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CNC CHARLESTON
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SAMPLING AND ANALYSIS PLAN (SAP) DATED 29 AUGUST 2000 FOR ZONE G SITE 17 BUILDING B42 WITH SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL REVIEW LETTER CNC CHARLESTON SC
10/06/2000
CH2M JONES LLC

D H E C

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Columbia, SC 29201-1708

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6 October 2000

Department of the Navy
Southern Division NFEC
P.O. Box 190010
North Charleston, SC 29419-9010
Attention: Mr. Gabriel Magwood

Re: Sampling and Analysis Plan dated 29 August 2000
Zone G/Site 17-Building B42 (Site Identification # 17780)
Charleston Naval Complex/Charleston Naval Base
Charleston, SC
Charleston County

Dear Mr. Magwood:

The author has completed technical review of the referenced document. As submitted, the plan provides for additional groundwater sampling to support the request for "no further action" this site. The proposed monitoring program appears reasonable for the known contaminants and the facility may proceed, as appropriate.

Should you have any questions please contact me at (803) 898-3559 or bristopl@columb32.dhec.state.sc.us.

Sincerely,

Paul L. Bristol, Hydrogeologist
Groundwater Quality Section
Bureau of Water

cc: Trident District EQC

G 9.20.00
Lo 10.6.00

SAMPLING AND ANALYSIS PLAN
FOR
ZONE G/ SITE 17-BUILDING B42

SITE IDENTIFICATION # 17780

Charleston Naval Complex
Charleston, South Carolina

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
Charleston, South Carolina 29406

Submitted by:
CH2M-JONES, LLC.
115 Perimeter Center Place NE
Suite 700
Atlanta, Georgia 30346-1278

Contract Number: N62467-99-C-0960

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August 2000

REPARED BY:

8-29-00
Brian R. Crawford
Engineer II
CH2M-JONES, LLC.

APPROVED BY:

8/30/00
Jed A. Heames
Site Superintendent
CH2M-JONES, LLC.

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ACRONYMS

AST	Aboveground Storage Tank
bls	below land surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene Isomers
CAP	Corrective Action Plan
CNC	Charleston Naval Complex
COC	Chemical of Concern
EISOPQAM	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual
EPA	Environmental Protection Agency
ft	foot
mg/kg	microgram per kilogram
mg/L	microgram per liter
OVA	Organic Vapor Analyzer
QA	Quality Assurance
QC	Quality Control
RBSL	Risk-Based Screening Level
RDA	Redevelopment Authority
SAP	Sampling and Analysis Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSTL	Site-Specific Target Level
TTNUS	Tetra Tech NUS
UST	Underground Storage Tan

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been prepared by CH2M-JONES, LLC. The plan is designed for Zone G/ Site 17-Building B42; Underground Storage Tank (UST) B42 located at the Charleston Naval Complex (CNC), Charleston, South Carolina.

The South Carolina Department of Health and Environmental Control (SCDHEC) has designated this site as Identification Number: 17780. This SAP provides methods to further evaluate the applicability of intrinsic remediation and monitoring well abandonment as a corrective action for UST B42 in accordance with SCDHEC Corrective Action Guidance, June 1997.

1.1 General Site Description

The CNC is in the city of North Charleston, on the west bank of the Cooper River in Charleston County, South Carolina as shown in Figure 1. This installation consists of two major areas: an undeveloped dredge materials area on the east bank of the Cooper River on Daniel Island in Berkley County, and a developed area on the west bank of the Cooper River. The developed portion of the base is on the peninsula bounded on the west by the Ashley River and on the east by the Cooper River.

The area surrounding CNC is "mature urban", having long been developed with commercial, industrial, and residential land use. Commercial areas are primarily west of CNC; industrial areas are primarily to the north of the base along Shipyard Creek. A site vicinity map, which exhibits adjacent properties and structures, vicinity roads, current utilities, and vicinity surface drainage, is included as Figure 2.

Building B42 was used as a store room/boiler house for the former Green House. It was constructed over 20 years ago on previously undeveloped land. UST B42 was a 560 gallon tank which supplied heating fuel oil for the buildings boiler. The boiler was located on the southwest corner of Building B42 (see Figure 3) (Tetra Tech NUS, Inc. [TTNUS] Rapid Assessment Report [RA], 2000).

1.2 Objective

This presents the groundwater monitoring plan to further document that PAH and VOC compounds are not present. in the groundwater to support consideration of "no further action"for Building B42 at this time Details for the abandonment of monitoring wells at this site are also included in this plan.

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2.0 PROPOSED REMEDIATION TECHNOLOGY

Based on the results of the RA modeling, one additional monitoring event will be performed for the site. The monitoring program will consist of sampling all monitoring wells listed in the SCDHEC letter dated 03 April 2000. The proposed monitoring program is described in detail in Sections 3.0 and 4.0 of this plan.

3.0 MONITORING WELL INSTALLATION AND ABANDONMENT

3.1 Monitoring Well Installation

No monitoring wells will be installed as part of this plan.

3.2 Monitoring Well Abandonment

Six monitoring wells will be abandoned at Building B42 following the South Carolina Well Standards and Regulations R.61-71. The well abandonment will include grouting wells, removing stick-ups and removing all guard posts.

3.3 Surveying

Because no monitoring wells will be installed at this site, a new survey will not be conducted.

3.4 Equipment Decontamination

All drilling equipment, augers, well casing and screens, and soil and groundwater sampling equipment involved in field sampling activities will be decontaminated according to the Environmental Protection Agencies (EPA) " Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM).

4.0 PROPOSED GROUNDWATER MONITORING PROGRAM

4.1 Monitoring Frequency and Reporting

The groundwater monitoring program proposed at building B42 will be performed in accordance with SCDHEC Corrective Action Guidance, June 1997, and consist of the following:

Sampling date	Monitoring Wells Sampled	Field Measures	Laboratory Analytical
Second half [1]2000	CNC17-MW-06D, MW-01, MW-02, MW-05	T°, pH, DO, Conductivity, Depth to water, Total depth, Turbidity	Naphthalene 8260 BTEX 8260 Sulfate, nitrate, total dissolved iron, alkalinity, methane

1. Second half is defined by the second half of the year (July through December).

- **Frequency:** Groundwater samples will be taken from CNC17 MW-06D, MW-01, MW-02, MW-05.

- **Reporting:** Groundwater monitoring reports will be submitted to SCDHEC after the sampling event from the second half.

Included in the reports will be field and analytical information from the certified laboratory indicating well numbers, analytical methods used, date sampled, date analyzed, and method detection limits.

Following the sampling event the analytical results will be evaluated and submitted to SCDHEC including further recommendations for the site.

- **Groundwater Sampling**

Prior to any groundwater sampling, each well will be measured for water levels and total depth and each well will be purged in accordance the EPA EISOPQAM.

4.2 Analytical Parameters

The following constituents will be analyzed for each groundwater sample:

- Naphthalene using method 8260.
- BTEX using method 8260

The following parameters will be analyzed in order to evaluate the effectiveness of intrinsic remediation:

- Nitrate (NO^{-3})
- Sulfate (SO^{-4})
- Total dissolved iron
- Methane (CH_4)
- Alkalinity

4.3 Field Measurements

The following parameters will be sampled in the field:

- Temperature
- pH
- Dissolved Oxygen
- Depth to water table
- Depth of well
- Turbidity
- Specific Conductance

Field measurements will be recorded in the field book and in field forms.

4.4 Groundwater Level Measurements

Groundwater measurements will be taken from all monitoring wells at the site during each sampling event. All water level measurements will be taken on the same day as anticipated sampling.

Measurements will be taken with an electrical water level meter or interface probe if floating product is present using the highest part of the top of the casing as a reference point for determining depths to water and total depths. Water level measurements will be recorded to the nearest 0.01-foot in the field book.

4.5 Sample Handling

Sample Handling will be conducted with the following references:

EPA EISOPQAM (EPA May, 1996).

