Guidelines for Assessment and Corrective Action*. Effective July 1, 2001.
- North Carolina Department of Environment and Natural Resources, Division of Water Quality, 2002, *Title 15A Subchapter 2L-Classifications and Water Quality Standards Applicable To The Groundwaters of North Carolina*. Effective as of December 2002.
- O'Brien & Gere Engineers, Inc, *Corrective Action Plan, JP-5 Line Area, Marine Corps Air Station, New River, North Carolina*. June 1991.
- O'Brien & Gere Engineers, Inc, *Ground Water Remediation Systems at Various Locations (TT & JP-5), Marine Corps Air Station, New River, North Carolina, Marine Corps Base, Camp Lejeune, North Carolina*. June 26, 1991.
- Radian International, *Final Remedial Action Operation Optimization Case Study, JP-5 Line Area, Marine Corps Air Station New River, North Carolina*. May 2000.
- S&ME, *JP-5 Fuel Line Investigation, MCAS(H), Camp Lejeune, North Carolina, Contract N62470-81-C-3763, S&ME Job Number 057-83-128*. Date unknown.
- Shaw Environmental Inc., *Final Annual Monitoring Report, JP-5 Line Area, Marine Corps Base, Camp Lejeune, Onslow County, North Carolina*. January 2004.

TABLES

TABLE 1

WELL CONSTRUCTION DATA

**JP-5 LINE AREA
MARINE CORPS AIR STATION
NEW RIVER, NC**

WELL I.D.	DATE CONSTRUCTED	TOP OF CASING (Feet)	DIAMETER (Inches)	TOTAL DEPTH (Feet Below TOC)	CASING INTERVAL (Feet Below TOC)	SCREEN INTERVAL (Feet Below TOC)
TYPE II MONITORING WELLS						
OBG-1	9/27/1989	UKN	2	15.0	0.0-5.0	5.0-15.0
OBG-2	9/27/1989	NA	2	15.0	0.0-5.0	5.0-15.0
OBG-4	9/27/1989	21.09	2	15.0	0.0-5.0	5.0-15.0
OBG-5	9/27/1989	22.88	2	13.0	0.0-3.0	3.0-13.0
OBG-6	9/27/1989	21.63	2	15.0	0.0-5.0	5.0-15.0
W-2	UKN	24.29	UKN	UKN	UKN	UKN
W-7	UKN	26.50	UKN	UKN	UKN	UKN
W-8	UKN	26.52	UKN	UKN	UKN	UKN
W-10	UKN	25.88	UKN	UKN	UKN	UKN
W-13	UKN	UKN	UKN	UKN	UKN	UKN
RECOVERY WELLS						
OBG-3	9/27/1989	UKN	6	25.0	0.0-10.0	10.0-25.0
RW-1	UKN	UKN	UKN	UKN	UKN	UKN
RW-2	UKN	UKN	UKN	UKN	UKN	UKN

1. Casing and screen intervals are assumed to be based on measurements from ground surface.
2. Total depth based on maximum depth of screen interval.
3. Top of casing provided by Shaw Environmental, Inc. Annual Monitoring Report, dated January 2004.
4. Data for casing and screen intervals obtained from the O'Brien & Gere Engineers, Inc. Corrective Action Plan, dated June 1991.
5. UKN = Unknown.
6. TOC = Top Of Casing.
7. + indicates "stick-up" casing.
8. Shading indicates well not located or abandoned. Data from these wells is from previously submitted reports.

TABLE 2																		
GROUNDWATER SAMPLING HISTORY																		
RAO & RCAP JP-5 LINE AREA MARINE CORPS AIR STATION NEW RIVER, NC																		
WELL I.D.	DATE INSTALLED	YEARS SAMPLED																LAST DATE ABOVE 2L GWQS
		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
TYPE II MONITORING WELLS																		
OBG-1	9/27/1989	X																NEVER ABOVE
OBG-2	9/27/1989																	NO DATA
OBG-4	9/27/1989	X									X	X	X	X	X	X	X	12/2/2002
OBG-5	9/27/1989										X	X	X	X	X	X	X	3/30/2003
OBG-6	9/27/1989	X										X						NEVER ABOVE
W-2																		NO DATA
W-7											X	X	X	X	X	X	X	3/30/2003
W-8											X	X	X	X	X	X	X	3/30/2003
W-10		X										X					X	3/31/2004
W-13											X	X	X	X	X	X		12/2/2002
RECOVERY WELLS																		
OBG-3	9/27/1989	X																9/30/1989
RW-1																		NO DATA
RW-2																		NO DATA

1. The information presented within is based on data obtained from the following reports:

Corrective Action Plan, JP-5 Line Area, MCAS New River, North Carolina, O'Brien & Gere Engineers, Inc., June 1991.

Remedial Action Operation Optimization Case Study, JP-5 Line Area, MCAS New River, North Carolina, Radian International, June 2000.

Final Annual Monitoring Report, JP-5 Line Area, Marine Corps Base Camp Lejeune, North Carolina, Shaw Environmental, Inc. January 2004.

2. Last date above 2L GWQS = The last date in which a contaminant of concern was above the 2L GWQS for each monitoring well.

3. NO DATA = No sampling records available for these wells.

4. 2003 and 2004 Data provided by Engineering & Environment, Inc.

6. Shading indicates well not located or damaged. Data from these wells is from previously submitted reports.

TABLE 3

**SUMMARY OF HISTORICAL FREE PHASE PRODUCT
THICKNESS MEASUREMENTS**

**REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
JP-5 LINE AREA**

MARINE CORPS AIR STATION, NEW RIVER, NC

WELL ID	MAXIMUM THICKNESS (feet)							
	CAP DATA	1998	1999	2000	2001	2002	2003	2004
TYPE II MONITORING WELLS								
OBG-1	NM	NM	NM	NM	NM	NM	NM	NM
OBG-2	NM	NMT	NMT	NMT	NMT	NMT	NM	NMT
OBG-4	0.00	NMT	NMT	NMT	NMT	NMT	NM	NMT
OBG-5	0.00	NMT	NMT	NMT	NMT	NMT	NM	NMT
OBG-6	0.00	NMT	NMT	NMT	NMT	NMT	NM	NMT
W-2	0.00	NMT	NMT	NMT	NMT	NMT	NM	NMT
W-7	0.00	NMT	NMT	NMT	NMT	NMT	NM	NMT
W-8	0.00	NMT	NMT	NMT	NMT	NMT	NM	NMT
W-10	0.80	0.89	NMT	NMT	NMT	NMT	NM	NMT
W-13	NM	NMT	NMT	NMT	NMT	NMT	NM	NMT
RECOVERY WELLS								
OBG-3	NM	NM	NM	NM	NM	NM	NM	NM
RW-1	NM	7.79	5.36	1.10	4.85	0.64	NM	0.61
RW-2	NM	4.31	0.03	NMT	0.84	NMT	NM	NMT
No. of AFVR events per year*		0	2	9	11	0	0	2

1. NM = Not Measured for product thickness.

2. NMT = No Measureable Thickness.

3. * Refer to Appendix E for actual gauging data.

4. A product recovery system was in operation at the site until July 19, 2000.

5. No AFVR events were conducted between December 12, 2001 and May 27, 2004.

6. CAP data obtained from the O'Brien & Gere Engineers, Inc. Corrective Action Plan, dated June 1991.

7. Historical data obtained from the Shaw Environmental, Inc. Annual Monitoring Report, dated January 2004.

8. 2004 data provided by Engineering & Environment, Inc.

9. Shading indicates wells not located or abandoned. Data from these wells is from previously submitted reports.

TABLE 4

**SUMMARY OF HISTORICAL GROUNDWATER CONTAMINANTS OF CONCERN
TYPE II MONITORING WELLS**

**REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
JP-5 LINE AREA**

MARINE CORPS AIR STATION, NEW RIVER, NC

COMPOUND	2L GWQS (µg/L)	GCL (µg/L)	MAXIMUM CONCENTRATIONS (µg/L)							
			CAP DATA	1998	1999	2000	2001	2002	2003	2004
TYPE II MONITORING WELLS										
Benzene	1	5,000	<100	BQL	0.284J	BQL	BQL	BQL	52.7	<1.0
Methyl Tert-Butyl Ether	200	200,000	<100	NA	NA	NA	NA	NA	<1.0	NA
Ethylbenzene	29	29,000	<100	BQL	0.0820J	BQL	BQL	BQL	8.6	<1.0
Total Xylenes	530	87,500	490.0	BQL	0.289J	BQL	BQL	BQL	24.7	<3.0
Toluene	1,000	257,500	<100	BQL	BQL	BQL	BQL	BQL	60.3	<1.0
Naphthalene	21	15,500	NA	39	0.585J	BQL	BQL	BQL	7.8J	<6.1
1-Methylnaphthalene	NE	NE	NA	16	BQL	BQL	BQL	BQL	<8.2	NA
2-Methylnaphthalene	28	12,500	NA	28	BQL	BQL	BQL	BQL	<8.2	NA
Bis(2-ethylhexyl)phthalate	3	3,000	NA	BQL	34	BQL	180	380	<5.7	33.1
Acenaphthene	80	2,120	NA	NA	1.75J	NA	NA	NA	<8.2	<6.1
Acenaphthylene	210	1,965	NA	NA	NA	NA	NA	NA	<8.2	<6.1
Benzo(a)anthracene	0.05	22	NA	NA	NA	NA	NA	NA	<8.2	<6.1
Pyrene	210	210	NA	NA	NA	NA	NA	NA	<8.2	<6.1
Fluorene	280	950	NA	NA	1.74J	NA	NA	NA	<8.2	<6.1
Anthracene	2,100	2,100	NA	NA	NA	NA	NA	NA	<8.2	<6.1
Fluoranthene	280	280	NA	NA	NA	NA	NA	NA	<8.2	<6.1
Phenanthrene	210	410	NA	NA	NA	NA	NA	NA	<8.2	<6.1
Dibenzofuran	28	28,000	NA	NA	2.55J	NA	NA	NA	NA	NA
Trichloroethene	2.8	2.8	<100	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.7	0.07	<100	NA	NA	NA	NA	NA	NA	NA

1. NE = Not established. Therefore, the 2L GWQS for the constituent is the reporting limit.

2. NA= Not Analyzed

3. J = Estimated concentration less than reporting limit.

4. BQL = Below Quantitation Limits.

5. Shading represents concentrations above 2L GWQS.

6. CAP data obtained from the O'Brien & Gere Engineers, Inc. Corrective Action Plan, dated June 1991.

7. 1998 through 2002 data obtained from the Shaw Environmental, Inc. Annual Monitoring Report, dated January 2004.

8. A portion of the 1999 data was obtained from the Radian International, Remedial Action Operation Optimization Case Study, dated June 2000.

9. 2003 & 2004 data provided by Engineering & Environment, Inc.

10. All other compounds analyzed were below laboratory method/quantitation detection limits or historically below 2L GWQS.

TABLE 5
REVISED TARGET CLEANUP CONCENTRATIONS
REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
JP-5 LINE AREA
MARINE CORPS AIR STATION, NEW RIVER, NC

MEDIUM	COMPONENT	CURRENT CONDITIONS	TARGET CLEANUP	
Free Product	Gasoline/Diesel	0.61"	<1/8"	
GROUNDWATER			<i>GCL</i>	<i>2L GWQS</i>
	1,2 Dichlorobenzene	NA	72,500	620
	Benzene	<1.0	5,000	1
	Methyl Tert-Butyl Ether	NA	200,000	200
	Ethylbenzene	<1.0	29,000	29
	Total Xylenes	<3.0	87,500	530
	Toluene	<1.0	257,500	1,000
	Naphthalene	<6.1	15,500	21
	1-Methylnaphthalene	NA	NE	NE
	2-Methylnaphthalene	NA	12,500	28
	Acenaphthene	<6.1	2,120	80
	Acenaphthylene	<6.1	1,965	210
	Benzo(a)anthracene	<6.1	22	0.05
	Benzo(k)fluoranthene	NA	0.6	0.047
	Pyrene	<6.1	210	210
	Fluorene	<6.1	950	280
	Anthracene	<6.1	2,100	2,100
	Fluoranthene	<6.1	280	280
	Phenanthrene	<6.1	410	210
	Trichloroethene	NA	2.8	2.8
	Tetrachloroethene	NA	0.7	0.07
	Lead	NA	15,000	15

1. NE = Not established. Therefore, the NCGWQS for the constituent is the reporting limit.

2. NA = Not Analyzed

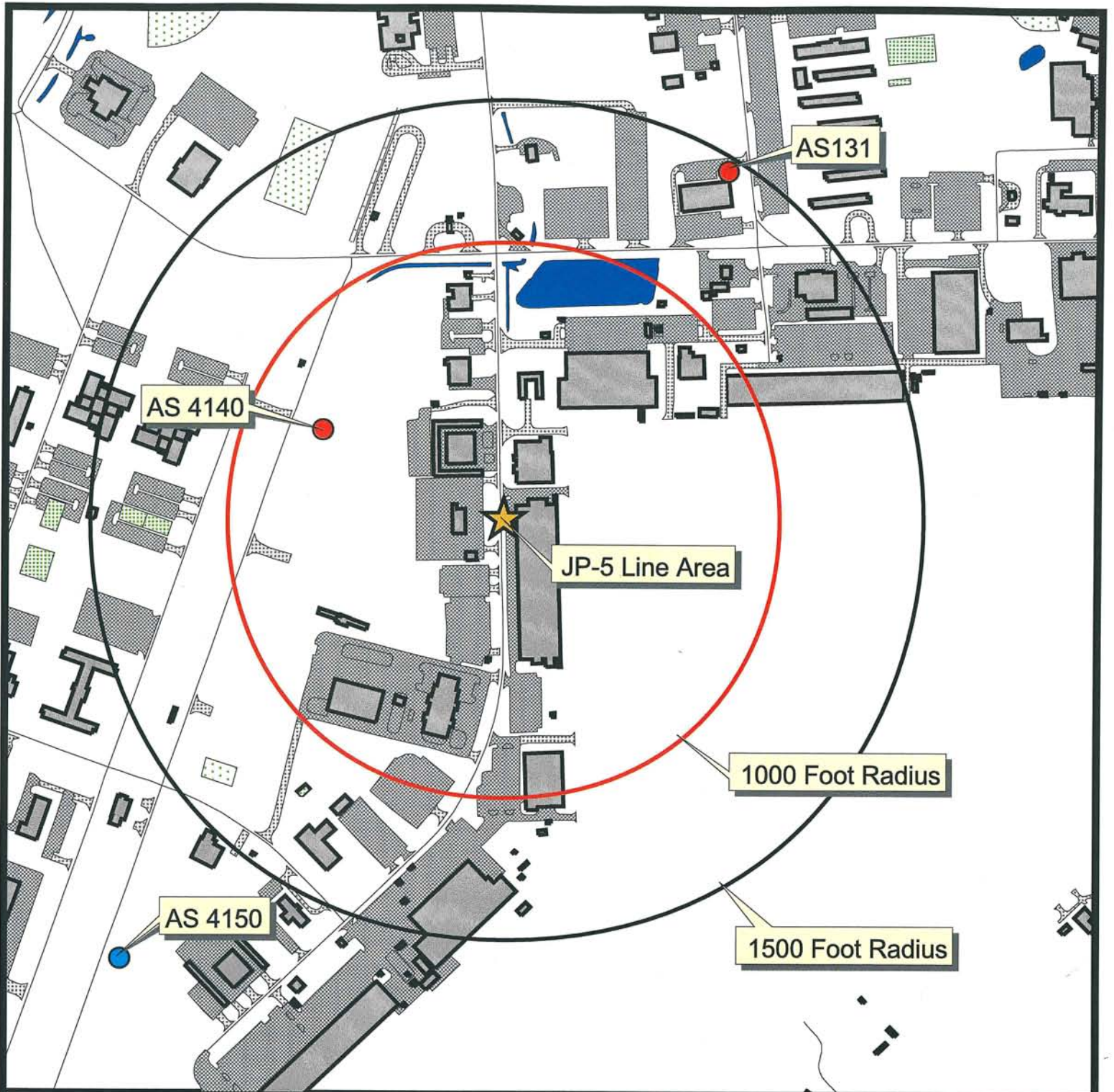
3. CAP Data obtained from the O'Brien & Gere Engineers, Inc. Corrective Action Plan, dated June 1991.