4.6 Sample Packing and Shipping

The following forms will be completed to complete the packing/shipping process:

- Sample labels
- Chain-of-custody labels
- Appropriate labels applied to shipping coolers
- Chain-of-custody forms
- Federal express air bills

4.7 Quality Check

Quality Control (QC) samples will be collected during sampling events. QC samples may include field blanks, field duplicates, and trip blanks. Definitions of each can be found below as described by the EISOPQAM:

- **Field Blank:** a sample collected using organic-free water, which has been run over/through sample collection equipment. These samples are used to determine if contaminants have been introduced by contact of the sample medium with sampling equipment. Equipment field blanks are often associated with collecting rinse blanks of equipment that has been field cleaned.

- **Field Duplicates:** Two or more samples collected from a common source. The purpose of a duplicate sample is to estimate the variability of a given characteristic or contamination associated with a population.

- **Trip Blank:** A sample, which is prepared prior to the sampling event in the actual container and is stored with the investigative samples throughout the sampling event. They are often packaged for shipment with the other samples and submitted for analysis. At no time after their preparation are trip blanks to be opened before they reach the laboratory. Trip blanks are used to determine if samples were contaminated during storage and/or transportation back to the laboratory (a measure of sample handling variability resulting in positive bias in contaminant concentration). If samples are to be shipped, trip blanks are to be provided with each shipment but not for each cooler.

4-8 Control Limits

Analysis	Control Parameter	Control Limit	Corrective Action
Air Monitoring	Check Calibration of OVA daily	Calibrate to manufactures specifications	Recalibrate. If unable to calibrate, replace.
pH of water	Continuing calibration check of pH 7.0 buffer	pH= 7.0	Recalibrate. If unable to calibrate, replace electrode.
Specific Conductance of water	Continuing calibration check of standard solution	> 1% of standard	Recalibrate.

4.9 Record keeping

In addition to records kept in logbooks, forms will be kept on log sheets for soil and groundwater. See Appendix B.

4.10 Site Management and Base Support

Throughout the investigation activities, work on the CNC will be coordinated through SOUTHDIV and SCDHEC.

The primary contacts for each are as follows:

1. SOUTHDIV point of contact
   Gabe Magwood
   Southern Division Engineering Command
   2155 Eagle Drive
   North Charleston, SC 29406
   (843) 820-7307

2. SOUTHDIV point of contact
   Tony Hunt
   Southern Division Engineering Command
   2155 Eagle Drive
   North Charleston, SC 29406
   (843) 820-7307

3. SCDHEC point of contact
   Paul Bristol
   South Carolina Department of Health and Environmental Control
   2600 Bull Street
   Columbia, SC 29201
   (843) 898-3559

REFERENCES

South Carolina Department of Health and Environmental Control. 1997. Corrective Action Guidance.

Tetra Tech NUS, Inc.; 2000 Rapid Assessment for Site 17 (Building B42), Charleston, South Carolina.

United States Environmental Protection Agency. 1990. Code of Federal Regulations 136.

United States Environmental Protection Agency. 1988. EPA Users Guide to Contract Laboratory Program.

United States Environmental Protection Agency. 1996. EPA Environmental Investigations Standard Operating Procedures for Quality Assurance Manual.

APPENDIX A

BORING LOG

PROJECT NAME: Site 17 Bldg. B42 BORING NUMBER: CNC-17-BØ1
PROJECT NUMBER: ND124 Zone G DATE: 5-2
DRILLING COMPANY: GEOLOGIST: SASCO
DRILLING RIG: 250 / 5200 DRILLER: COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1						Asphalt, fill		Dry		n/a		
	2						fill		Dry		n/a		
	3					Dk Brown	Sandy silt, some fill		Dry	2			
	4		4			Lt Brown	" " some clay		Moist	2			
	5					Brown	Sandy silt		Moist	3			
	6					Yellow-Brown	" "		"	3			
	7					Tan	" "		"	2			
X	8		4			Tan/lt. gray	" " trace clay		Moist	2			
	9						Sandy silt		Wet	2			
	10				Med stiff		" " with clay		Moist	2			
	11				Med. stiff		" " with clay		Moist	2			
	12		4				" "		Wet	2			
	13					Lt. gray	Silty sand		Saturated	—			
	14					Lt gray	Silty sand		Saturated	—			
	15						—		—	—			
	16		2				—		—				
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area 9

Remarks:

Background (ppm): 2

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

PROJECT NAME: Site 17 Bldg. B42 BORING NUMBER: CNC17-B03
PROJECT NUMBER: W0124 Zone G DATE: 5-3
DRILLING COMPANY: GEOLOGIST: SISCO
DRILLING RIG: 250 / 5400 DRILLER: COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1						Asphalt		Dry				
	2						Fill		Dry				
	3					Dk. Brown	Sandy silt		Moist	2			
	4		3.5			Dk. Brown	" " , trc clay		Moist	2			
	5					" "	" " " "		moist	2			
	6			mottled orange		Lt. Brown	" , some clay		moist	2			
	7					Hi gray	silty organic clay		moist	50			
	8		4			Lt. gray	silty organic clay		moist	100			
	9					Lt gray	silty organic clay		wet	10			
	10					Hi gray	" "		moist	20			
	11					mottled "	" "		moist	20			
	12		4			olive "	silty sand		wet	20			
	13								SATURATED				
	14								"				
	15								"				
	16		0						"				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 2

Remarks:

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

PROJECT NAME: Site 17 Bldg. B42 BORING NUMBER: CNC17-BØ6
PROJECT NUMBER: N0124 Zone G DATE: 5-3
DRILLING COMPANY: GEOLOGIST: S/SCO
DRILLING RIG: 250 / 5700 DRILLER: COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1						asphalt (3")		dry				
	2			dk	brown		sandy silt		dry	2			
	3			orange			silty sand		dry	2			
	4		3.5'	orange			" "		moist	2			
	5			med. stiff orange			silty clay trace sand		moist	3			
	6			orange			sand silt some clay		moist	3			
	7			orange			silty sand		moist	3			
	8		4'	orange w/brown			silty clayey sand		moist	3			
X	9			mottled			silty clay		moist	3			
X	10			orange w/olive			silty sand trace clay		moist	3			
	11						silty sand		wet	3			
	12		4'				" " tr. clay		wet	3			
	13			lt. brown			silty sand		saturated	–			
	14			lt. brown			" "		saturated	–			
	15						" "		saturated	–			
	16		3'	lt. brown			" "		saturated	–			
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 2

Converted to Well: Yes ____ No X Well I.D. #: ____

BORING LOG

PROJECT NAME: Site 17 Bldg. B42
BORING NUMBER: 17-B08
PROJECT NUMBER: N0124 Zone G
DATE: 5-3
DRILLING COMPANY:
GEOLOGIST: SISCO
DRILLING RIG: 250 / 5400
DRILLER: COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				—		Asphalt		Dry				
	2				Dark brown		fill & sandy silt		Dry				
	3				Orange brown		Sandy silt		Moist	3			
	4		3.5		" "		" "		Moist	3			
	5				Brown		" "		"	3			
	6				" Orange		" " tr. clay		"	3			
	7				stretched "		" " some clay		"	3			
	8		4		Lt. Gray		Sandy silt tr. clay		Moist	3			
	9				Lt. Brown		Sandy silt		"	3			
	10				Gray		Silty clay		"	3			
	11				Gray		" "		"	3			
	12		4	▼	Gray		Silty Sand		Wet	3			
	13								Saturated	~~3~~			
	14								"				
	15								"				
	16		Ø						"				
	17												
	18												
	19												
	20		Ø										
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 3

Remarks:

Converted to Well: Yes X No ____ Well I.D. #: ____

Piezometers

BORING LOG

PROJECT NAME: Chas. Naval Complex
PROJECT NUMBER: 0219 /Site 17/Zone E G
DRILLING COMPANY: Custom Drilling Co.
DRILLING RIG: B-61 Mobile
BORING NUMBER: CNC17-MW06D
DATE: 6/21/99
GEOLOGIST: Mark Darrington
DRILLER: Darrell Martin

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0	0						No S.S. samples collected						
	15			15					strong petro odor.				
1	15	4/2	0"				No sample retained in spoon even using sand catcher device.			—		2K	0
	17	2/2											
2	17	3/6	18"	17.5	dkbr-or		- silty sand M-C grn, poorsort (Top 3") - moist		No petro. odors				
	19	7/10			dkgry		(@17.5) stiff clay, plastic, smooth, dry to damp.		No petro. odor.	0			0
3	19	3/3	3"		dkgrey		Clay - stiff, cohesive, plastic, smooth, no shells, dense, dry to damp			0			0
	21	5/6											

19-20' interval -- Upon retrieving the S.S. sampler, it was noted that the formation @ 19-20' was so tight or created such a suction that the 3" stainless tip to the S.S. sampler was pulled off.
TO set surface casing, 6" Ø PVC, (S.C) to 20 ft. bls. - TO create pilothole to 20 ft.

When rock coring, enter rock brokeness.
Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks:

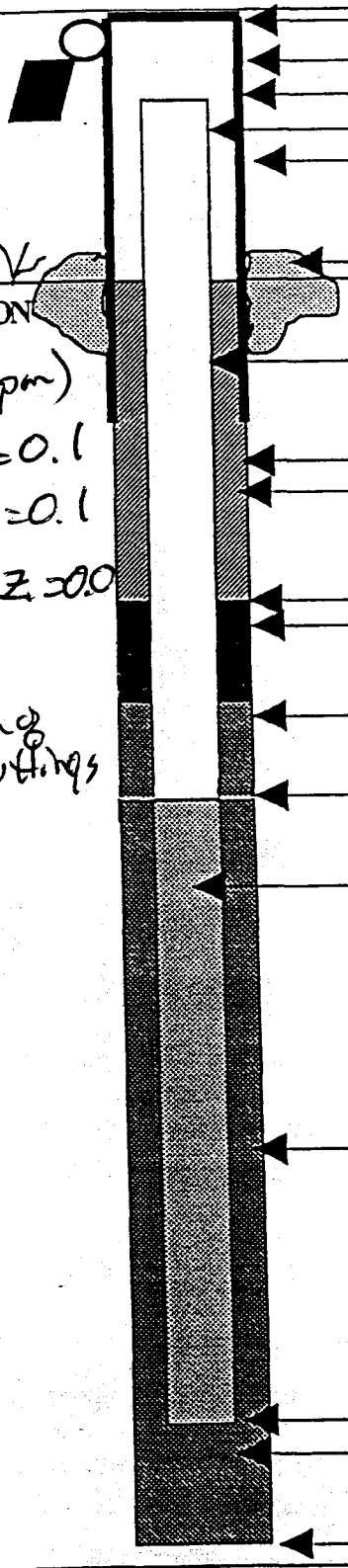
Converted to Well: Yes ✓ No ____ Well I.D. #: CNC17-MW06D

BORING NO

OVERBURDEN MONITORING WELL SHEET

~~Zone F~~ Zone G

PROJECT Chas Naval Complex	LOCATION: Site 17 (B42)	DRILLER Custom Dr
PROJECT NO. ~~0124~~ ~~0219~~ N0124 062199	BORING CNC017-MW03	METHOD: ~~DPT~~ 4.25" H
ELEVATION Site 17	DATE 6/16/99	DRILLING Darrell Martin
FIELD GEOLOGIST Mark Darrington		DEVELOPMENT: ~~NA~~



(Asphalt)
GROUND
ELEVATION

FID (ppm)
- Bkgrnd = 0.1
- In Hole = 0.1
- Driller BZ = 0.0

(A) 1 Drum of Soil Cuttings

ELEVATION OF TOP OF SURFACE CASING:
ELEVATION OF TOP OF RISER PIPE:
STICK-UP TOP OF SURFACE CASING: Flush
STICK-UP RISER PIPE: Flush
I.D. OF SURFACE CASING: 8" ID x 10" OD
TYPE OF SURFACE CASING: Steel Cover with bolt-on lid (Flush) Pemco
TYPE OF SURFACE SEAL: Concrete Pad (Quickcrete) 2ft x 2ft x 6 inch
RISER PIPE I.D.: 2 inch
TYPE OF RISER PIPE: PVC, Sch. 40 Flush threaded (F.T.)
BOREHOLE DIAMETER: 8.25 inch
TYPE OF SEAL: Portland Cement Type I
ELEVATION / DEPTH OF SEAL: 12.5'
TYPE OS SEAL: "Choke Sand" Very Fine Sand (30/65)
DEPTH TOP OF SAND PACK: 4.0'
ELEVATION / DEPTH TOP OF SCREEN: 15.0'
TYPE OF SCREEN: PVC, Sch. 40, F.T.
SLOT SIZE X LENGTH: 0.010 inch x 10 ft.
I.D. OF SCREEN: 2 inch.
TYPE OF SAND PACK: Standard sand (m) Qtz sand (20/30) 7/50 lb. bags
ELEVATION / DEPTHBOTTOM OF SCREEN: 115.0'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 115.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: Sand (20/30)
ELEVATION / DEPTH OF HOLE: 115.0'

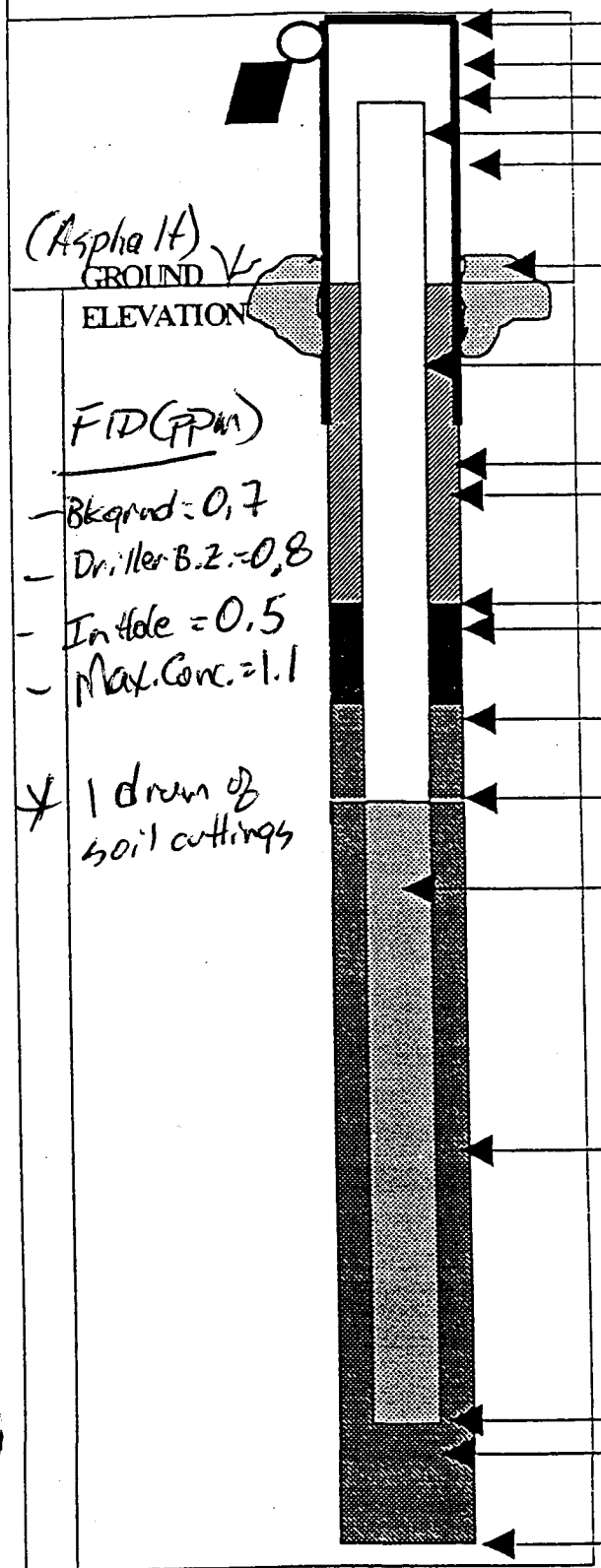
BORING NO.: CNC17-MW05

OVERBURDEN MONITORING WELL SHEET

PROJECT: Chas. Naval Complex
PROJECT NO.: ~~0124~~ 0124
ELEVATION: 062199
FIELD GEOLOGIST: Mark Dairington