4. Historical data obtained from the Shaw Environmental, Inc. Annual Monitoring Report, dated January 2004 and the Radian International Remedial Action Operation Optimization Case Study, dated June 2000.

5. 2003 & 2004 Data provided by Engineering & Environment, Inc.

6. Groundwater current conditions and target cleanup concentrations are in ug/L.

FIGURES



LEGEND

Water Supply Wells

- ACTIVE
- CLOSED
- INACTIVE
- PENDING
- Roads
- Railroads
- Recreational Horse Trail
- Buildings and Structures
- Parking Lots
- Playgrounds
- Driveways
- Athletic Fields
- Athletic Courts
- Surface Water
- Creeks
- Surface Water



CATLIN
ENGINEERS and SCIENTISTS

DRAWN BY: CHECK BY: APPROVED BY:

THW

JKB

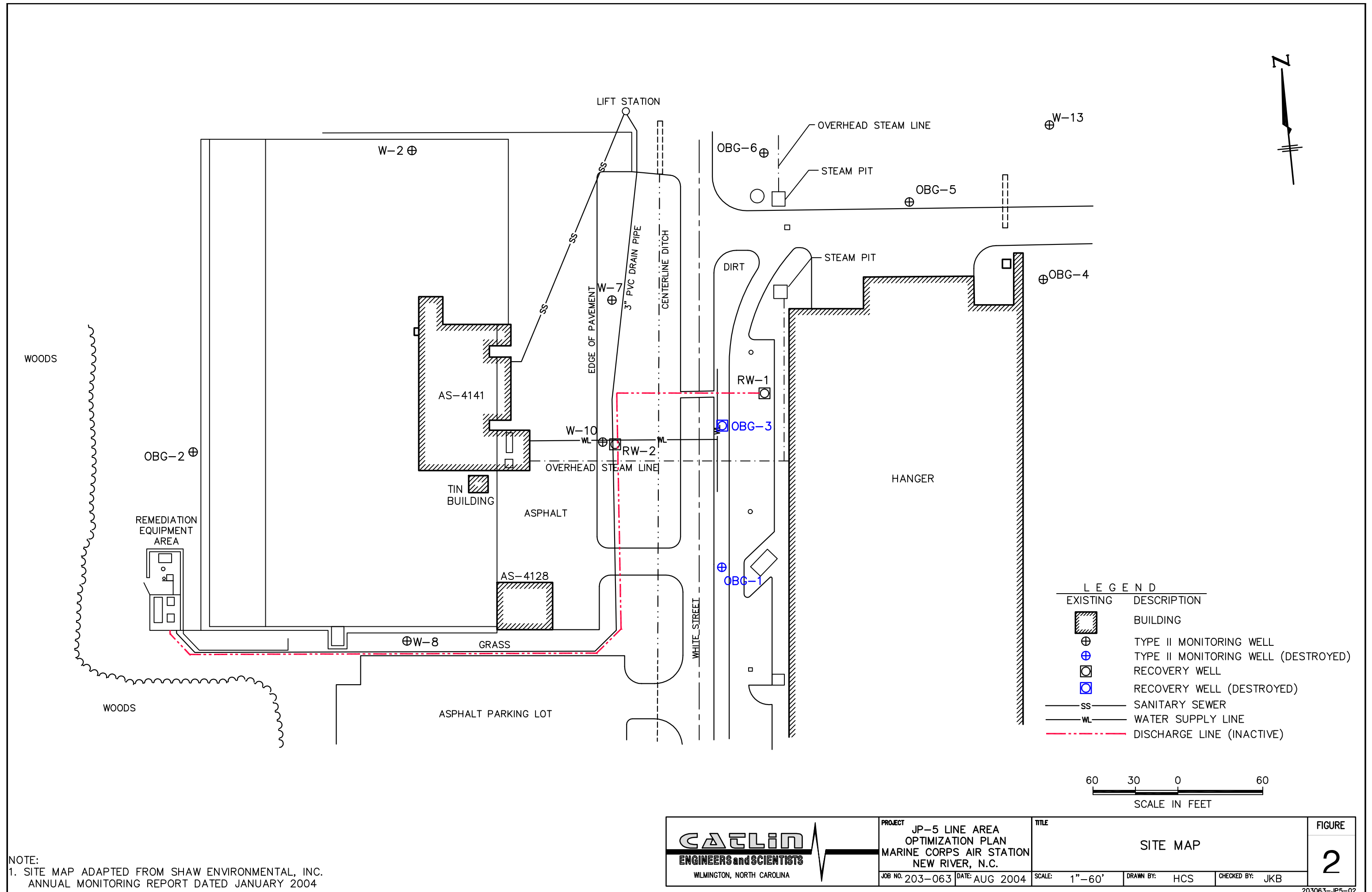
CATLIN PROJECT No.: 203-063

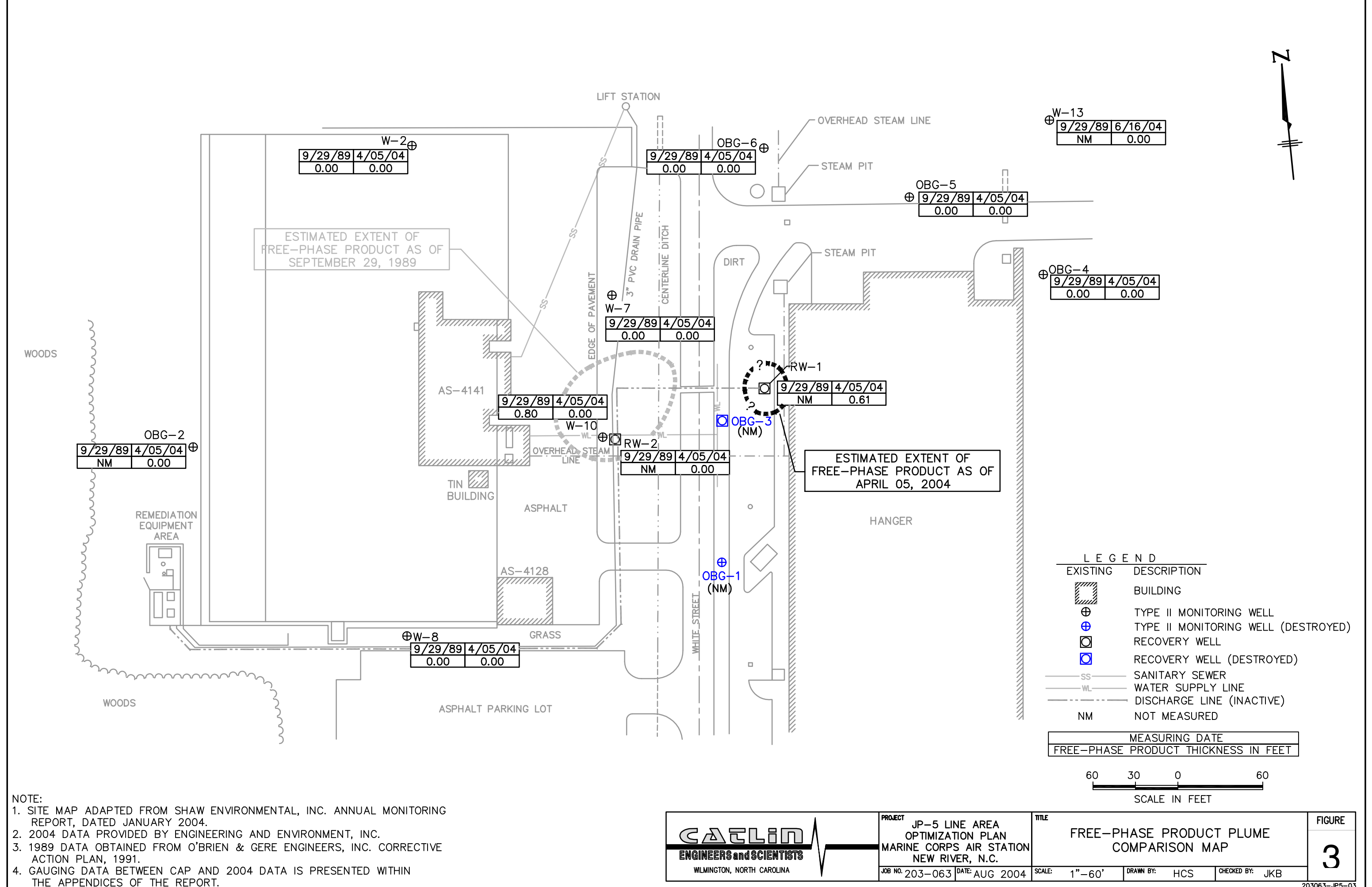
SITE LOCATION MAP

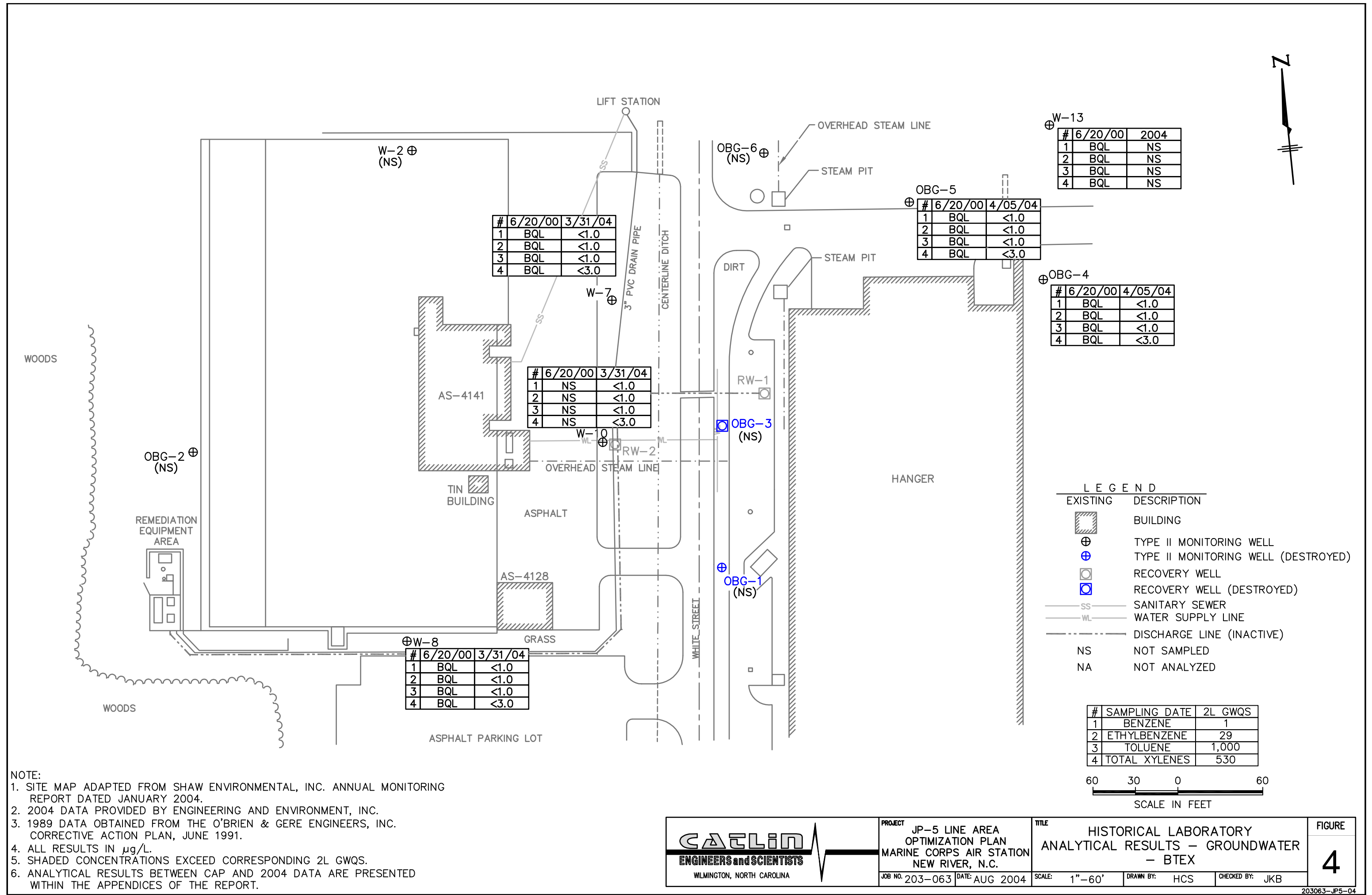
**JP-5 LINE AREA
1500 Ft. RADIUS WITH RECEPTORS**