LOCATION: Site 17 / B42 (~~Zone F~~ Zone G)
BORING: CNC17-MW05
DATE: 6/16/99

DRILLER: Custom Drilling
METHOD: ~~DPT~~ 4.25" HSA
DRILLING: Darrell Martin
DEVELOPMENT: ~~NA~~



FID (PPM)
- Bkgrnd: 0.7
- Driller B.Z.: 0.8
- In Hole = 0.5
- Max. Conc. = 1.1

* 1 drum of soil cuttings

ELEVATION OF TOP OF SURFACE CASING:
ELEVATION OF TOP OF RISER PIPE:
STICK-UP TOP OF SURFACE CASING: Flush
STICK-UP RISER PIPE: Flush
I.D. OF SURFACE CASING: 8" ID x 10" OD
TYPE OF SURFACE CASING: Steel cover w/ bolt-on lid (Flush) & Pemco
TYPE OF SURFACE SEAL: Concrete Pad (Quickcrete) 2ft x 2ft x 6in.
RISER PIPE I.D.: 2-in.
TYPE OF RISER PIPE: PVC, Sch. 40 Flush Threaded (F.T.) & Toomey
BOREHOLE DIAMETER: 8.25-in.
TYPE OF SEAL: Portland Cement Type I
ELEVATION / DEPTH OF SEAL: 12.5'
TYPE OS SEAL: "Choke Sand" Very fine Qtz. Sand (30/65)
DEPTH TOP OF SAND PACK: 4.0'
ELEVATION / DEPTH TOP OF SCREEN: 15.0'
TYPE OF SCREEN: PVC, Sch. 40, F.T.
SLOT SIZE X LENGTH: 0.010-in x 10ft.
I.D. OF SCREEN: 2-in.
TYPE OF SAND PACK: Standard Sand (TM) Qtz. Sand (20/30) 7/50lb. bags
ELEVATION / DEPTH BOTTOM OF SCREEN: 115.0'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 115.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: Sand (20/30)
ELEVATION / DEPTH OF HOLE: 115.0'

APPENDIX B

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 17 Bldg. B42
Project No.: N0124 Zone G

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 17SLB01-0708
Sample Location:
Sampled By: JA/JB
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/17/99	7-8'	orange	clay sand
Time: 1050			
Method:			
Monitor Reading (ppm): 1			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH	1 4oz jar	✓	
BTEX	4 encore	✓	

OBSERVATIONS / NOTES:

MAP:

Duplicate if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Janet Bonknight

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 17 Bldg. 842
Project No.: N0124 Zone G

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 17SLB03-0506
Sample Location:
Sampled By: JA / JB
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/17/99	5-6'	orange mottled	sandy clay
Time: 1210			
Method:			
Monitor Reading (ppm): 1			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TOC - FOC	1 4oz jar	✓	
TPH	1 4oz jar	✓	
PAH	1 4oz jar	✓	
BTEX	4 EnCore	✓	
Grain Size Hydrometer	2 32oz jars	✓	

OBSERVATIONS / NOTES:

Bored twice to get enough sample

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Garrett Borkenight

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 17 Bldg. B42
Project No.: N0124 Zone G

[] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 17SLB05-0708
Sample Location:
Sampled By: JA / JB
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/17/99 Time: 1200 Method: Monitor Reading (ppm): 3	7-8'	orange grey mottel	sandy clay

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH	1 4oz jar	✓	
BTEX	4 EnCores	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
	17SLB05-0708D

Signature(s): Janet Banknight

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 17 Bldg. B42
Project No.: N0124 Zone G

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 17SLB09-0708
Sample Location:
Sampled By: JA / JB
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/17/99 Time: 1425 Method: Monitor Reading (ppm): 3	7-8'	orange & grey mottled	clay sand moist

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH	1 4oz jar	✓	
BTEX	4 Encore	✓	

OBSERVATIONS / NOTES:

Drilled to 11ft

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Janet Bonknight

MONITORING WELL DEVELOPMENT RECORD

Well: MW-2 Zone G
Site: 17 Bldg. B42
Date Installed: 6-16-99
Date Developed: 7-9-99
Dev. Method: Pump
Pump Type:

Depth to Bottom (ft.): 14.75
Static Water Level Before (ft.): 9.00
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity: .98 gals.
Casing ID (in.): 2"

Responsible Personnel: B. Hill
Drilling Co.: Custom Drilling
Project Name: CNC17 Zone G
Project Number: N0124

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)	D.O
0812		3		28.6°	6.08	.647	999	Tan	3.80
0815		10		29.4°	6.22	.619	999	"	4.02
0817		15		30.6°	6.24	.620	865	"	4.06
0823		25		31.5°	6.27	.571	185	"	4.00
0827		30		30.9°	6.15	.524	89	Cloudy	4.00
0830		35		31.7°	6.19	.578	85	"	4.02
								Total Purged	
								~ 35 gals	

MONITORING WELL DEVELOPMENT RECORD

Page ___ of ___

Well: MW-3 Zone G
Site: 17 Bldg. B42
Date Installed: 6-16-99
Date Developed: 7-9-99
Dev. Method: Pump
Pump Type:

Depth to Bottom (ft.): 15.10'
Static Water Level Before (ft.): 9.00
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity: .99 gals.
Casing ID (in.): 2"

Responsible Personnel: R. Hill
Drilling Co.: Custom Drilling
Project Name: CNG17 Zone G
Project Number: N0124

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)	D.O.
1040		1		34.5	6.08	.507	999	Tan	3.41
1046		6		31.6	6.11	.355	999	"	4.19
1052		10		32.4	6.11	.336	999	"	3.91
1058		14		32.9°	6.05	.317	500	"	4.10
1103		18		32.9°	5.99	.311	148	Cloudy	4.02
1108		22		33.3	6.00	.321	85	"	4.24
1113		26		32.8°	5.96	.313	53	"	4.42
1119		30		33.2°	5.91	.307	40	"	4.30

MONITORING WELL DEVELOPMENT RECORD

Well: MW-6D Zone G
Site: 17 Bldg. B42
Date Installed: 6-22-99
Date Developed: 7-9-99
Dev. Method: Pump
Pump Type:

Depth to Bottom (ft.): 26.25
Static Water Level Before (ft.): 8.43
Static Water Level After (ft.):
Screen Length (ft.): 5'
Specific Capacity: 2.9 gals
Casing ID (in.): 2"

Responsible Personnel: R. Hill
Drilling Co.: Custom Drilling
Project Name: CNG17 Zone G
Project Number: N0124

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.) D.O
0940		1		35.2°	8.74	.400	23	Green 2.06

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: CNC Zone G

Project No.: N0124 Site 17 Bldg. B42

Sampled By: JA/RH

Field Analyst:

Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 17GLMØ1Ø1 ~~MW1~~

Sample Location: MW1

Duplicate: ☐

Blank: ☐

SAMPLING DATA:

Date: 7 20 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: 0-1 ppm ~~mg/L~~) Analysis Time: 1605 ~~1555~~

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
	x 0.01	= mg/L
	x 0.02	= mg/L

CHEMetrics: 1 ~~mg/L~~ ppm

Notes:

Alkalinity:

Analysis Time: 1620

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & _____	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	= mg/L
☒	100-400 mg/L	100 ml	1.600 N	1.0	~~Ø~~ & 1ØØ	x 1.0	= 1ØØ mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & _____	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:	Ø	Ø	1ØØ

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1632

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☒	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
	x 0.1	= mg/L
	x 0.2	= mg/L
3Ø1	x 1.0	= 3Ø1 mg/L
	x 2.0	= mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: Site 17 Bldg. B42

Sample ID No.: 17GLM01

Project No.: N0124 Zone G

Sample Location:

Sampled By:

Duplicate: ☐

Field Analyst:

Blank: ☐

Field Form Checked as per QA/QC Checklist (initials):

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: _____ Analysis Time: 1821

Program/Module: 525nm 41

Concentration: 0.1 mg/L

Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 __ IR-18C Color Wheel Other: _____ Analysis Time: _____

Program/Module: 500nm 33

Concentration: 0.07 mg/L

Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____

Concentration: _____ mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☑

Correct measurement units are cited in the SAMPLING DATA block: ☑

Mulitplication is correct for each *Multiplier* table: ☑

Final calulated concentration is within the appropriate *Range Used* block: ☑

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☑

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☑

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☑

Title block is initialized by person who performed the QA/QC Ckecklist: ☑

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: Site 17 Bldg. B42
Sample ID No.: 17GLMφ2φ1
Project No.: N0124 Zone G
Sample Location:
Sampled By:
Duplicate: ☐
Field Analyst:
Blank: ☐
Field Form Checked as per QA/QC Checklist (initials):

SAMPLING DATA:

Date: 7 20 95	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1648

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
_____	x 0.01	= mg/L
_____	x 0.02	= mg/L

CHEMetrics: .6 mg/L

Notes:

Alkalinity:

Analysis Time: 1623

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & _____	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	= mg/L
☒	100-400 mg/L	100 ml	1.600 N	1.0	275 & 275	x 1.0	= 275 mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & _____	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:	0	φ	1φφ

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1645

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☒	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
_____	x 0.1	= mg/L
_____	x 0.2	= mg/L
22φ	x 1.0	= 22φ mg/L
_____	x 2.0	= mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: Site 17 Bldg. B42

Project No.: N0124 Zone G

Sampled By:

Field Analyst:

Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.:

Sample Location: Fmw 2

Duplicate: ☐

Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: _____ Analysis Time: 1823

Program/Module: 525nm 41

Concentration: 1.2 mg/L

Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: _____

Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 __ IR-18C Color Wheel Other: _____ Analysis Time: _____

Program/Module: 500nm 33

Concentration: 0.11 mg/L

Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____

Concentration: _____ mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☑

Correct measurement units are cited in the SAMPLING DATA block: ☑

Mulitplication is correct for each *Multiplier* table: ☑

Final calulated concentration is within the appropriate *Range Used* block: ☑

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☑

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☑

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☑

Title block is initialized by person who performed the QA/QC Ckecklist: ☑

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: Site 17 Bldg. B42
Project No.: ND124 Zone G
Sampled By:
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 17GLM03Ø1
Sample Location:
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 7 20 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1610

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
_____	x 0.01	= mg/L
_____	x 0.02	= mg/L

CHEMetrics: .9 ~~mg/L~~ ppm

Notes:

Alkalinity:

Analysis Time: 1626 92

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & _____	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	= mg/L
☒	100-400 mg/L	100 ml	1.600 N	1.0	— & 2Ø0	x 1.0	= 244 mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & _____	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:	Ø	Ø	2Ø6

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: 1653

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☒	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
_____	x 0.1	= mg/L
_____	x 0.2	= mg/L
195	x 1.0	= 195 mg/L
_____	x 2.0	= mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: Site 17 Bldg. B42
Project No.: N0124 Zone G
Sampled By:
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.:
Sample Location: 17mw3
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: _____ Analysis Time: 1823

Program/Module: 525nm 41

Concentration: 1.1 mg/L

Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: _____

Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 __ IR-18C Color Wheel Other: _____ Analysis Time: _____

Program/Module: 500nm 33

Concentration: 0.00 mg/L

Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____

Concentration: _____ mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Ckecklist: ☐

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: ONSIT Bldg. B42
Project No.: ND124 Zone G

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 17GLM0551
Sample Location: MW-5
Sampled By: JH / RH
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 7-20-99								
Time: 1510	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:	Clear	4.37						

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 7-20-99								
Method: Slow Purge	Initial	4.37	.230	26.2	19	3.51		
Monitor Reading (ppm):	1	4.62	.189	26.3	5	3.79		
Well Casing Diameter & Material	2	4.76	.189	26.9	21	3.92		
Type: PVC 2"	3	4.57	.192	26.9	15	3.25		
Total Well Depth (TD):	14.98							
Static Water Level (WL):	8.68							
One Casing Volume(gal/L): 1.05	~~1008~~							
Start Purge (hrs):	1008							
End Purge (hrs):	1100							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, Naph., MTBE, EDB	HCl	3 x 40 ml vials	7-20-99
PAH	—	2 x 1 L amber	7-20-99

OBSERVATIONS / NOTES:

Circle if Applicable:

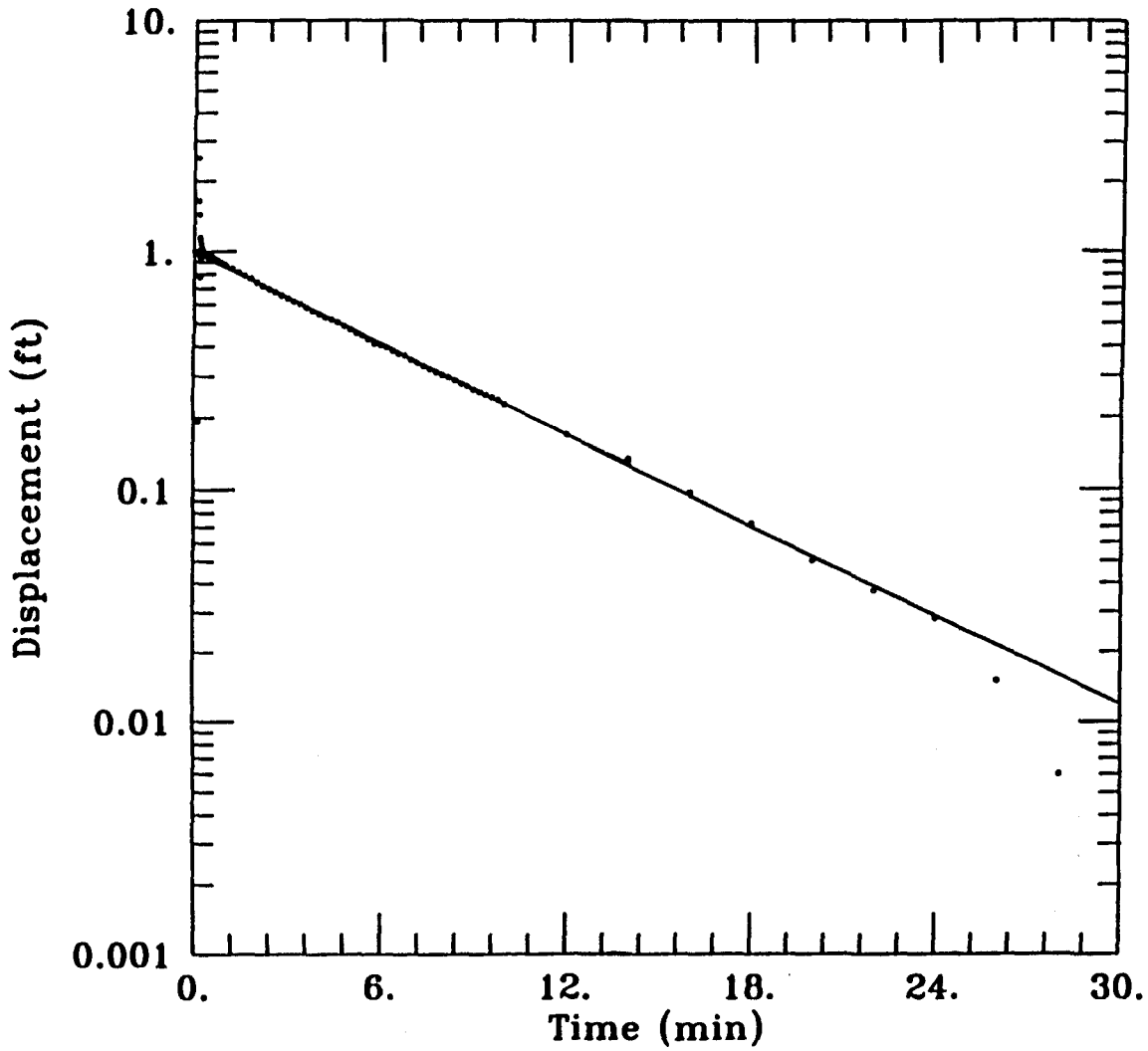
MS/MSD	Duplicate ID No.:

Signature(s):

APPENDIX C

Client: **CLEAN**	Company: **E/A&H**
Location: **NAVAL BASE CHARLESTON**	Project: **2907-08450**

FALLING HEAD SLUG TEST NBCGGDG002



DATA SET:
G002FAL.AQT
04/09/97

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

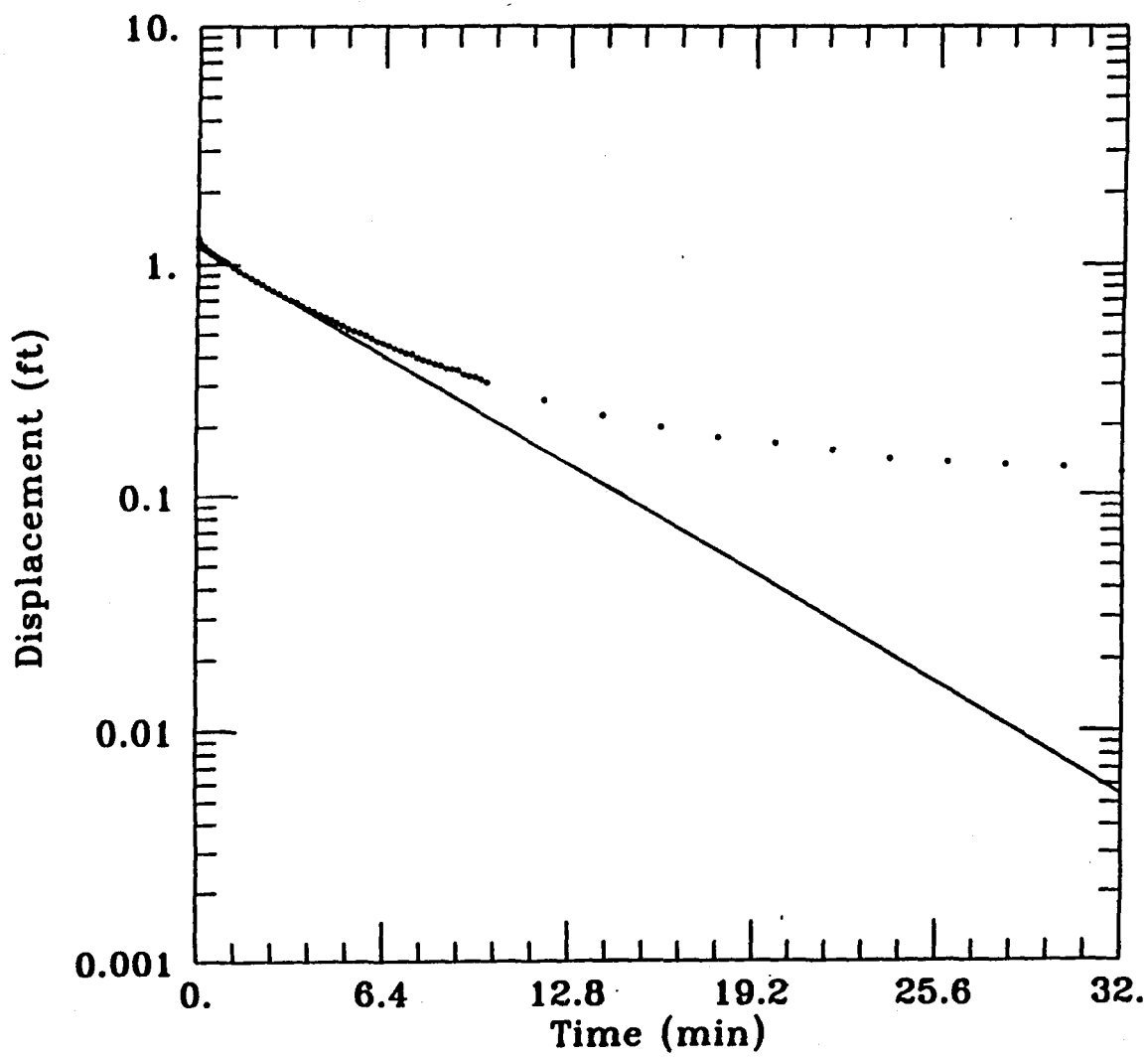
PROJECT DATA:
test date: January 1997

TEST DATA:
H0 = 1. ft
rc = 0.083 ft
rw = 0.3125 ft
L = 5. ft
b = 5. ft
H = 5. ft

PARAMETER ESTIMATES:
K = 0.0002064 ft/min
y0 = 0.9928 ft

Client: **CLEAN**	Company: **E/A&H**
Location: **NAVAL BASE CHARLESTON**	Project: **2907-08450**

RISING HEAD SLUG TEST NBCGGDG002



DATA SET:
G002RIS.AQT
04/09/97

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: January 1997

TEST DATA:
H0 = 1. ft
rc = 0.083 ft
rw = 0.3125 ft
L = 5. ft
b = 5. ft
H = 5. ft

PARAMETER ESTIMATES:
K = 0.0002353 ft/min
y0 = 1.184 ft

AQTESOL

TABLE 1

GROUNDWATER ELEVATIONS
SITE 17, BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well #	Total Depth of Well (ft)	Top of Casing Elevation, ft (MSL)	Date Measured	Depth to Water, ft (BTOC)	Depth to Product, ft (BTOC)	Product Thickness (ft)	Groundwater Elevation (MSL)
CNC17-M01	12	12.54	7/20/1999	8.85	ND	ND	3.69
CNC17-M02	12	12.42	7/20/1999	8.73	ND	ND	3.69
CNC17-M03	12	12.36	7/20/1999	8.66	ND	ND	3.70
CNC17-M04	12	12.09	7/20/1999	8.41	ND	ND	3.68
CNC17-M05	12	12.42	7/20/1999	8.68	ND	ND	3.74
CNC17-M06D	12	12.57	7/21/1999	9.50	ND	ND	3.07

TABLE 3

GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS
SITE 17, BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Dissolved Oxygen (mg/l)	Alkalinity (mg/l)	Carbon Dioxide (mg/l)	Sulfide (mg/l)	Ferrous Iron (mg/l)	Nitrite (mg/l)	Manganese (mg/l)	Nitrogen/ Nitrate (mg/l)*	Sulfate (mg/l)*	Methane (ug/l)*
CNC17-M01	7/20/1999	2.60	100	301	0.02	0.07	NA	0.1	0.040	NA	NA
CNC17-M02	7/20/1999	2.26	275	220	0.01	0.11	NA	1.2	NA	NA	NA
CNC17-M03	7/20/1999	3.60	200	195	0.03	0.00	NA	1.1	0.090	NA	NA

Notes:
mg/l - Milligrams per liter
ug/l - Micrograms per liter
E- Estimated Concentration
* Fixed base laboratory analysis
NA = Not analyzed