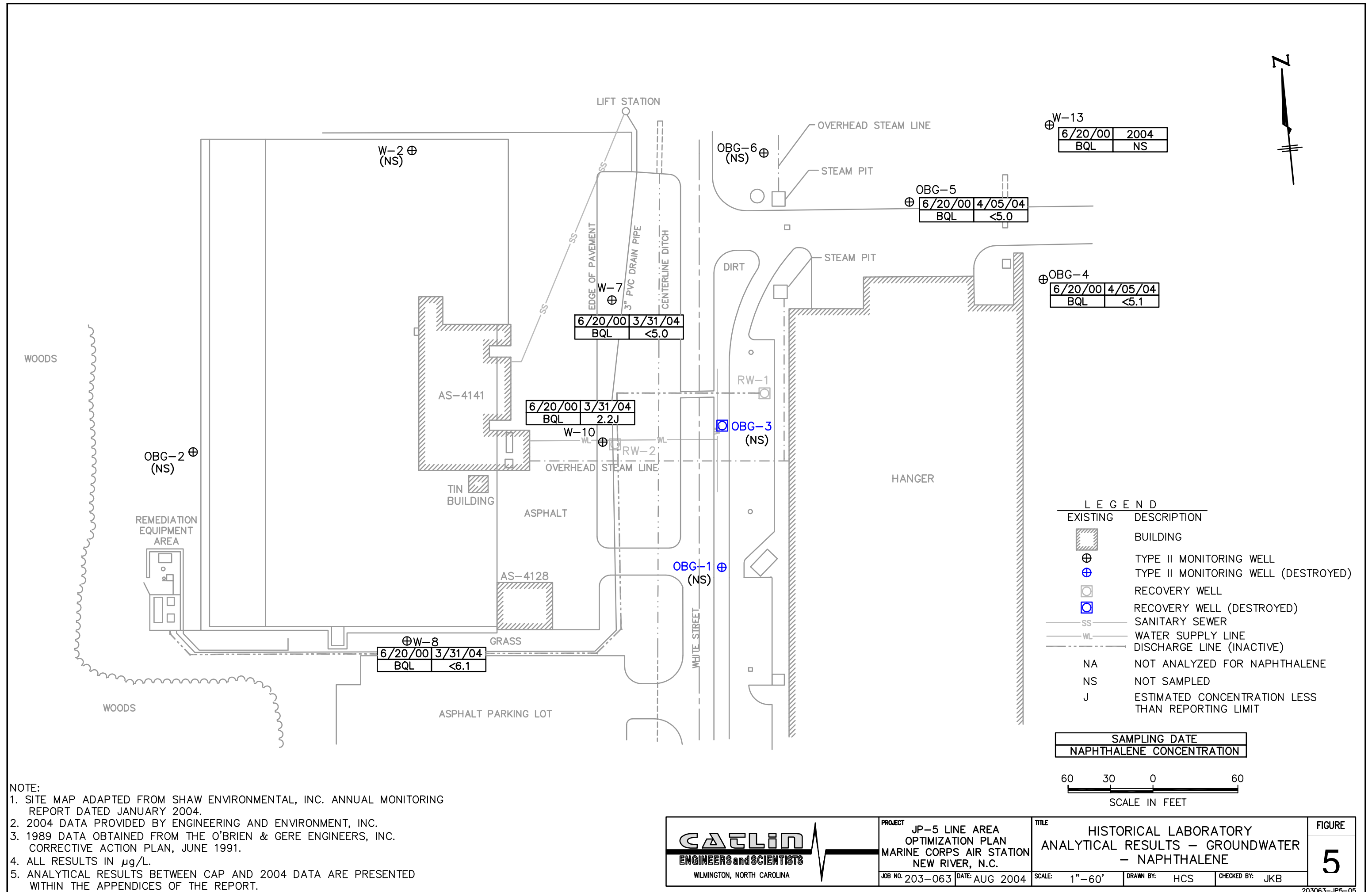
FIGURE

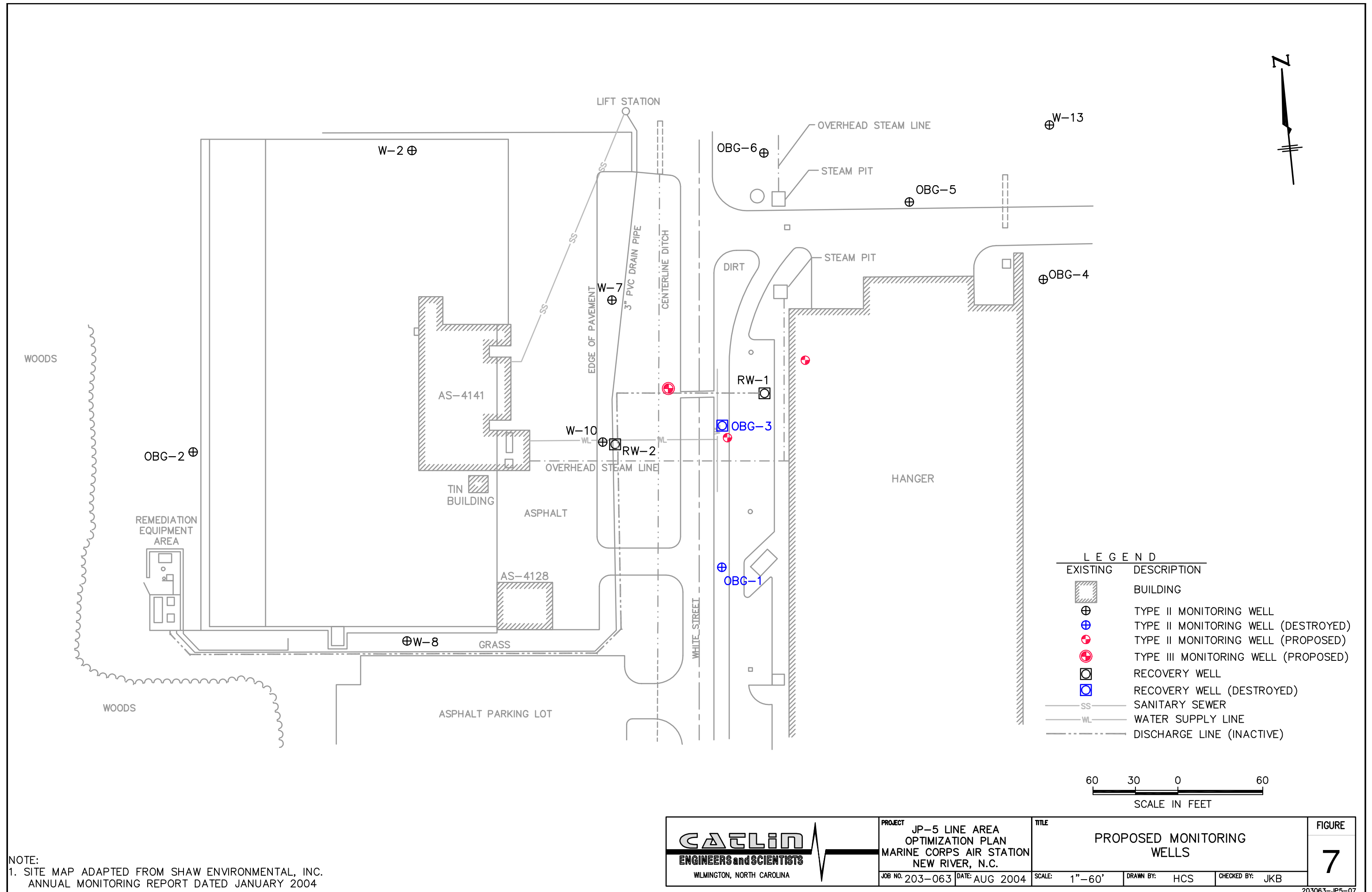
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APPENDIX A

SUMMARY OF HISTORICAL SOIL LABORATORY RESULTS

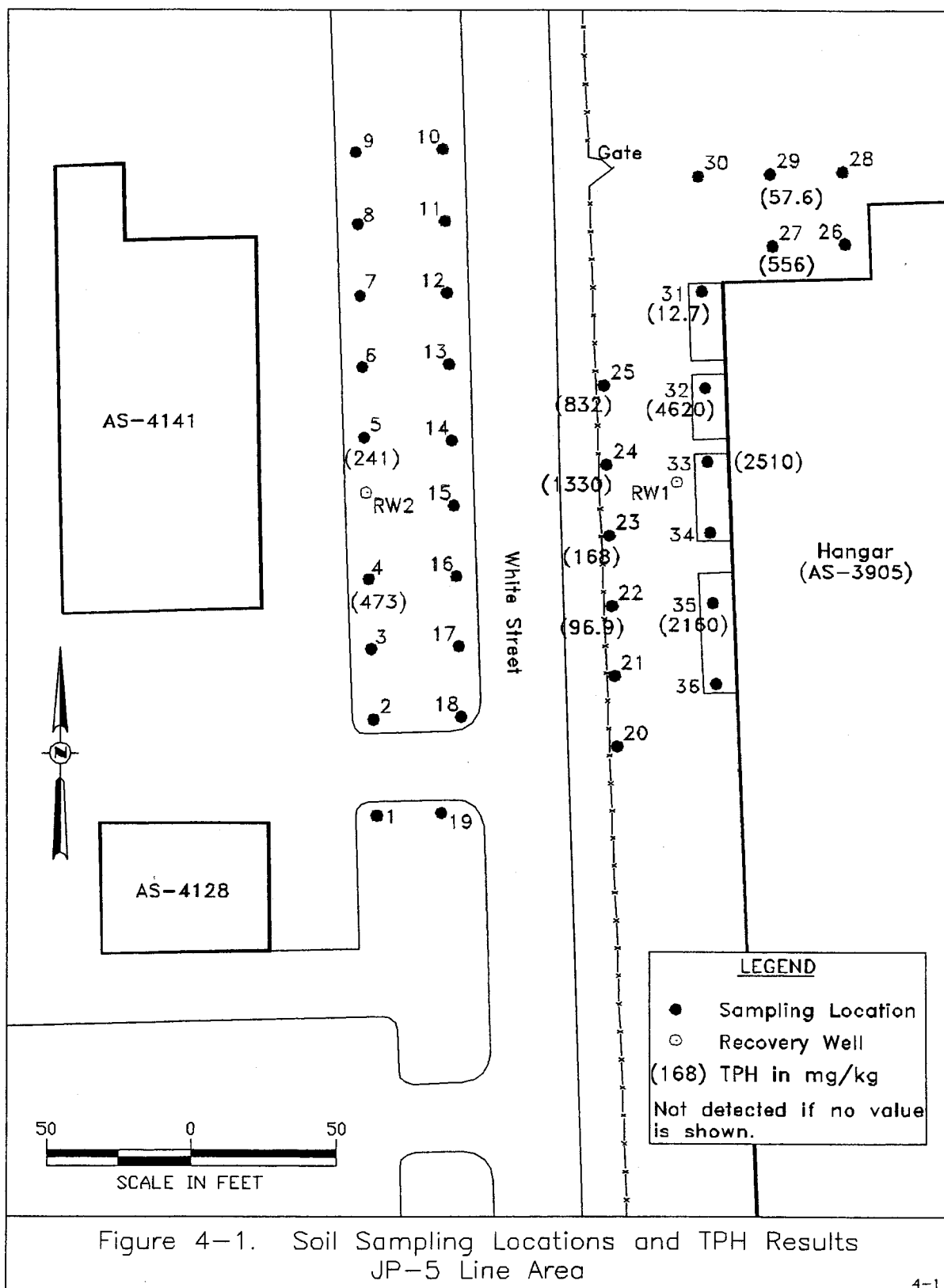
REMEDIAL ACTION OPERATION OPTIMIZATION CASE STUDY

**Table 4-1. Summary of Validated TPH Results in Soil
JP-5 Line Area**

Sample Number	Depth (ft. bgs)	TPH (µg/g)
1	6.5-7.0	ND (18.2)
2	6.5-7.0	ND (12.3)
3	5.5-6.0	ND (13.2)
4	5.5-6.0	473
5	5.5-6.0	241
6	6.5-7.0	ND (25.8)
7	5.5-6.0	ND (6.32)
8	5.5-6.0	ND (5.40)
9	6.5-7.0	ND (5.58)
10	4.5-5.0	ND (7.01)
11	4.5-5.0	ND (7.26)
12	4.5-5.0	ND (16.0)
13	3.5-4.0	ND (7.03)
14	4.5-5.0	ND (33.4)
15	4.5-5.0	ND (5.99)
16	3.5-4.0	ND (6.49)
17	3.5-4.0	ND (6.85)
18	5.5-6.0	ND (5.71)
19	3.5-4.0	ND (5.65)
20	3.5-4.0	ND (36.9)
21	4.5-5.0	ND (18.9)
22	3.5-4.0	96.9
23	3.5-4.0	168
24	3.5-4.0	1330
25	3.5-4.0	832
26	3.5-4.0	ND (26.7)
27	3.5-4.0	556
28	3.5-4.0	ND (15.7)
29	4.5-5.0	57.6
30	3.5-4.0	ND (11.1)
31	5.5-6.0	12.7
32	5.5-6.0	4620
33	6.5-7.0	2510
34	4.5-5.0	ND (18.8)
35	5.5-6.0	2160
36	5.5-6.0	ND (15.3)

Note: ND = Not detected at (detection limit).

The operating records, however, show that while the system may not recover any free product during a given month, at other times recovery rates average between 0.6 and 0.8 gallons per day. This pattern of product recovery suggests that any recoverable fuel remaining in the JP-5 Line Area occurs in "pockets" that are transported intermittently into the recovery well's capture zone and extracted.



APPENDIX B

SUMMARY OF HISTORICAL GROUNDWATER LABORATORY RESULTS

CORRECTIVE ACTION PLAN



Laboratory Report

CLIENT O'BRIEN & GERE ENGINEERS, INC. JOB NO. 3435.001.130
DESCRIPTION Camp Le Jeune JP - 5
Waters
DATE COLLECTED 9-29/30-89 DATE REC'D. 10-2-89 DATE ANALYZED 10-5/6-89

Description	OBG-3	OBG-4	OBG-6	OBG-1	W-10
Sample #	J1354	J1355	J1356	J1357	J1358
Volatile Petroleum Hydrocarbons and Solvents by Purge & Trap/GC:					
BENZENE	13.	<1.	<1.	<1.	<100.
TOLUENE	<10.		2.		
ETHYLBENZENE	49.		<1.		↓
XYLENES	220.	↓	2.	↓	490.
TRICHLOROETHENE	<10.	<1.	<1.	<1.	<100.
TETRACHLOROETHENE	<10.	<1.	<1.	<1.	<100.
MTBE	<100.	<10.	<10.	<10.	<100.
TOTAL HYDROCARBONS	4500.	<10.	<10.	29.	890,000.
COMMENTS	gasoline	-	-	-	Fuel
UNITS: µg/l					

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/l (ppm) unless otherwise noted

Comments:

Authorized: *Thomas A. Alexander*

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

Date: October 18, 1989

REMEDIAL ACTION OPERATION OPTIMIZATION CASE STUDY

Table 4-4. Summary of Validated Analytical Results
Volatile Organic Compounds
December 1999
JP-5 Line Area

Analyte	Groundwater Standard	W-7	W-8	W-10	OBG-4	OBG-5	OBG-6
Benzene	1	ND (0.0469)	ND (0.0469)	0.284 J	ND (0.0469)	ND (0.0469)	ND (0.0469)
Ethylbenzene	29	ND (0.0563)	ND (0.0563)	0.0820 J	ND (0.0563)	ND (0.0563)	ND (0.0563)
o-Xylene	530	ND (0.0732)	ND (0.0732)	0.183 J	ND (0.0732)	ND (0.0732)	ND (0.0732)
M,p-Xylenes	530	ND (0.112)	ND (0.112)	0.106 J	ND (0.112)	ND (0.112)	ND (0.112)

Note: Target analytes not listed were not detected.

All results reported in micrograms per liter.

ND = Not detected at (detection limit).

J = Estimated value.

**Table 4-5. Summary of Validated Analytical Results
Semivolatile Organic Compounds
December 1999
JP-5 Line Area**

Analyte	Groundwater Standard	W-7	W-8	W-10	OBG-4	OBG-5	OBG-6
Acenaphthene	80	ND (0.133)	ND (0.151)	1.75 J	ND (0.130)	ND (0.129)	ND (0.128)
bis(2-ethylhexyl) phthalate	3	ND (0.772)	ND (3.01)	34.0	ND (0.757)	ND (0.750)	ND (0.743)
Dibenzofuran	28	ND (0.150)	ND (0.170)	2.55 J	ND (0.148)	ND (0.146)	ND (0.145)
Fluorene	280	ND (0.132)	ND (0.149)	1.74 J	ND (0.130)	ND (0.128)	ND (0.127)
Napthalene	21	ND (0.126)	ND (0.143)	ND (0.126)	0.585 J	ND (0.123)	ND (0.121)

Note: Target analytes not listed were not detected.

All results reported in micrograms per liter.

ND = Not detected at (detection limit).

J = Estimated value.