TABLE 4

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 17, BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (ppm)
CNC17-B06	17SSB0602	2	2
	17SSB0603	3	2
	17SSB0604	4	2
	17SSB0605	5	2
	17SSB0606	6	50
	17SSB0607	7	100
	17SSB0608	8	10
	17SSB0609	9	20
	17SSB0610	10	20
CNC17-B07	17SSB0703	3	2
	17SSB0704	4	2
	17SSB0705	5	2
	17SSB0706	6	2
	17SSB0707	7	2
	17SSB0708	8	2
	17SSB0709	9	2
	17SSB0710	10	3
CNC17-B08	17SSB0803	3	3
	17SSB0804	4	3
	17SSB0805	5	3
	17SSB0806	6	3
	17SSB0807	7	3
	17SSB0808	8	3
	17SSB0809	9	3
	17SSB0810	10	3
CNC17-B09	17SSB0903	3	3
	17SSB0904	4	3
	17SSB0905	5	3
	17SSB0906	6	3
	17SSB0907	7	3
	17SSB0908	8	3
	17SSB0909	9	5
	17SSB0910	10	10

Notes:
OVA - organic vapor analyzer equipped with a flame ionization detector
PPM - parts per million

TABLE 6

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
SITE 17, BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Laboratory Screening Date (PPB)[1]					
		Benzene	Toluene	Ethyl-benzene	Total Xylenes	Naphthalene	Diesel Range Organics
CNC17-B01	17GFB01-16	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
CNC17-B02	17GFB02-16	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC17-B03	17GFB03-16	<1.0	<1.0	9.8	3.1	540	1.4
CNC17-B04	17GFB04-16	<1.0	<1.0	<1.0	<1.0	8	0.1
CNC17-B05	17GFB05-16	<1.0	<1.0	<1.0	<1.0	21	0.2
CNC17-B06	17GFB06-16	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC17-B07	17GFB07-16	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
CNC17-B08	17GFB08-16	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC17-B09	17GFB09-16	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1

NOTES:
(1) Laboratory screening data were analyzed using USEPA Method 8260.
Compounds not detected are reported as less than the instrument detection limit.
PPB - parts per billion
NA = Not analyzed

TABLE 8

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE 17, BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/ Sample No.	Sample Date	Benzene (ug/L)	Ethyl-benzene (ug/L)	Toluene (ug/L)	Xylenes (total) (ug/L)	Naphthalene (ug/L)	Benzo(a) anthracene (ug/L)	Benzo(b) fluoranthene (ug/L)	Benzo(k) fluoranthene (ug/L)	Chrysene (ug/L)	Dibenzo(a,h) anthracene (ug/L)	MTBE (ug/L)
RBSL[1]		5	700	1000	10000	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	40
CNC17M-01 / 17GLM0101	20-Jul-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC17M-02 / 17GLM0201	20-Jul-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC17M-03 / 17GLM0301	20-Jul-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC17M-04 / 17GLM0401	20-Jul-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC17M-05 / 17GLM0501	20-Jul-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC17M-06 / 17GLM0601	21-Jul-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC17M-06 / 17GLM0601D	21-Jul-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC17TL[3] / 17TL00401	20-Jul-99	< 5	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5
CNC17TL[3] / 17TL00501	21-Jul-99	< 5	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5

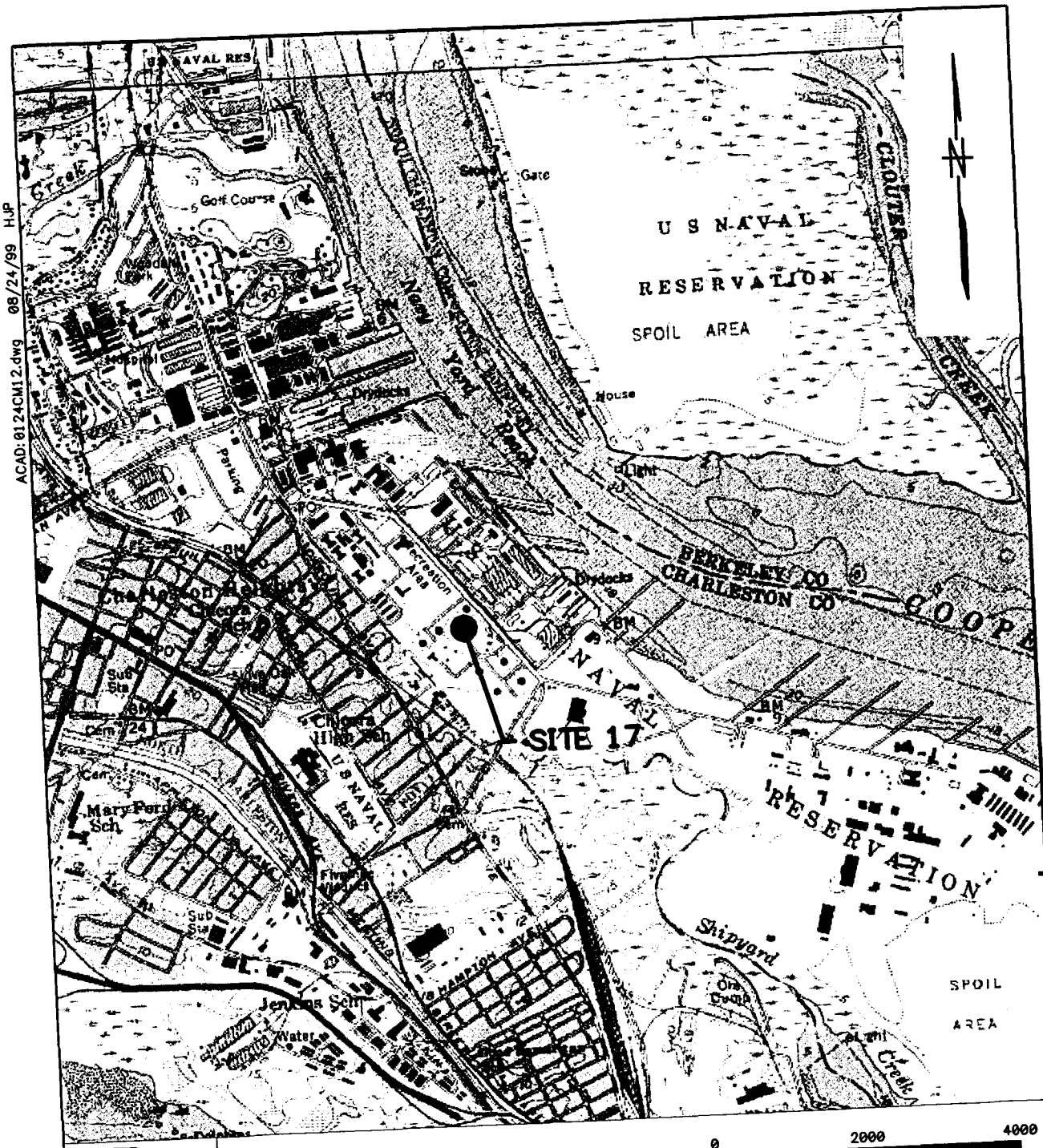
All concentrations are in ug/L.

NA - Not analyzed

(1) South Carolina Department of Health and Environmental Control Risk Based Screening Levels for ground water.

(2) The Risk based screening level for individual PAH CoC is 10 ug/l or 25 ug/l for total PAHs.