FINAL ANNUAL MONITORING REPORT – JANUARY 2004

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR Regulatory Limit	Sample Location Sample ID Sample Date	ORG-4					
			USTAS4141-ORG04-02D	USTAS4141-ORG04-02C	USTAS4141-ORG04-02B	USTAS4141-ORG04-02A	USTAS4141-ORG04-01D	USTAS4141-ORG04-01C
Volatile Aromatic Hydrocarbons by USEPA method 603, ug/L								
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L								
Bis(2-ethylhexyl)phthalate	Detection Limit		14	BQL	23	18	BQL	23
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR Regulatory Limit	Sample Location Sample ID	OBG-4					
			USTAS4141-OBG04-01B	USTAS4141-OBG04-01A	USTAS4141-OBG04-00D	USTAS4141-OBG04-00C	USTAS4141-OBG04-00B	USTAS4141-OBG04-00A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L		Sample Date	6/19/2001 *#	3/19/2001 *#	12/20/2000 *#	9/18/2000 *#	6/20/2000 *#	3/23/2000 *#
	1	Benzene	BQL	BQL	BQL	BQL	BQL	BQL
	29	Ethylbenzene	BQL	BQL	BQL	BQL	BQL	BQL
	1000	Toluene	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L	530	Total Xylenes	BQL	BQL	BQL	BQL	BQL	BQL
	Detection Limit	Bis(2-ethylhexyl)phthalate	45	BQL	BQL	BQL	BQL	BQL
	21	Naphthalene	BQL	BQL	BQL	BQL	BQL	BQL
	Detection Limit	1-Methylnaphthalene	BQL	BQL	BQL	BQL	BQL	BQL
	28	2-Methylnaphthalene	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter		NCDENR	Sample Location		ORG-4								
			Sample ID	Sample Date	USTAS4141-OBG04-99D	USTAS4141-OBG04-99C	USTAS4141-OBG04-99B	USTAS4141-OBG04-99A	USTAS4141-OBG04-98D	USTAS4141-OBG04-98C			
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L		Regulatory Limit											
	Benzene	1			BQL	BQL	9/23/1999 **	6/16/1999 #	3/22/1999 *	12/21/1998			9/23/1998
	Ethylbenzene	29			BQL	BQL	BQL	BQL	BQL	BQL			BQL
	Toluene	1000			BQL	BQL	BQL	BQL	BQL	BQL			BQL
	Total Xylenes	530			BQL	BQL	BQL	BQL	BQL	BQL			BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L													
	Bis(2-ethylhexyl)phthalate	Detection Limit			BQL	BQL	BQL	BQL	BQL	BQL			BQL
	Naphthalene	21			BQL	BQL	BQL	BQL	BQL	BQL			39
	1-Methylnaphthalene	Detection Limit			BQL	BQL	BQL	BQL	BQL	BQL			16
	2-Methylnaphthalene	28			BQL	BQL	BQL	BQL	BQL	BQL			28

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR Regulatory Limit	Sample Location Sample ID Sample Date	ORG-4				ORG-5			
			USTAS4141-OBG04-98B	USTAS4141-OBG04-98A	USTAS4141-OBG05-02D	USTAS4141-OBG05-02C	USTAS4141-OBG05-02B	USTAS4141-OBG05-02A		
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	Benzene		BQL	3/9/1998	12/2/2002 *#	9/18/2002 #	6/19/2002 *#	3/19/2002 *#		
	Ethylbenzene		BQL	BQL	BQL	BQL	BQL	BQL		
	Toluene		BQL	BQL	BQL	BQL	BQL	BQL		
	Total Xylenes		BQL	BQL	BQL	BQL	BQL	BQL		
Semivolatile Organic Compounds by USEPA method 625/827/0, ug/L	Bis(2-ethylhexyl)phthalate									
	Naphthalene	Detection Limit 21	BQL	BQL	50	31	42	22		
	1-Methylnaphthalene	Detection Limit	BQL	BQL	BQL	BQL	BQL	BQL		
	2-Methylnaphthalene	28	BQL	BQL	BQL	BQL	BQL	BQL		

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR	Sample Location		ORG-5					
		Sample ID	Sample Date	USTAS4141-ORG05-01D	USTAS4141-ORG05-01C	USTAS4141-ORG05-01B	USTAS4141-ORG05-01A	USTAS4141-ORG05-00D	USTAS4141-ORG05-00C
<i>Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L</i>	Regulatory Limit								
1	1								
Benzene				BQL					
Ethylbenzene	29			BQL					
Toluene	1000			BQL					
Total Xylenes	530			BQL					
<i>Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L</i>									
Bis(2-ethylhexyl)phthalate	Detection Limit								
Naphthalene	21			25	41	13			
1-Methylnaphthalene	Detection Limit			BQL	BQL	BQL			
2-Methylnaphthalene	28			BQL	BQL	BQL			

Notes:
Detected concentrations are indicated in boldface type.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR	Sample Location		ORG-5					
		Regulatory Limit	Sample Date	USTAS4141-OBG05-00B	USTAS4141-OBG05-00A	USTAS4141-OBG05-99D	USTAS4141-OBG05-99C	USTAS4141-OBG05-99B	USTAS4141-OBG05-99A
<i>Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L</i>									
	Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL
	Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL
	Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL
<i>Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L</i>	Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL
	Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
	Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL
	1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
	2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
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verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter		NCDENR	Sample Location Sample ID		ORG-5			MW-7	
		Regulatory Limit	Sample Date	USTAS4141-ORG05-98D	USTAS4141-ORG05-98C	USTAS4141-ORG05-98B	USTAS4141-ORG05-98A	USTAS4141-MW07-02D	
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L									
Benzene	1		12/21/1998	BQL	BQL	6/25/1998	3/9/1998	12/2/2002 *#	
Ethylbenzene	29			BQL	BQL	BQL	BQL	BQL	
Toluene	1000			BQL	BQL	BQL	BQL	BQL	
Total Xylenes	530			BQL	BQL	BQL	BQL	BQL	
Semi-volatile Organic Compounds by USEPA method 615/627/0C, ug/L									
Bis(2-ethylhexyl)phthalate	Detection Limit			BQL	BQL	BQL	BQL	23	
Naphthalene	21			BQL	32	BQL	BQL	BQL	
1-Methylnaphthalene	Detection Limit			BQL	11	BQL	BQL	BQL	
2-Methylnaphthalene	28			BQL	24	BQL	BQL	BQL	

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR	Sample Location		MW-7						
		Sample ID	Sample Date	USTAS4141-MW07-02B	USTAS4141-MW07-02A	USTAS4141-MW07-01D	USTAS4141-MW07-01C	USTAS4141-MW07-01B	USTAS4141-MW07-01A	
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	Regulatory Limit									
	1			6/19/2002 *#	3/19/2002 *#	12/18/2001 *#	9/24/2001 #	6/19/2001 *#	3/19/2001 *#	
	29			BQL	BQL	BQL	BQL	BQL	BQL	
	1000			BQL	BQL	BQL	BQL	BQL	BQL	
Semivolatile Organic Compounds by USEPA method 625/827/6, ug/L	530			BQL	BQL	BQL	BQL	BQL	BQL	
	Detection Limit			250	110	180	100	140	BQL	
	21			BQL	BQL	BQL	BQL	BQL	BQL	
1-Methylnaphthalene	Detection Limit			BQL	BQL	BQL	BQL	BQL	BQL	
2-Methylnaphthalene	28			BQL	BQL	BQL	BQL	BQL	BQL	

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR	Sample Location		MW-7						
		Sample ID	Sample Date	USTAS4141-MW07-00D	USTAS4141-MW07-00C	USTAS4141-MW07-00B	USTAS4141-MW07-00A	USTAS4141-MW07-99D	USTAS4141-MW07-99C	
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L										
Benzene	Regulatory Limit: 1		BQL	9/18/2000 *#		6/20/2000 *#	3/23/2000 *#	1/28/1999 *#		9/23/1999 *#
Ethylbenzene	29		BQL		BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL		BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL		BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L										
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL		BQL	BQL	BQL	24		10
Naphthalene	21		BQL		BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL		BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL		BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter		NCDENR	Sample Location		MW-7				
			Sample ID	USTAS4141-MW07-99B	USTAS4141-MW07-99A	USTAS4141-MW07-98D	USTAS4141-MW07-98C	USTAS4141-MW07-98B	USTAS4141-MW07-98A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L		Regulatory Limit	Sample Date	6/16/1999 #	3/22/1999 *	12/21/1998	9/23/1998	6/25/1998	3/9/1998
Benzene		1		BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene		29		BQL	BQL	BQL	BQL	BQL	BQL
Toluene		1000		BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes		510		BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Bis(2-ethylhexyl)phthalate		Detection Limit		15	21				
Naphthalene		21		BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene		Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene		28		BQL	BQL	BQL	BQL	BQL	BQL

Notes:

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with Laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JF-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR Regulatory Limit	Sample Location		MW-8					
		Sample ID	Sample Date	USTAS4141-MW08-02D	USTAS4141-MW08-01C	USTAS4141-MW08-01B	USTAS4141-MW08-01A	USTAS4141-MW08-01D	USTAS4141-MW08-01C
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L									
Benzene	1			BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29			BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000			BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530			BQL	BQL	BQL	BQL	BQL	BQL
Semi-volatile Organic Compounds by USEPA method 625/8270C, ug/L									
Bis(2-ethylhexyl)phthalate	Detection Limit			23	34	30	70	48	38
Naphthalene	21			BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit			BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28			BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCIDENR	Sample Location Sample ID	MW-#				
			USTAS4141-MW08-01B	USTAS4141-MW08-01A	USTAS4141-MW08-00D	USTAS4141-MW08-00C	USTAS4141-MW08-00B
Volatile Aromatic Hydrocarbons by USEPA <i>method 602, ug/L</i>	Regulatory Limit	Sample Date	6/19/2001 *#	3/19/2001 *#	12/20/2000 *#	9/18/2000 *#	6/20/2000 *#
	1		BQL	BQL	BQL	BQL	BQL
	29		BQL	BQL	BQL	BQL	BQL
	1000		BQL	BQL	BQL	BQL	BQL
Semi-volatile Organic Compounds by USEPA <i>method 625/8270C, ug/L</i>	530		BQL	BQL	BQL	BQL	BQL
	Detection Limit		29	11	BQL	BQL	BQL
	21		BQL	BQL	BQL	BQL	BQL
1-Methylpiperthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL
	28		BQL	BQL	BQL	BQL	BQL
2-Methylpiperthalene							

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter		NCDENR	Sample Location		MW-8						
			Regulatory Limit	Sample Date	Sample ID	USTAS4141-MW08-99D	USTAS4141-MW08-99C	USTAS4141-MW08-99B	USTAS4141-MW08-99A	USTAS4141-MW08-98D	USTAS4141-MW08-98C
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L		Regulatory Limit									
		Benzene	1								
		Ethylbenzene	29								
		Toluene	1000								
Total Xylenes		530									
		Semi-volatile Organic Compounds by USEPA method 625/8270C, ug/L									
Bis(2-ethylhexyl)phthalate		Detection Limit									
		Naphthalene	21								
1-Methylnaphthalene		Detection Limit									
		2-Methylnaphthalene	28								

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter		NCDENR	Sample Location		MW-8		MW-13			
			Sample ID	Sample Date	USTAS4141-MW08-98B	USTAS4141-MW08-98A	USTAS4141-MW13-02D	USTAS4141-MW13-01C	USTAS4141-MW13-01B	
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L		Regulatory Limit			6/25/1998	3/9/1998	12/2/2002 *	9/18/2002 #	6/19/2002 *	3/19/2002 *
	Benzene	1			BQL	BQL	BQL	BQL	BQL	BQL
	Ethylbenzene	29			BQL	BQL	BQL	BQL	BQL	BQL
	Toluene	1000			BQL	BQL	BQL	BQL	BQL	BQL
	Total Xylenes	530			BQL	BQL	BQL	BQL	BQL	BQL
Semi-volatile Organic Compounds by USEPA method 625/827/0C, ug/L										
	Bis(2-ethylhexyl)phthalate	Detection Limit			BQL	BQL	380	BQL	74	47
	Naphthalene	21			BQL	BQL	BQL	BQL	BQL	BQL
	1-Methylnaphthalene	Detection Limit			BQL	BQL	BQL	BQL	BQL	BQL
	2-Methylnaphthalene	28			BQL	BQL	BQL	BQL	BQL	BQL

Notes:

Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR	Sample Location		MW-13					
		Regulatory Limit	Sample Date	USTAS4141-MW13-01D	USTAS4141-MW13-01C	USTAS4141-MW13-01B	USTAS4141-MW13-01A	USTAS4141-MW13-00D	USTAS4141-MW13-00C
Volatiles Aromatic Hydrocarbons by USEPA <i>method 602, ug/L</i>									
		1		BQL	BQL	BQL	BQL	BQL	BQL
		29		BQL	BQL	BQL	BQL	BQL	BQL
		1000		BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA <i>method 625/8270C, ug/L</i>		530		BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate Naphthalene 1-Methylnaphthalene 2-Methylnaphthalene		Detection Limit		22	22	37	65	BQL	BQL
		21		BQL	BQL	BQL	BQL	BQL	BQL
		Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
		28		BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR Regulatory Limit	Sample Location Sample ID Sample Date	MW-13				
			USTAS4141-MW13-00B	USTAS4141-MW13-00A	USTAS4141-MW13-99D	USTAS4141-MW13-99C	USTAS4141-MW13-99B
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L							
Benzene	1		BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L							
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	24
Naphthalene	21		BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

Table 4-2
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
JP-5 Line Area
Marine Corps Air Station
Camp Lejeune, North Carolina

Parameter	NCDENR Regulatory Limit	Sample Location		MW-13			
		Sample ID	Sample Date	USTAS4141-MW13-98D	USTAS4141-MW13-98C	USTAS4141-MW13-98B	USTAS4141-MW13-98A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L							
Benzene	1			BQL	BQL	BQL	BQL
Ethylbenzene	29			BQL	BQL	BQL	BQL
Toluene	1000			BQL	BQL	BQL	BQL
Total Xylenes	530			BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L							
Bis(2-ethylhexyl)phthalate	Detection Limit			BQL	BQL	BQL	BQL
Naphthalene	21			BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit			BQL	BQL	BQL	BQL
2-Methylnaphthalene	28			BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
verified with electronic data deliverables

DATA PROVIDED BY ENGINEERING & ENVIRONMENT, INC.

MARCH 2003 – MARCH 2004

Table 1
Summary of Laboratory Analyses for Groundwater
JP5 Line
March 2004

Sample Location	NCGWQS	MW-OBG04	MW-OBG05	MW-W7	MW-W8	MW-W10
Date Sampled		04/05/04	04/05/04	03/31/04	03/31/04	03/31/04
EPA 602 (µg/L)						
Benzene	1	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	29	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	1000	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	530	<3.0	<3.0	<3.0	<3.0	<3.0
Methyl Tert Butyl Ether	200	NA	NA	NA	NA	NA
Total BTEX		ND	ND	ND	ND	ND
EPA 625 (µg/L)						
Acenaphthene	80	<5.1	<5.0	<5.0	<6.1	<5.0
Acenaphthylene	210	<5.1	<5.0	<5.0	<6.1	<5.0
Anthracene	2100	<5.1	<5.0	<5.0	<6.1	<5.0
Benzo(a)anthracene	0.05	<5.1	<5.0	<5.0	<6.1	<5.0
Bis(2-ethylhexyl)phthalate	3	<5.1	<5.0	<5.0	<6.1	33.1
Fluoranthene	280	<5.1	<5.0	<5.0	<6.1	<5.0
Fluorene	280	<5.1	<5.0	<5.0	<6.1	<5.0
1-Methynaphthalene	RL	NA	NA	NA	NA	NA
2-Methynaphthalene	14	NA	NA	NA	NA	NA
Naphthalene	21	<5.1	<5.0	<5.0	<6.1	2.2 J
Phenanthrene	210	<5.1	<5.0	<5.0	<6.1	<5.0
Pyrene	210	<5.1	<5.0	<5.0	<6.1	<5.0
TICs		None	None	None	85	424

NCGWQS: North Carolina Groundwater Quality Standard

NA: Not analyzed; analyte quantitation not requested for the sampling event

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

RL: Reporting Limit, no NCGWQS established for the constituent; therefore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

TICs: Tentatively Identified Compounds; laboratory report presents individual presumptive compounds and associated estimated concentrations

Bold type indicates detectable concentrations.

Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

Table 1
Summary of Laboratory Analyses for Groundwater
JP5 Line
June 2003

Sample Location	NCGWQS	MW-OBG04 06/20/03	MW-OBG05 06/20/03	MW-W7 06/20/03	MW-W8 06/20/03	MW-W10 NS	MW-W13 06/20/03
Date Sampled							
EPA 602 (µg/L)							
Benzene	1	<1.0	<1.0	<1.0	<1.0	NS	<1.0
Ethylbenzene	29	<1.0	<1.0	<1.0	<1.0	NS	<1.0
Toluene	1000	<1.0	<1.0	<1.0	<1.0	NS	<1.0
Xylenes (total)	530	<3.0	<3.0	<3.0	<3.0	NS	<3.0
Methyl Tert Butyl Ether	200	<1.0	<1.0	<1.0	<1.0	NS	<1.0
Total BTEX		ND	ND	ND	ND	NS	ND
EPA 625 (µg/L)							
Acenaphthene	80	<5.1	<5.1	<5.2	<8.2	NS	<5.1
Acenaphthylene	210	<5.1	<5.1	<5.2	<8.2	NS	<5.1
Anthracene	2100	<5.1	<5.1	<5.2	<8.2	NS	<5.1
Benzo(a)anthracene	0.05	<5.1	<5.1	<5.2	<8.2	NS	<5.1
Bis(2-ethylhexyl)phthalate	3	NA	NA	NA	NA	NA	NA
Fluoranthene	280	<5.1	<5.1	<5.2	<8.2	NS	<5.1
Fluorene	280	<5.1	<5.1	<5.2	<8.2	NS	<5.1
1-Methynaphthalene	RL	<5.1	<5.1	<5.2	<8.2	NS	<5.1
2-Methynaphthalene	14	<5.1	<5.1	<5.2	<8.2	NS	<5.1
Naphthalene	21	3.4 J	5.4	4.4 J	7.8 J	NS	1.3 J
Phenanthrene	210	<5.1	<5.1	<5.2	<8.2	NS	<5.1
Pyrene	210	<5.1	<5.1	<5.2	<8.2	NS	<5.1

NCGWQS: North Carolina Groundwater Quality Standard

NA: Not analyzed; analyte quantitation not requested for the sampling event

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

NS: Not sampled; location not sampled during the sampling event

RL: Reporting Limit, no NCGWQS established for the constituent; therefore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

Bold type indicates detectable concentrations.

Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

Table 1
Summary of Laboratory Analyses for Groundwater
JP5 Line
March 2003

Sample Location	NCGWQS	MW-OBG04 03/30/03	MW-OBG05 03/30/03	MW-W7 03/30/03	MW-W7D 03/30/03	MW-W8 03/30/03	MW-W10 NS	MW-W13 03/30/03
EPA 602 (µg/L)								
Benzene	1	<1.0	1.1	29.6	29.9	52.7	NS	<1.0
Ethylbenzene	29	<1.0	0.92 J	7.6	7.7	8.6	NS	0.64 J
Toluene	1000	<1.0	0.65 J	44.5	45	60.3	NS	<1.0
Xylenes (total)	530	<3.0	1.2 J	22.2	22.6	24.7	NS	<3.0
Methyl Tert Butyl Ether	200	<1.0	<1.0	<1.0	<1.0	<1.0	NS	<1.0
Total BTEX		ND	3.87	104.1	105.2	146.3	NS	0.64
EPA 625 (µg/L)								
Acenaphthene	80	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Acenaphthylene	210	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Anthracene	2100	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Benzo(a)anthracene	0.05	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Bis(2-ethylhexyl)phthalate	3	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Fluoranthene	280	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Fluorene	280	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
1-Methynaphthalene	RL	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
2-Methynaphthalene	14	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Naphthalene	21	<5.1	<5.1	<5.1	1.3 J	2.3 J	NS	<5.2
Phenanthrene	210	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2
Pyrene	210	<5.1	<5.1	<5.1	<5.1	<5.7	NS	<5.2

NCGWQS: North Carolina Groundwater Quality Standard

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

NS: Not sampled; location not sampled during the sampling event

RL: Reporting Limit, no NCGWQS established for the constituent; therefore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

Bold type indicates detectable concentrations.

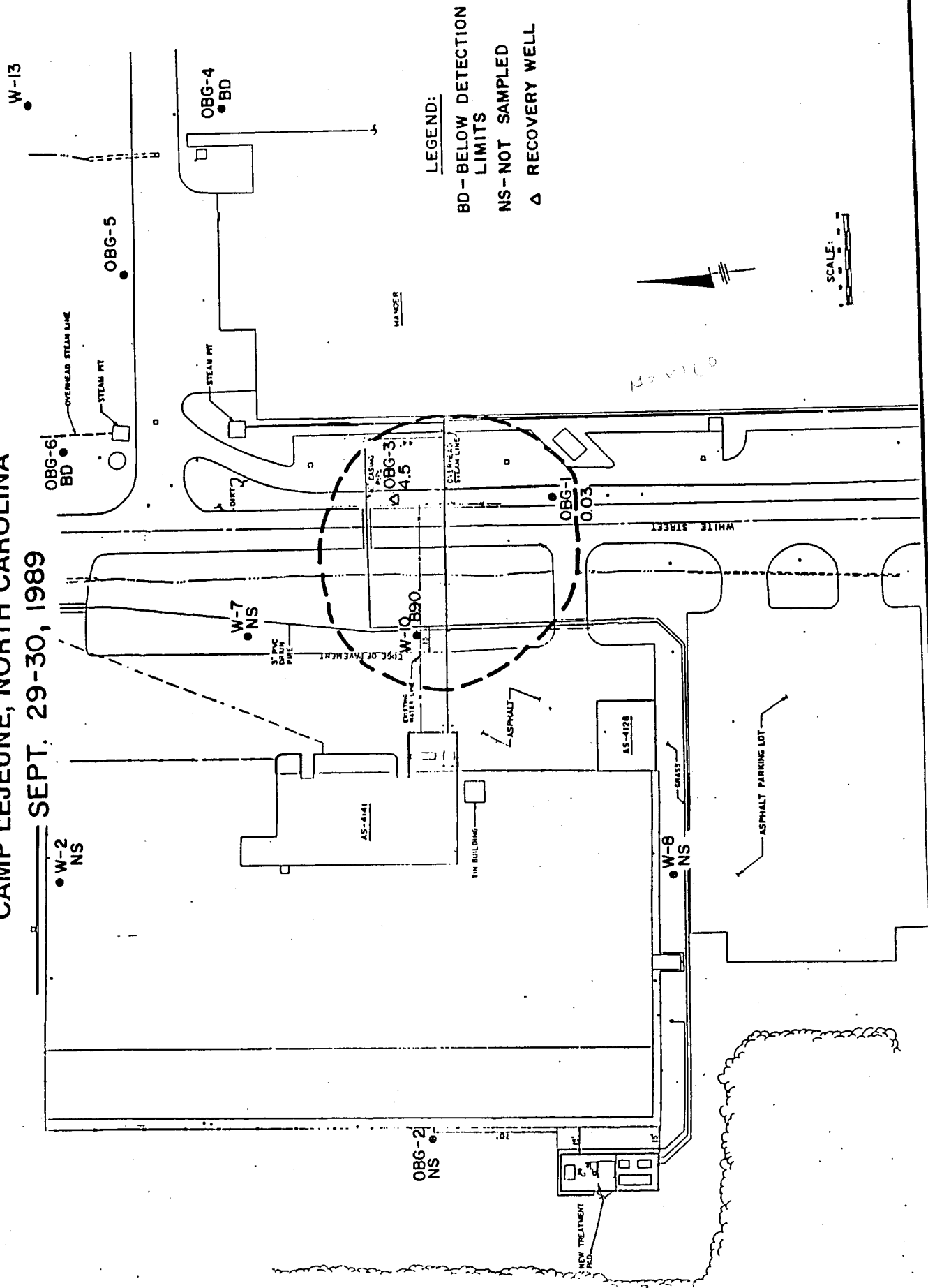
Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

APPENDIX C

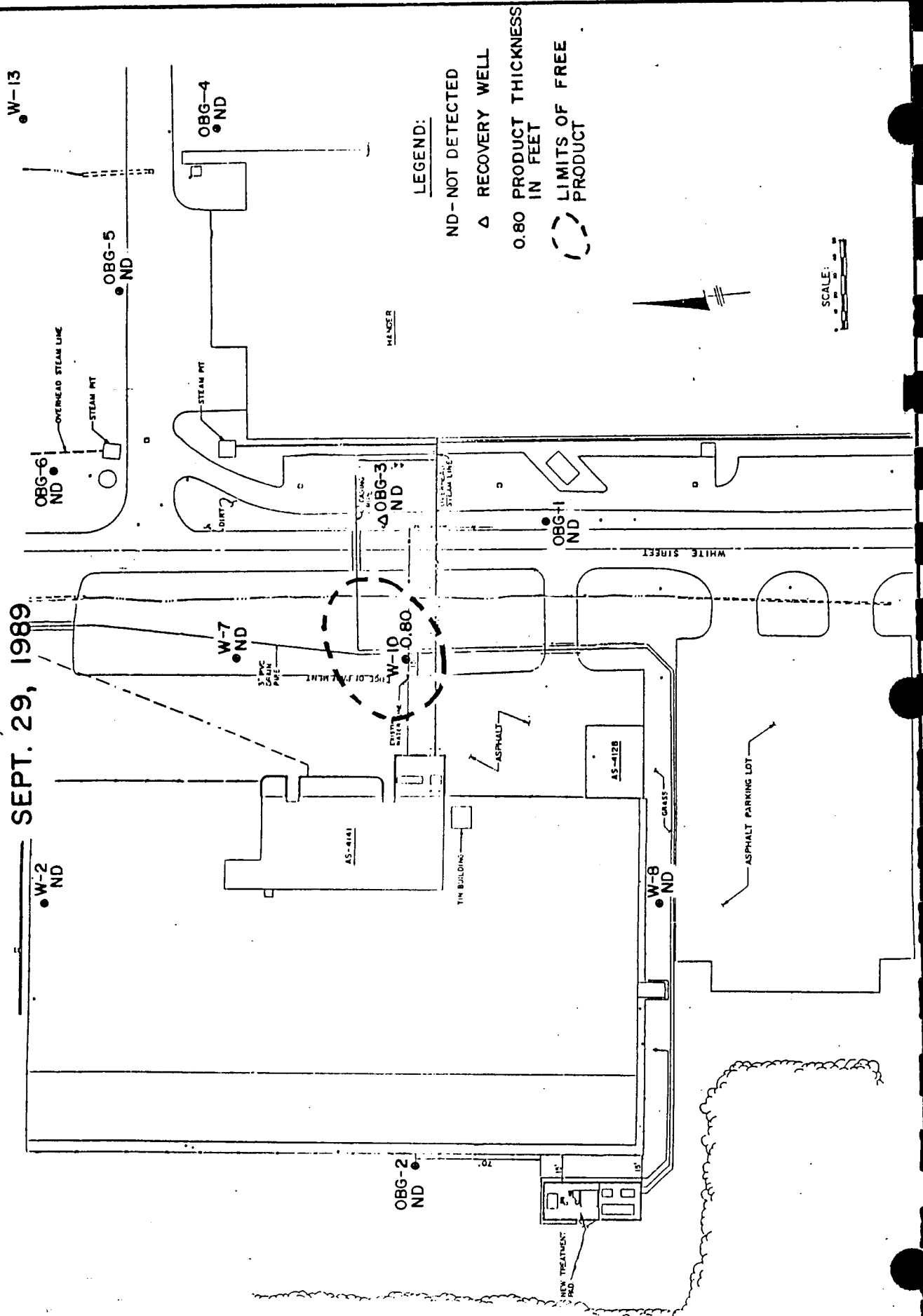
SELECTED FIGURES FROM VARIOUS REPORTS

CORRECTIVE ACTION PLAN

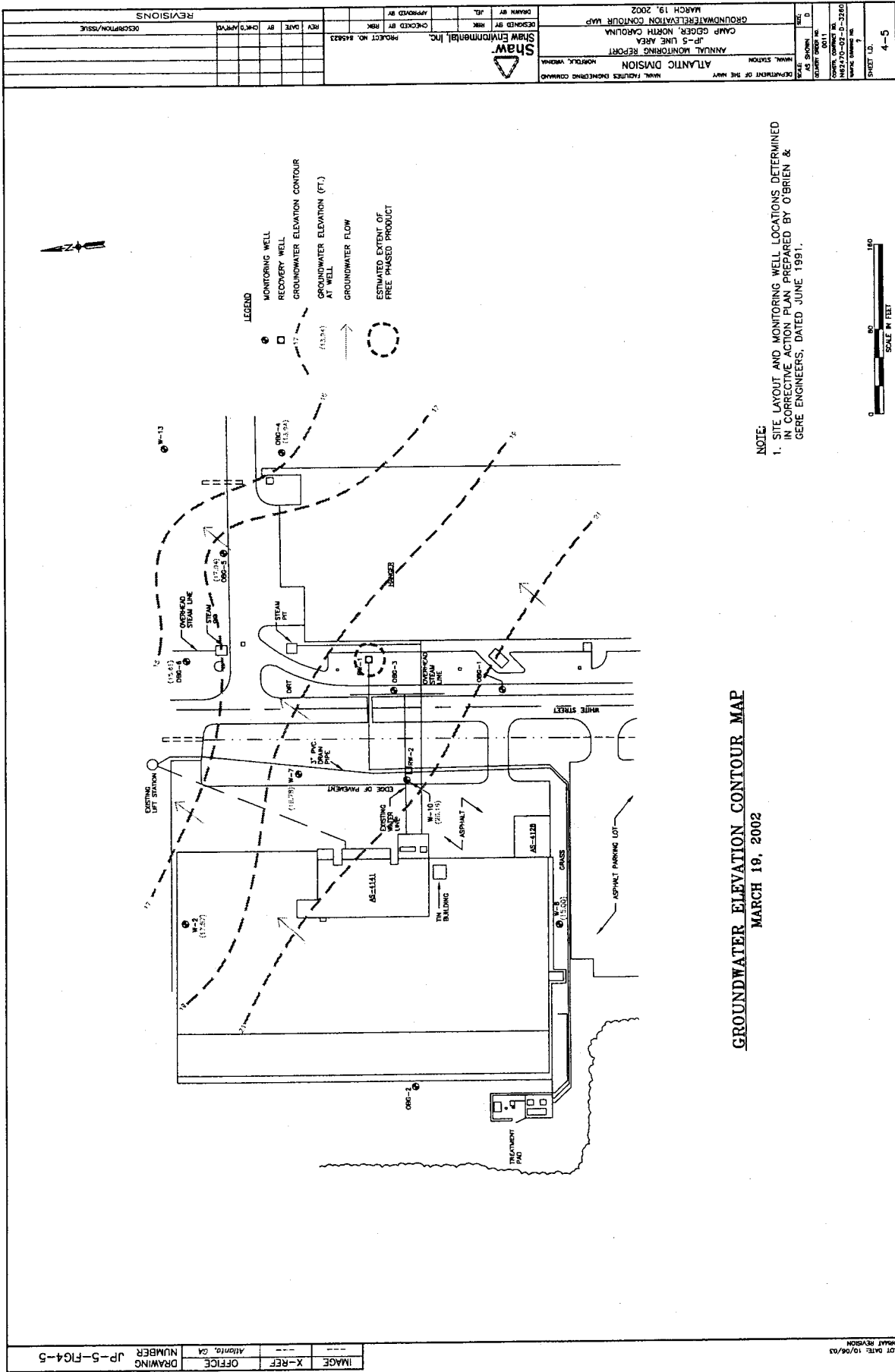
JP-5 LINE AREA
DISSOLVED TPH MAP
CAMP LEJEUNE, NORTH CAROLINA
SEPT. 29-30, 1989



JP-5 LINE AREA
FREE PRODUCT MAP
CAMP LEJEUNE, NORTH CAROLINA
SEPT. 29, 1989



FINAL ANNUAL MONITORING REPORT – JANUARY 2004



APPENDIX D

RISK CLASSIFICATION AND LAND USE FORM

A. RISK CHARACTERIZATION

Submit the following questionnaire in its entirety. Answer all questions completely. Attach additional pages as needed to fully explain answers. Base answers/explanations on information known or required to be obtained during the Limited Site Assessment.

NOTE: *Source area means point of release from a UST system.*

Limited Site Assessment Risk Classification and Land Use Form

Part I - Groundwater/Surface Water/Vapor Impacts

High Risk

1. *Has the release contaminated any water supply well including any used for non-drinking purposes?* YES NO

No. According to MCB Camp Lejeune and the latest Wellhead Protection Plan Update (2002), the closest active water supply well is AS-4150, located approximately 2,100 feet southwest of the site, and does not have known contamination.

2. *Is a water supply well used for drinking water located within 1,000 feet of the source area of the discharge or release?* YES NO

No. According to water supply well data provided by MCB Camp Lejeune, there are no active water supply wells located within 1,000 feet of the subject site.

3. *Is a water supply well not used for drinking water (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 feet of the source area of the release?* YES NO

No. Wells were not located within 250 feet of the source area of release.

4. *Does groundwater within 500 feet of the source area of the release have the potential for future use (there is no other source of water supply other than the groundwater)?* YES NO

No. There are an adequate number of locations for additional water supply wells to be installed on other portions of the base.

5. *Do vapors from the release pose a threat of explosion because of accumulation of the vapors in a confined space or pose any other serious threat to public health, public safety or the environment?* YES NO
If YES describe.

No. There has been no evidence to suggest an accumulation of vapors and no evidence of accumulation has been reported.

6. *Are there any other factors that would cause the discharge or release to pose an imminent danger to public health, public safety, or the environment?* YES NO
If YES describe.

No, data collected during this investigation does not provide evidence to suggest other factors that would cause an imminent danger to public health, public safety or the environment.

Intermediate Risk

7. *Is a surface water body located within 500 feet of the source area of the discharge or release?* YES NO
If YES, does the maximum groundwater contaminant concentration exceed the surface water quality standards and criteria found in 15A NCAC 2B.0200 by a factor of 10? YES NO

No. According to the latest GIS data provided by MCB Camp Lejeune, no surface water bodies have been located within 500 feet of the source area.

8. *Is the source area of the discharge or release located within an approved or planned wellhead protection area as defined in 42 USC 300h-7(e)?* YES NO
If YES describe.

Wellhead protection areas defined by 42 USC 200h-7(e) have not, as of this report, been designed by NCDENR for MCB, Camp Lejeune. However, MCB Camp Lejeune has identified wellhead protection areas on the base. Based on the most recent Wellhead Protection Plan Update (2002) performed for MCB Camp Lejeune, the site is not located within a potential wellhead protection area.

9. *Is the release located in the Coastal Plain physiographic region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985?* YES NO
If YES, is the source area of the release located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer that is being used or may be used as a source of drinking water? YES NO
If YES describe.

A Type III deep monitoring well is currently not located at the JP-5 site; therefore, recharge to the deeper aquifer cannot be confirmed at this time. However, based on Type III deep monitoring well data from other areas of the New River Air Station, CATLIN assumes recharge is a possibility.

10. *Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels established by the Department?* YES NO

All historical groundwater contaminant levels have been below the current GCLs. However, free-phase product has historically been present at the site.

Part II - Land Use

Property Containing Source Area of Release

The questions below pertain to the property containing the source area of the release.

1. *Does the property contain one or more primary or secondary residences (permanent or temporary)?* YES NO
Describe.

No. The property does not contain any primary or secondary residences.

2. *Does the property contain a school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly?* YES NO
Describe.

No. The property does not contain any of the above referenced public assembly places.

3. *Does the property contain a commercial (e.g., retail, warehouse, office/business space, etc.) or industrial (e.g., manufacturing, utilities, industrial research and development, chemical/petroleum bulk storage, etc.) enterprise, an inactive commercial or industrial enterprise, or is the land undeveloped?* YES NO
Describe.

Yes. The current site layout primarily encompasses paved parking areas with a hangar on a small portion of the site. White street crosses through the center of the site in a north – south direction.

4. *Do children visit the property?* YES NO
Explain.

Yes. Since a portion of the site is a parking area with a road, there is potential for children to visit the site.

Is access to the property reliably restricted consistent with its use (e.g., by fences, security personnel or both)? YES NO
Explain.

Yes. The parking area and roadway are not restricted and the hangar portion is restricted by a fence and guarded gate.

5. *Do pavement, buildings, or other structures cap the contaminated soil?* YES NO
Describe.

Yes. Portions of the previously identified areas of potentially impacted soils have an asphalt and/or concrete cap.

If YES, what mechanisms are in place or can be put into place to ensure that the

contaminated soil will remain capped in the foreseeable future?

As necessary, appropriate land use restrictions will insure that any potentially impacted soils will remain capped.

6. *What is the zoning status of the property?*

The MCB Camp Lejeune is not subject to local or county zoning requirements. The surrounding properties have been developed for military support purposes.

7. *Is the use of the property likely to change in the next 20 years?*

YES NO

Explain.

No. The designated use of military property is not likely to change within the foreseeable future.

Property Surrounding Source Area of Release

The questions below pertain to the area within 1500 feet of the source area of the release (excludes property containing source area of the release):

1. *What is the distance from the source area of the release to the **nearest** primary or secondary residence (permanent or temporary)?*

The closest residence is a primary residence approximately 1,150 feet west/northwest of the subject source area.

2. *What is the distance from the source area of the release to the **nearest** school, daycare center, hospital, playground, park, recreation area, church, nursing home or other place of public assembly?*

A playground is located approximately 1,200 feet to the west of the subject source area. Please note, other athletic fields are located within a 1,500-foot radius of the subject source area, refer to Figure 1.

3. *What is the zoning status of properties in the surrounding area?*

As previously mentioned, the MCB Camp Lejeune is not subject to local or county zoning requirements.

4. *Briefly characterize the use and activities of the land in the surrounding area.*

The land surrounding the source area has been developed for military support purposes, including a hangar and other various support facilities.

B. RECEPTOR INFORMATION

1. Water Supply Wells

Physical reconnaissance and review of the Wellhead Protection Plan – 2002 Update prepared by AH Environmental indicated that there are no active water supply wells located within 1,500 feet of the subject site. The closest active water supply well is AS-4150, located approximately 2,100 feet southwest of the source area of release. Water supply wells located within 1,500 feet of the subject site are listed as “closed” within the latest database provided by Camp Lejeune to CATLIN include AS-4140 and AS-131.

2. Public Water Supplies

Are public water supplies available within 1,500 feet of the source area of the release?

YES NO

If YES, where is the location of the nearest public water lines and the source(s) of the public water supply (indicate on map). Describe.

Public water is provided to buildings within 1,500 feet of the subject site by water mains which carry treated potable water. Potable water is supplied to the site and surrounding areas by the MCB water supply system. Potable water for Camp Lejeune is obtained from various water treatment facilities throughout the base. Groundwater obtained from the Castle Hayne Aquifer is the raw water source for the treatment facilities.

3. Surface Water

Identify all surface water bodies (e.g., ditch, pond, stream, lake, river) within 1,500 feet of the source area of the release. This information must be shown on the USGS topographic map.

There are numerous surface water bodies located within 1,500 feet of the source area of release including detention/retention ponds and drainage ditches. However, no surface water bodies have been located within 500 feet of the source area. All information regarding potential surface water receptors was provided by MCB Camp Lejeune, and is shown on the site location map, Figure 1.

4. Wellhead Protection Areas

Identify all planned or approved wellhead protection areas (e.g., ditch, pond, stream, lake, river) within 1,500 feet of the source area of the release. This information must be shown on the USGS topographic map. Wellhead protection areas are defined in 42 USC 300h-7(e).

According to the Wellhead Protection Plan – 2002 Update prepared by AH Environmental Consultants, the site is not located within a wellhead protection area. However, there is a wellhead protection area within 1,500 feet of the subject site. This area is associated with public water supply well AS-4150, located approximately 2,100 feet southwest of the subject source area.

5. Deep Aquifers in the Coastal Plain Physiographic Region

(Refer to page 19 of the guidelines) NOTE: This requirement only pertains to releases in the Coastal Plain physiographic region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985.

As identified in the Geologic Map of North Carolina (North Carolina Department of Natural Resources and Community Development 1985), the subject site lies within the Coastal Plain physiographic province. A deep monitoring well is currently not located at the JP-5 site; therefore, recharge to the deeper cannot be confirmed at this time.

To some degree seven of the ten aquifers identified to date in the North Carolina Coastal Plain are typically present beneath portions of the MCB Camp Lejeune. In order of increasing depth, these aquifers include the Surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers.

Aquifers below the surficial aquifer in the area typically include the Castle Hayne Aquifer, the Beaufort Aquifer, and the Peedee Aquifer, in order of increasing depth. Both the Beaufort and Peedee Aquifers contain saltwater in portions of the MCB Camp Lejeune and are not generally used for water supply. The Castle Hayne Aquifer contains freshwater and is the principal aquifer used in the area for water supply.

6. Subsurface Structures

Numerous underground utilities are present throughout the site. These utilities are located above the shallow groundwater table and are not considered potential receptors.

7. Property Owners and Occupants

The subject site is owned and operated by the Commanding General – Marine Corps Base, Camp Lejeune.

APPENDIX E

**GROUNDWATER ELEVATION DATA AND
FREE-PHASE PRODUCT THICKNESS**

CORRECTIVE ACTION PLAN

TABLE 1
JP-5 LINE AREA
GROUNDWATER ELEVATIONS
Sept. 29 1989

Well #	TOC Elevation	DTW Below Grade	Product Thickness	Corrected Groundwater Elevation
	(AMSL)	(in feet)	(in feet)	(AMSL)
W-2	24.29	7.33*	0.00	16.96
W-7	26.50	6.65	0.00	19.85
W-8	26.52	6.20	0.00	20.32
W-10	25.88	6.46	0.80	20.03
OBG-4	21.09	6.45	0.00	14.64
OBG-5	22.88	8.25	0.00	14.63
OBG-6	21.63	5.97	0.00	15.66

AMSL - Above Mean Sea Level

DTW - Depth To Water

* - DTW taken from Metal Outer Casing

FINAL ANNUAL MONITORING REPORT – JANUARY 2004

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	4/12/2002				3/19/2002				2/14/2002			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	
OBG-2			Not Measured						Not Measured				
OBG-4	21.09		7.41	13.68			13.94		7.15			13.65	
OBG-5	22.88		5.84	17.04			17.04		5.84			16.69	
OBG-6	21.63		5.90	15.73			15.81		5.82			15.61	
W-2	24.29		6.81	17.48			17.57		6.72		Not Measured		
W-7	26.50		6.80	19.70			19.78		6.72		6.74	19.76	
W-8	26.52		11.41	15.11			15.00		11.52		11.90	14.62	
W-10	25.88		5.88	20.00			20.16		5.72		5.93	19.95	
W-13			5.71						5.69		5.98		
RW-1		5.55	6.12		5.51	6.15		5.68			6.29		
RW-2			7.68			7.51					7.62		

tes:
 = feet
 = top of casing elevation
 l = mean sea level
 initial water level survey prior to AFVR event
 final water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	12/18/2001			12/12/01 ¹			11/26/01 ²		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			Not Measured			Not Measured			Not Measured	
OBG-4	21.09		8.03	13.06		8.41	12.68		8.85	12.24
OBG-5	22.88		7.20	15.68		7.69	15.19		8.38	14.50
OBG-6	21.63		7.36	14.27		8.38	13.25		8.65	12.98
W-2	24.29		Not Measured			7.53	16.76		Not Measured	
W-7	26.50		7.58	18.92		7.89	18.61		Not Measured	
W-8	26.52		12.94	13.58		13.60	12.92		Not Measured	
W-10	25.88		6.55	19.33		7.20	18.68		Not Measured	
W-13			6.55			7.00			7.40	
RW-1		6.42	6.50			Not Measured			10.47	
RW-2			8.40			Not Measured			Not Measured	

SS:
feet
= top of casing elevation
= mean sea level
¹ial water level survey prior to AFVR event
²ial water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	11/26/01 ¹				10/29/01 ²				10/29/01 ¹			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			Not Measured				Not Measured			Not Measured		Not Measured	Not Measured
OBG-4	21.09		8.05	13.04			8.58			12.51		7.79	13.30
OBG-5	22.88		7.23	15.65			8.03			14.85		6.92	15.96
OBG-6	21.63		7.83	13.80			8.00			13.63		7.31	14.32
W-2	24.29		Not Measured				Not Measured					Not Measured	
W-7	26.50		Not Measured				Not Measured					Not Measured	
W-8	26.52		Not Measured				Not Measured					Not Measured	
W-10	25.88		Not Measured				Not Measured					Not Measured	
W-13			6.65				7.10					6.33	
RW-1		6.50	6.75		6.10		10.95				6.10	6.50	
RW-2			Not Measured				Not Measured					Not Measured	

ES:
feet
= top of casing elevation
= mean sea level
¹ial water level survey prior to AFVR event
²nal water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	10/02/01 ²			10/02/01 ¹			9/24/2001		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			Not Measured	Not Measured		Not Measured	Not Measured		Not Measured	Not Measured
OBG-4	21.09		7.91	13.18		7.20	13.89		6.90	
OBG-5	22.88		7.28	15.60		6.25	16.63		5.80	17.08
OBG-6	21.63		7.30	14.33		6.62	15.01		6.26	15.37
W-2	24.29		Not Measured			Not Measured			6.98	17.31
W-7	26.50		Not Measured			Not Measured			7.15	19.35
W-8	26.52		Not Measured			Not Measured			11.23	15.29
W-10	25.88		Not Measured			Not Measured			6.23	19.65
W-13			6.40			5.70			5.16	
RW-1		5.45	9.10		5.45	6.33			6.42	
RW-2			Not Measured			Not Measured		5.24	6.08	

ES:
 feet
 = top of casing elevation
 = mean sea level
 initial water level survey prior to AFVR event
 final water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	8/27/01 ²			8/27/01 ¹			7/26/01 ²		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			Not Measured			Not Measured			Not Measured	
OBG-4	21.09		7.46	13.63		6.76	14.33		7.03	7.30
OBG-5	22.88		6.93	15.95		5.51	17.37		Not Measured	
OBG-6	21.63		6.50	15.13		5.70	15.93		5.90	10.03
W-2	24.29		6.88	17.41		6.87	17.42		6.68	10.74
W-7	26.50		6.90	19.60		6.89	19.61		6.35	13.26
W-8	26.52		11.23	15.29		10.88	15.64		11.38	4.26
W-10	25.88		6.10	19.78		6.01	19.87		5.28	14.59
W-13			5.78			5.18			5.53	
RW-1			9.20		5.02	5.52			9.23	
RW-2			Not Measured			Not Measured			Not Measured	

1 = feet
 2 = top of casing elevation
 1 = mean sea level
 initial water level survey prior to AFVR event
 final water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	7/26/01 ¹				6/27/01 ¹				6/19/2001			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			Not Measured						Not Measured			6.42	
OBG-4	21.09		6.79	7.54			14.76		6.33			6.54	14.55
OBG-5	22.88		5.43	11.94			17.85		5.03			5.25	17.63
OBG-6	21.63		5.61	10.32			16.61		5.02			5.28	16.35
W-2	24.29		6.60	10.82			17.94		6.35			6.42	17.87
W-7	26.50		6.25	13.36			20.37		6.13			6.20	20.30
W-8	26.52		10.95	4.69			18.38		8.14			9.45	17.07
W-10	25.88		5.14	14.73			20.73		5.15			5.30	20.58
W-13			5.18						4.75			4.85	
RW-1		4.98	5.50		4.65	4.95		4.90				5.05	
RW-2			Not Measured			6.70						6.95	

es:
feet
= top of casing elevation
= mean sea level
¹ tial water level survey prior to AFVR event
nal water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	5/29/01 ²				5/29/01 ¹				4/25/01 ²			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			Not Measured						Not Measured			3.42	
OBG-4	21.09		7.97	13.12			13.97		7.12			7.90	13.19
OBG-5	22.88		7.50	15.38			16.78		6.10			6.50	16.38
OBG-6	21.63		7.21	14.42			14.81		6.82			7.69	13.94
W-2	24.29		Not Measured						Not Measured			6.50	17.79
W-7	26.50		5.76	20.74			19.85		6.65			7.40	19.10
W-8	26.52		7.26	19.26			19.74		6.78			11.70	14.82
W-10	25.88		4.95	20.93			20.78		5.10			5.35	20.53
W-13			6.46						5.27			6.40	
RW-1			9.72			5.56			5.92			10.45	
RW-2			8.68						7.46			9.35	

es:
feet
= top of casing elevation
= mean sea level
¹ initial water level survey prior to AFVR event
² final water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	4/25/01 ¹				3/30/01 ²				3/30/01 ¹			
	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.40			2.32			2.26			
OBG-4	21.09		6.93	14.16		7.22	13.87		6.35			14.74
OBG-5	22.88		5.83	17.05		6.21	16.67		5.12			17.76
OBG-6	21.63		6.68	14.95		6.80	14.83		7.93			13.70
W-2	24.29		6.78	17.51		5.63	18.66		5.55			18.74
W-7	26.50		7.38	19.12		5.59	20.91		5.52			20.98
W-8	26.52		11.52	15.00		9.26	17.26		9.13			17.39
W-10	25.88		6.02	19.86		4.40	21.48		4.26			21.62
W-13			5.50			5.71			5.03			
RW-1		5.45	5.80			11.56		4.76	4.86			
RW-2			7.50			8.53			7.65			

AS:
feet
= top of casing elevation
= mean sea level
¹ = initial water level survey prior to AFVR event
² = final water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	3/19/2001				2/28/01 ²				2/28/01 ¹			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.96			2.42			2.42			2.42	
OBG-4	21.09		6.64	14.45		7.60	13.49		6.65	14.44		6.65	14.44
OBG-5	22.88		5.41	17.47		6.24	16.64		5.26	17.62		5.26	17.62
OBG-6	21.63		6.13	15.50		6.83	14.80		5.92	15.71		5.92	15.71
W-2	24.29		6.65	17.64		6.00	18.29		5.93	18.36		5.93	18.36
W-7	26.50		6.61	19.89		5.55	20.95		5.62	20.88		5.62	20.88
W-8	26.52		10.27	16.25		10.75	15.77		10.57	15.95		10.57	15.95
W-10	25.88		5.06	20.82		4.63	21.25		4.60	21.28		4.60	21.28
W-13			5.23			6.05			5.13			5.13	
RW-1		4.93	5.35			9.07			5.56			5.56	
RW-2			7.04			8.76			7.10			7.10	

AS:
feet
= top of casing elevation
= mean sea level
¹ial water level survey prior to AFVR event
²al water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	1/17/01 ²			1/17/01 ¹			12/20/2000		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.40			3.45			3.14	
OBG-4	21.09		7.79	13.30		6.99	14.10		6.55	14.54
OBG-5	22.88		Not Measured			Not Measured			5.47	17.41
OBG-6	21.63		7.62	14.01		6.70	14.93		6.09	15.54
W-2	24.29		6.74	17.55		6.75	17.54		6.87	17.42
W-7	26.50		6.38	20.12		6.36	20.14		6.18	20.32
W-8	26.52		11.85	14.67		11.50	15.02		10.12	16.40
W-10	25.88		4.93	20.95		4.91	20.97		5.02	20.86
W-13			6.33			5.78			5.18	
RW-1			9.19		5.58	6.04		5.10	5.35	
RW-2			9.15			7.57			7.03	

ss:
 feet
 = top of casing elevation
 = mean sea level
 ial water level survey prior to AFVR event
 ial water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	11/16/00 ²				11/16/00 ¹				9/18/2000		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)		
OBG-2			4.14			4.12			3.27			
OBG-4	21.09		8.01	13.08		7.32	13.77		6.34	14.75		
OBG-5	22.88		6.92	15.96		6.28	16.60		5.28	17.60		
OBG-6	21.63		7.87	13.76		7.02	14.61		5.83	15.80		
W-2	24.29		7.60	16.69		7.62	16.67		6.67	17.62		
W-7	26.50		7.75	18.75		7.76	18.74		7.15	19.35		
W-8	26.52		12.13	14.39		11.96	14.56		9.82	16.70		
W-10	25.88		6.76	19.12		6.77	19.11		6.25	19.63		
W-13			6.51			5.86			4.60			
RW-1			9.43		5.65	5.85		4.75	4.88			
RW-2			10.52			7.98			7.24			

ES:
feet
= top of casing elevation
= mean sea level
¹ tial water level survey prior to AFVR event
² nal water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	7/13/00 ²			7/13/00 ¹			6/29/00 ²		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.76			3.72			3.16	
OBG-4	21.09		8.15	12.94		7.45	13.64		7.84	13.25
OBG-5	22.88		7.65	15.23		6.62	16.26		Not Measured	
OBG-6	21.63		8.93	12.70		7.39	14.24		8.23	13.40
W-2	24.29		7.13	17.16		7.11	17.18		6.69	17.60
W-7	26.50		7.73	18.77		7.70	18.80		7.40	19.10
W-8	26.52		12.62	13.90		12.23	14.29		12.29	14.23
W-10	25.88		7.19	18.69		7.01	18.87		6.48	19.40
W-13			6.63			6.02			6.23	
RW-1			9.10		5.77	6.15			8.09	
RW-2			10.35			8.16			9.44	

S:
 feet
 : top of casing elevation
 = mean sea level
 ial water level survey prior to AFVR event
 ial water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	6/29/00 ¹			6/20/00 ²			6/20/00 ¹		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.26			2.71			2.65	
OBG-4	21.09		7.14	13.95		7.77	13.32		7.18	13.91
OBG-5	22.88		Not Measured			7.33	15.55		6.18	16.70
OBG-6	21.63		7.11	14.52		8.19	13.44		6.93	14.70
W-2	24.29		6.72	17.57		6.59	17.70		6.50	17.79
W-7	26.50		7.36	19.14		7.30	19.20		7.35	19.15
W-8	26.52		11.76	14.76		12.35	14.17		11.82	14.70
W-10	25.88		6.32	19.56		6.15	19.73		6.14	19.74
W-13			5.80			6.45			5.35	
RW-1		5.52	5.65			8.18		5.51	5.90	
RW-2			8.40			9.27			8.60	

S:
 feet
 : top of casing elevation
 = mean sea level
 ial water level survey prior to AFVR event
 ial water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	5/31/00 ²			5/31/00 ¹			5/25/2000		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.80			3.73			3.27	
OBG-4	21.09		7.73	13.36		7.03	14.06		6.89	14.20
OBG-5	22.88		6.53			5.98	16.90		Not Measured	
OBG-6	21.63		8.22	13.41		7.09	14.54		6.93	14.70
W-2	24.29		7.29	17.00		7.27	17.02		6.72	17.57
W-7	26.50		7.67	18.83		7.65	18.85		7.58	18.92
W-8	26.52		11.86	14.66		11.60	14.92		11.30	15.22
W-10	25.88		6.51	19.37		6.27	19.61		6.12	19.76
W-13			6.30			5.60			5.41	
RW-1			8.30		5.45	5.50		5.30	5.34	
RW-2			10.20			8.20			9.13	

1. i.
2. et
top of casing elevation
: mean sea level
al water level survey prior to AFVR event
al water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	4/26/00 ¹				4/17/2000				3/27/00 ²			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	
OBG-2			2.21						2.37		2.64		
OBG-4	21.09		5.49	15.60			14.48		6.61		6.75	14.34	
OBG-5	22.88		5.23	17.65			17.45		5.43		5.79	17.09	
OBG-6	21.63		6.22	15.41			15.30		6.33		6.50	15.13	
W-2	24.29		6.34	17.95			18.05		6.24		6.29	18.00	
W-7	26.50		5.93	20.57			20.53		5.97		6.59	19.91	
W-8	26.52		9.98	16.54			16.39		10.13		10.78	15.74	
W-10	25.88		5.57	20.31			20.58		5.30		5.19	20.69	
W-13			5.02						4.98		5.37		
RW-1		5.82	6.92			4.80			5.70		7.29		
RW-2			7.90						8.15		11.12		

1. et
top of casing elevation
mean sea level
il water level survey prior to AFVR event
il water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	3/27/00 ¹			3/23/2000			3/7/00 ²		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			2.64			2.76			3.39	
OBG-4	21.09		6.75	14.34		NOT MEASURED			7.40	13.69
OBG-5	22.88		5.79	17.09		5.53	17.35		7.15	15.73
OBG-6	21.63		6.50	15.13		6.13	15.50		7.37	14.26
W-2	24.29		6.29	18.00		6.72	17.57		6.87	17.42
W-7	26.50		6.59	19.91		6.20	20.30		7.21	19.29
W-8	26.52		10.78	15.74		10.40	16.12		11.50	15.02
W-10	25.88		5.19	20.69		5.22	20.66		5.44	20.44
W-13			5.36			5.06			NOT MEASURED	
RW-1		5.00	5.30		5.15	5.33			8.54	
RW-2			9.16			8.34			8.90	

5.
 feet
 top of casing elevation
 = mean sea level
 al water level survey prior to AFVR event
 al water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	3/7/00 ¹			2/23/2000			1/27/2000		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.41			3.15			2.57	
OBG-4	21.09		6.85	14.24		6.64	14.45		6.75	14.34
OBG-5	22.88		6.93	15.95		5.69	17.19		5.45	17.43
OBG-6	21.63		6.91	14.72		6.68	14.95		6.54	15.09
W-2	24.29		6.93	17.36		6.80	17.49		6.53	17.76
W-7	26.50		7.21	19.29		6.98	19.52		5.43	21.07
W-8	26.52		11.36	15.16		10.96	15.56		9.28	17.24
W-10	25.88		5.15	20.73		5.50	20.38		4.98	20.90
W-13			NOT MEASURED			5.28			5.25	
RW-1		5.18	3.60		5.02	5.72		4.92	5.95	
RW-2			8.62			8.92			2.13	

s:
 feet
 : top of casing elevation
 = mean sea level
 al water level survey prior to AFVR event
 al water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	12/28/1999				11/18/1999				10/22/1999			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	
OBG-2			3.68						3.42		1.96		
OBG-4	21.09		7.40	13.69			14.41		6.68		5.66	15.43	
OBG-5	22.88		6.55	16.33			17.25		5.63		4.61	18.27	
OBG-6	21.63		7.69	13.94			15.08		6.55		5.43	16.20	
W-2	24.29		7.30	16.99			16.71		7.58		6.45	17.84	
W-7	26.50		7.36	19.14			18.91		7.59		7.56	18.94	
W-8	26.52		11.66	14.86			17.43		9.09		6.31	20.21	
W-10	25.88		6.63	19.25			19.03		6.85		5.35	20.53	
W-13			5.94						5.17		Not Measured		
RW-1			7.40		9.54	10.31					14.22		
RW-2			8.96			8.96					Not Measured		

E :
 set
 top of casing elevation
 : mean sea level
 al water level survey prior to AFVR event
 al water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	9/23/1999		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			1.96	
OBG-4	21.09		5.96	15.13
OBG-5	22.88		4.73	18.15
OBG-6	21.63		5.66	15.97
W-2	24.29		6.31	17.98
W-7	26.50		5.48	21.02
W-8	26.52		5.96	20.56
W-10	25.88		5.61	20.27
W-13			4.49	
RW-1		6.40	7.00	
RW-2			14.12	

Notes:

ft = feet

toc = top of casing elevation

msl = mean sea level

¹ Initial water level survey prior to AFVR event

² Final water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	9/1/99 ²			9/1/99 ¹		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			2.55			2.51	
OBG-4	21.09		7.24	13.85		7.07	14.02
OBG-5	22.88		5.96	16.92		5.75	17.13
OBG-6	21.63		6.51	15.12		6.15	15.48
W-2	24.29		6.80	17.49		6.80	17.49
W-7	26.50		6.17	20.33		6.10	20.40
W-8	26.52		7.18	19.34		7.11	19.41
W-10	25.88		6.12	19.76		5.59	20.29
W-13			Not Measured			Not Measured	
RW-1			6.10		6.15	6.80	
RW-2			9.22			4.90	

Notes:

ft = feet

toc = top of casing elevation

msl = mean sea level

¹ Initial water level survey prior to AFVR event

² Final water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	8/17/99 ²				8/17/99 ¹				7/22/1999			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)			
OBG-2			3.58			3.58			2.89				
OBG-4	21.09		7.75	13.34		7.64	13.45		7.05	14.04			
OBG-5	22.88		6.93	15.95		6.65	16.23		6.86	16.02			
OBG-6	21.63		7.51	14.12		7.21	14.42		6.64	14.99			
W-2	24.29		7.18	17.11		7.20	17.09		6.80	17.49			
W-7	26.50		8.02	18.48		8.03	18.47		7.23	19.27			
W-8	26.52		12.14	14.38		12.07	14.45		8.66	17.86			
W-10	25.88		8.05	17.83		7.36	18.52		6.42	19.46			
W-13			Not Measured			Not Measured			Not Measured				
RW-1			6.75		6.00	6.23		4.63	8.82				
RW-2			10.80			8.56		7.82	7.84				

1. set
 top of casing elevation
 2. mean sea level
 al water level survey prior to AFVR event
 al water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	6/16/1999				5/20/1999				4/26/1999		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)		
OBG-2			3.42			2.88			Not Measured			
OBG-4	21.09		7.41	13.68		6.74	14.35		7.19	13.90		
OBG-5	22.88		9.21	13.67		8.35	14.53		8.87	14.01		
OBG-6	21.63		6.48	15.15		6.17	15.46		6.71	14.92		
W-2	24.29		3.80	20.49		6.82	17.47		7.15	17.14		
W-7	26.50		7.44	19.06		7.06	19.44		7.63	18.87		
W-8	26.52		10.57	15.95		7.38	19.14		7.20	19.32		
W-10	25.88		6.24	19.64		5.90	19.98		6.55	19.33		
W-13			5.76			5.37			Not Measured			
RW-1		8.65	12.27		7.20	10.89		8.46	13.02			
RW-2		8.32	8.35		7.52	7.54			8.11			

S.
 feet
 : top of casing elevation
 = mean sea level
 al water level survey prior to AFVR event
 al water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	3/22/1999			1/22/1999			12/22/1998		
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			2.36			3.31			3.22	
OBG-4	21.09		7.18	13.91		8.09	13.00		8.02	13.07
OBG-5	22.88		7.72	15.16		9.71	13.17		9.69	13.19
OBG-6	21.63		6.12	15.51		8.21	13.42		8.31	13.32
W-2	24.29		6.45	17.84		4.30	19.99		4.35	19.94
W-7	26.50		5.79	20.71		6.35	20.15		6.92	19.58
W-8	26.52		6.96	19.56		7.26	19.26		9.79	16.73
W-10	25.88	Trace	5.02	20.86	Trace	6.33	19.55	6.78	6.79	19.10
W-13			5.76			8.46			8.51	
RW-1		4.80	10.16		11.59	12.67		12.67	13.69	
RW-2			9.40			14.17		8.94	8.98	

35'
feet
= top of casing elevation
= mean sea level
tial water level survey prior to AFVR event
nal water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	10/21/1998				9/23/1998				7/21/1998			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)			
OBG-2			3.85			3.24			3.62				
OBG-4	21.09		7.21	13.88		6.27	14.82		6.87	14.22			
OBG-5	22.88		9.03	13.85		7.90	14.98		6.72	16.16			
OBG-6	21.63		7.07	14.56		8.17	13.46		6.62	15.01			
W-2	24.29		5.10	19.19		4.45	19.84		3.93	20.36			
W-7	26.50		7.85	18.65		7.31	19.19		6.91	19.59			
W-8	26.52		9.25	17.27		8.88	17.64		7.09	19.43			
W-10	25.88		7.62	18.26	Trace	6.84	19.04	6.40	7.28	19.48			
W-13			6.68			5.74			6.26				
RW-1		5.13	8.12		4.25	6.18		5.83	8.53				
RW-2		8.33	8.37			7.05		7.03	8.01				

1. set
top of casing elevation
mean sea level
all water level survey prior to AFVR event
all water level survey following AFVR event

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	6/25/1998				5/25/1998				4/29/1998			
		Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			3.85						Not Measured			2.15	
OBG-4	21.09		6.62	14.47					Not Measured			6.43	14.66
OBG-5	22.88		8.69	14.19					Not Measured			8.37	14.51
OBG-6	21.63		6.49	15.14					Not Measured			6.78	14.85
W-2	24.29		3.82	20.47					Not Measured			3.75	20.54
W-7	26.50		7.19	19.31					Not Measured			7.16	19.34
W-8	26.52		7.02	19.50					Not Measured			7.09	19.43
W-10	25.88	6.36	7.25	19.52				5.87	Not Measured			6.74	20.01
W-13			6.14						Not Measured			6.05	
RW-1		4.31	8.60		3.75	11.42		3.44				11.23	
RW-2		7.37	8.33		6.08	10.35		6.49				10.80	

SS:
feet
= top of casing elevation
= mean sea level
tial water level survey prior to AFVR event
nal water level survey following AFVR even

Table 3.2
JP-5 Line Area
Marine Corps Air Station
New River, North Carolina
Groundwater Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	3/9/1998	
			Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
OBG-2			0.79	
OBG-4	21.09		5.32	15.77
OBG-5	22.88		6.95	15.93
OBG-6	21.63		5.60	16.03
W-2	24.29		2.85	21.44
W-7	26.50		5.31	21.19
W-8	26.52		5.10	21.42
W-10	25.88		4.61	21.27
W-13			4.98	
RW-1			Not Measured	
RW-2			Not Measured	

Notes:

ft = feet
 toc = top of casing elevation
 msl = mean sea level
¹ Initial water level survey prior to AFVR event
² Final water level survey following AFVR event

DATA PROVIDED BY ENGINEERING & ENVIRONMENT, INC.

APRIL 2004 – JUNE 2004

**ENGINEERING AND
ENVIRONMENT, INC.**

JP5 Water Levels

Date 4/5/2004

Well ID	W-2	Depth to Bottom		Depth to Product		Depth to Water	7.00
Well ID	OBG02	Depth to Bottom		Depth to Product		Depth to Water	4.87
Well ID	OBG04	Depth to Bottom	17	Depth to Product		Depth to Water	6.53
Well ID	OBG05	Depth to Bottom	14.52	Depth to Product		Depth to Water	5.35
Well ID	OBG06	Depth to Bottom		Depth to Product		Depth to Water	5.88
Well ID	W-7	Depth to Bottom	18.88	Depth to Product		Depth to Water	7.35
Well ID	W-8	Depth to Bottom	16.5	Depth to Product		Depth to Water	10.9
Well ID	W-10	Depth to Bottom	17.55	Depth to Product		Depth to Water	6.42
Well ID	RW01	Depth to Bottom		Depth to Product	4.90	Depth to Water	5.51
Well ID	RW02	Depth to Bottom	20.46	Depth to Product		Depth to Water	6.85



**ENGINEERING AND
ENVIRONMENT, INC.**

JP5 Water Levels

Date 5/4/2004

Well ID	W-2	Depth to Bottom		Depth to Product		Depth to Water	6.03
Well ID	OBG02	Depth to Bottom		Depth to Product		Depth to Water	3.78
Well ID	OBG04	Depth to Bottom	17	Depth to Product		Depth to Water	5.86
Well ID	OBG05	Depth to Bottom	14.52	Depth to Product		Depth to Water	4.18
Well ID	OBG06	Depth to Bottom		Depth to Product		Depth to Water	3.76
Well ID	W-7	Depth to Bottom	18.88	Depth to Product		Depth to Water	1.00
Well ID	W-8	Depth to Bottom	16.5	Depth to Product		Depth to Water	9.52
Well ID	W-10	Depth to Bottom	17.55	Depth to Product		Depth to Water	3.95
Well ID	RW01	Depth to Bottom		Depth to Product	4.15	Depth to Water	4.25
Well ID	RW02	Depth to Bottom	20.46	Depth to Product		Depth to Water	5.30



**ENGINEERING AND
ENVIRONMENT, INC.**

JP5 Water Levels

Date 6/16/2004

Well ID	W-2	Depth to Bottom		Depth to Product		Depth to Water	7.00
Well ID	OBG02	Depth to Bottom		Depth to Product		Depth to Water	4.85
Well ID	OBG04	Depth to Bottom	17	Depth to Product		Depth to Water	6.87
Well ID	OBG05	Depth to Bottom	14.52	Depth to Product		Depth to Water	5.85
Well ID	OBG06	Depth to Bottom		Depth to Product		Depth to Water	6.33
Well ID	W-7	Depth to Bottom	18.88	Depth to Product		Depth to Water	2.87
Well ID	W-8	Depth to Bottom	16.5	Depth to Product		Depth to Water	11.76
Well ID	W-10	Depth to Bottom	17.55	Depth to Product		Depth to Water	6.00
Well ID	W-13	Depth to Bottom	16.4	Depth to Product		Depth to Water	5.35
Well ID	RW01	Depth to Bottom		Depth to Product	5.25	Depth to Water	5.28
Well ID	RW02	Depth to Bottom	20.46	Depth to Product		Depth to Water	5.35

APPENDIX F

AGGRESSIVE FLUID-VAPOR RECOVERY DATA

FINAL ANNUAL MONITORING REPORT – JANUARY 2004

Table 3-1 TRANSPORTATION AND DISPOSAL LOG
J.A. JONES ENVIRONMENTAL SERVICES COMPANY
MCAS NEW RIVER, NORTH CAROLINA
PROJECT NUMBER: 005-067f

GALLONS TO DATE 51,455.50
TONS TO DATE 36.00
DRUMS TO DATE 10.00

DATE SHIPPED	DISPOSAL FACILITY	HAULER	TONS	GALLONS	DRUMS	MANIFEST NUMBER	LOAD NUMBER	COMMENTS
JP-5 Line								
4/22/1999	ES&J Enterprises 1555 Holland Rd. Autryville, North Carolina	ES&J Enterprises	18			834	S-001	Petroleum Contaminated Soil from Storage Tank Spill
4/22/1999	ES&J Enterprises 1555 Holland Rd. Autryville, North Carolina	ES&J Enterprises	18			836	S-002	Petroleum Contaminated Soil from Storage Tank Spill
5/27/1999	Fisher Industrial Service, Inc 402 Webster Chapel Rd Glencoe, AL 35905	Envirochem			7	195	D-001	Petroleum Contaminated Water from Storage Tank Spill
5/27/1999	Fisher Industrial Service, Inc 402 Webster Chapel Rd Glencoe, AL 35905	Envirochem			3	195	D-002	Empty Drums
8/18/1999	Building 976 North Plant	J.A. Jones		738		821	W-001	AFVR
9/1/1999	Building 976 North Plant	J.A. Jones		627.5		821	W-002	AFVR
1/28/2000	Building 976 North Plant	J.A. Jones		735		821	W-003	AFVR
3/27/2000	Shaw North Plant	J.A. Jones		400		821	W-004	AFVR
4/27/2000	Shaw North Plant	J.A. Jones		2,220		821	W-005	AFVR
5/11/2000	Shaw North Plant	J.A. Jones		2,215		1018	W-006	AFVR
5/31/2000	Shaw North Plant	J.A. Jones		1,875		948	W-007	AFVR
6/20/000	Shaw North Plant	J.A. Jones		2,270		958	W-008	AFVR
6/29/2000	Shaw North Plant	J.A. Jones		2,483		961	W-009	AFVR
7/13/2000	Shaw North Plant	J.A. Jones		2,242		967	W-010	AFVR
11/16/2000	Shaw North Plant	J.A. Jones		2,373		1053	W-011	AFVR
1/17/2001	Shaw North Plant	J.A. Jones		2,345		1288	W-012	AFVR
2/28/2001	Shaw North Plant	J.A. Jones		2,108		1298	W-013	AFVR
3/30/2001	Shaw North Plant	J.A. Jones		2,361		1453	W-014	AFVR
4/25/2001	Shaw North Plant	J.A. Jones		3,159		2544	W-015	AFVR
5/29/2001	Shaw North Plant	J.A. Jones		3,554		2569	W-016	AFVR
6/27/2001	Shaw North Plant	J.A. Jones		3,159		2597	W-017	AFVR
8/27/2001	Shaw North Plant	J.A. Jones		3,370		2647	W-018	AFVR
10/2/2001	Shaw North Plant	J.A. Jones		2,966		2671	W-019	AFVR
10/29/2001	Shaw North Plant	J.A. Jones		3,340		2692	W-020	AFVR
11/26/2001	Shaw North Plant	J.A. Jones		3,510		2684	W-021	AFVR
12/12/2001	Shaw North Plant	J.A. Jones		3,405		2725	W-022	AFVR
TOTAL as of 4/31/02			36.00	48,050.50	10.00	SOIL: 2 Loads WATER: 22 Loads DRUMS: 2 Loads		

DATA PROVIDED BY ENGINEERING & ENVIRONMENT, INC.

MAY 2004 – JUNE 2004

Aggressive Fluid Vapor K_{ov} (AFVR) Data Sheet

Facility: MCB Camp Lejeune, NC

Project #: 844098

Location: MCAS New River Bldg AS-390S

Initials: QR

Baseline Data - AFVR and Observation Wells

Date: 5-27-04

WELL IDENTIFICATION	WELL	ORIG		
AFVR WELL (YES/NO)	W1	ORIG-6	NO	
WELL DEPTH (FT BLS)	21.48	17.39		
DIAMETER (INCH)	6"	2"		
DEPTH TO PRODUCT (FT)	5.04	0		
DEPTH TO WATER (FT)	5.27	6.04		
PRODUCT INGRESS (FT)	.23	0		
SCREEN INTERVAL (FT BLS)	N/A	N/A		

AFVR Stack and Vacuum Truck Data

Stack Diameter	6 inches
FID Calibration Gas	Methane
Calibrated yes/no	yes

Fluids Recovered	Water (gals)	Product (gals)
	50	1/4

Water level Measurements - AFVR and Observation Wells (from TOC)

Actual Time	Elapsed Time	DTW	DTP	DTW	DTP	DTW	DTP	DTW	DTP
1500	0:00	5.27	5.04	6.04	0				
1515	0:15	-	-	6.04	0				
1530	0:30	-	-	6.04	0				
1545	0:45	-	-	6.04	0				
1600	1:00	-	-	6.05	0				
1615	1:15	-	-	6.05	0				
1630	1:30	5.07	0	6.05	0				
	1:45								
	2:00								
	2:30								
	3:00								
	3:30								
	4:00								
	4:30								
	5:00								
	5:30								
	6:00								

NOTE: DTW - Depth to Water (ft, TOC) DTP - Depth to Product (ft, TOC)

AFVR Stack and Vacuum Truck Measurements

Elapsed Time	FID (ppm)	Velocity (ft/sec, m/sec)	Temp (°F) (°C)	Vac Truck (°Hg) (RPM)
0:00	2200,000	400	87	23 600
0:15	2200,000	400	88	
0:30	2200,000	400	92	
0:45	196,812	400	95	
1:00	176,226	400	95	23 600
1:15	166,440	400	98	
1:30	159,680	400	101	
1:45				
2:00				
2:30				
3:00				
3:30				
4:00				
4:30				
5:00				
5:30				
6:00				

Aggressive Fluid Vapor R.

v6.y (AFVR) Data Sheet

Facility: MCB Camp Lejeune, NC

Project #: 844098

Location: MCHS New River Bldg AS-3905

Initials: J. #7

Baseline Data - AFVR and Observation Wells

Date: 6-11-04

WELL IDENTIFICATION	<u>KW-1</u>	<u>086-6</u>		
AFVR WELL (YES/NO)	<u>YES</u>	<u>NO</u>		
WELL DEPTH (FT BLS)	<u>21.48</u>	<u>17.39</u>		
DIAMETER (INCH)	<u>6"</u>	<u>2"</u>		
DEPTH TO PRODUCT (FT)	<u>5.08</u>	<u>0</u>		
DEPTH TO WATER (FT)	<u>5.51</u>	<u>6.25</u>		
PRODUCT THICKNESS (FT)	<u>.43</u>	<u>0</u>		
SCREEN INTERVAL (FT BLS)	<u>N/A</u>	<u>N/A</u>		

AFVR Stack and Vacuum Truck Data

Stack Diameter	6 inches
FID Calibration Gas	Methane
Calibrated yes/no	<u>YES</u>

Fluids Recovered	
Water (gals)	<u>75</u>
Product (gals)	<u>1/2</u>

Water level Measurements - AFVR and Observation Wells (from TOC)

Actual Time	Elapsed Time	DTW	DTP	DTW	DTP	DTW	DTP	DTW	DTP	DTW	DTP
<u>1440</u>	0:00	<u>5.51</u>	<u>5.08</u>	<u>6.25</u>	<u>0</u>						
<u>1455</u>	0:15	-	-	<u>6.25</u>	<u>0</u>						
<u>1510</u>	0:30	-	-	<u>6.26</u>	<u>0</u>						
<u>1525</u>	0:45	-	-	<u>6.25</u>	<u>0</u>						
<u>1540</u>	1:00	-	-	<u>6.25</u>	<u>0</u>						
<u>1555</u>	1:15	<u>5.37</u>	<u>0</u>	<u>6.25</u>	<u>0</u>						
	1:30										
	1:45										
	2:00										
	2:30										
	3:00										
	3:30										
	4:00										
	4:30										
	5:00										
	5:30										
	6:00										

NOTE: DTW - Depth to Water (ft, TOC) = DTP - Depth to Product (ft, TOC)

AFVR Stack and Vacuum Truck Measurements

Elapsed Time	FID (ppm)	Velocity (ft/sec)	Temp (°F)	Temp (°C)	Vac Truck (ftHg)	Vac Truck (kPa)
0:00	<u>7200, 600</u>	<u>400</u>	<u>90</u>		<u>23</u>	<u>600</u>
0:15	<u>7200, 600</u>	<u>400</u>	<u>95</u>			
0:30	<u>182, 146</u>	<u>400</u>	<u>98</u>			
0:45	<u>170, 132</u>	<u>400</u>	<u>101</u>			
1:00	<u>154, 440</u>	<u>400</u>	<u>100</u>		<u>23</u>	<u>600</u>
1:15	<u>143, 240</u>	<u>400</u>	<u>101</u>			
1:30						
1:45						
2:00						
2:30						
3:00						
3:30						
4:00						
4:30						
5:00						
5:30						
6:00						