(3) Trip blank



SOURCE: QUADRANGLE MAP SOUTH CAROLINA, REVISED 1979
QUADRANGLE MAP NORTH CHARLESTON REVISED, 1979

DRAWN BY HJP	DATE 8/20/99	SITE LOCATION MAP SITE 17, BUILDING B42, ZONE G CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SC	CONTRACT NO. N0124
CHECKED BY	DATE		APPROVED BY / DATE
COST/SCHED-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1 / REV. 0

DEPARTMENT OF THE NAVY ★ SOUTHERN DIV FACILITIES ENGINEERING COMD ★

ACAD: 0124CM12.dwg 08/24/99 HJP

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

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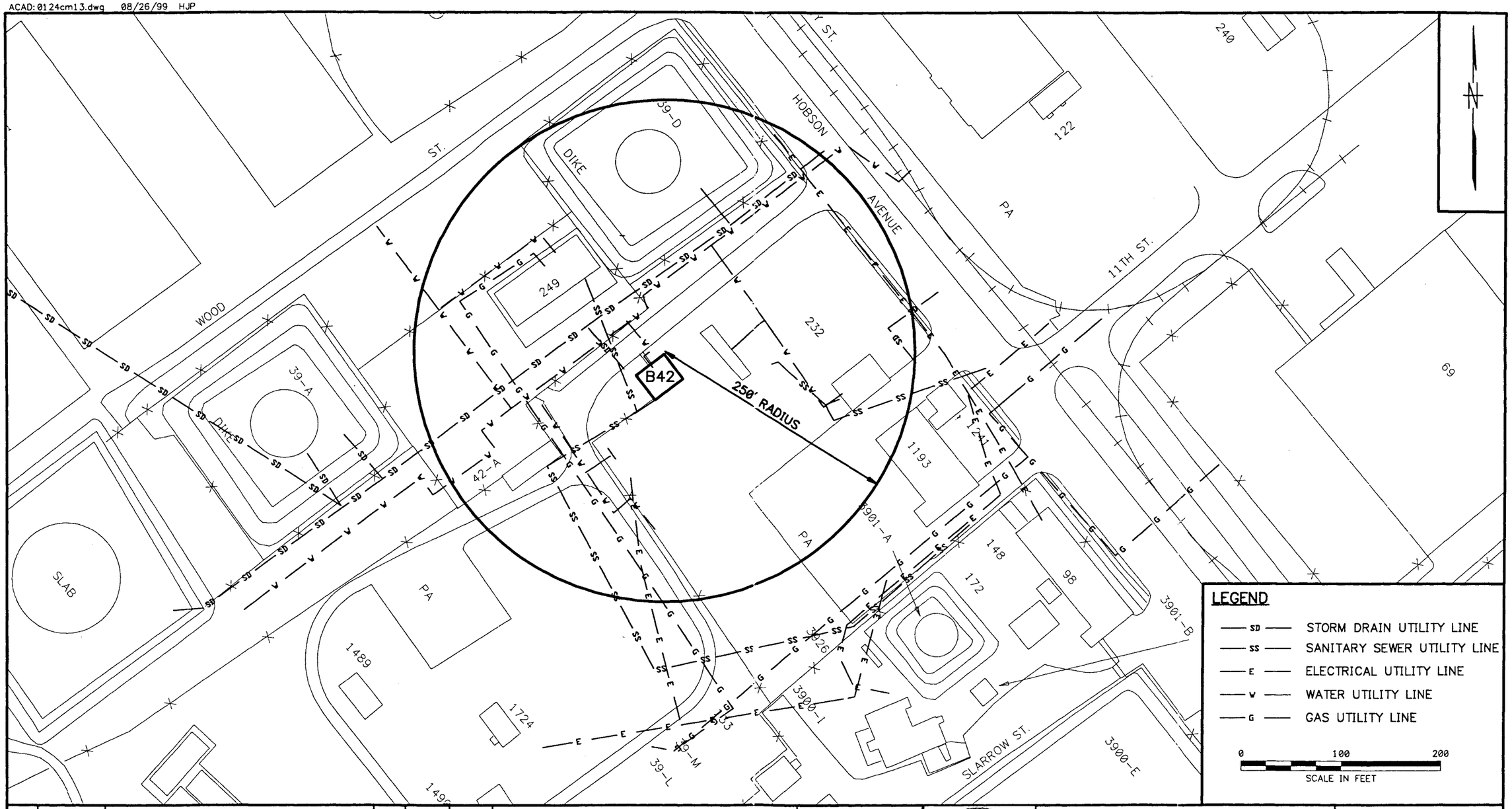


NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

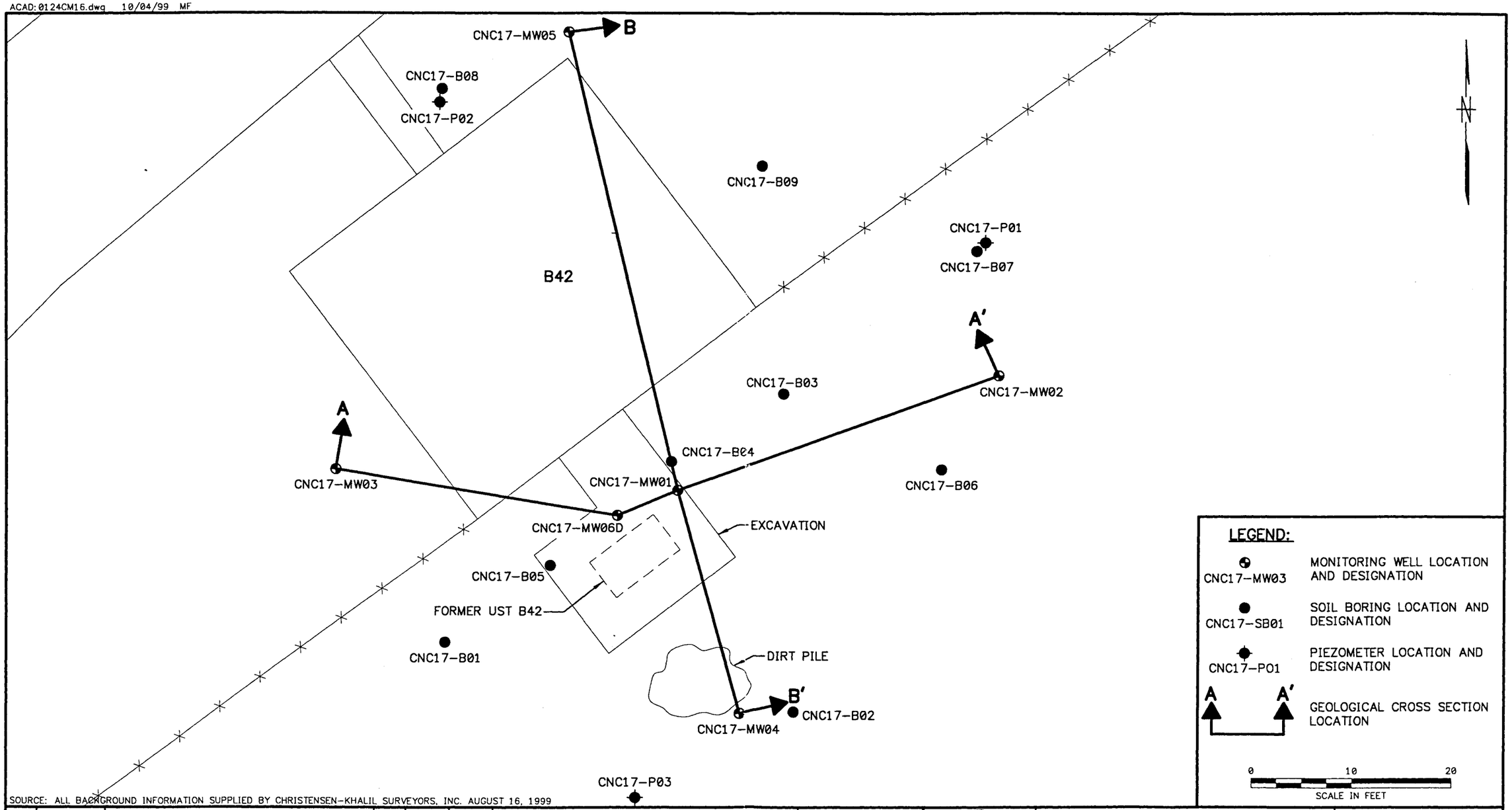
DRAWN BY HJP DATE 8/24/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SITE VICINITY MAP
SITE 17, BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

ACAD: 0124CM16.dwg 10/04/99 MF



SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

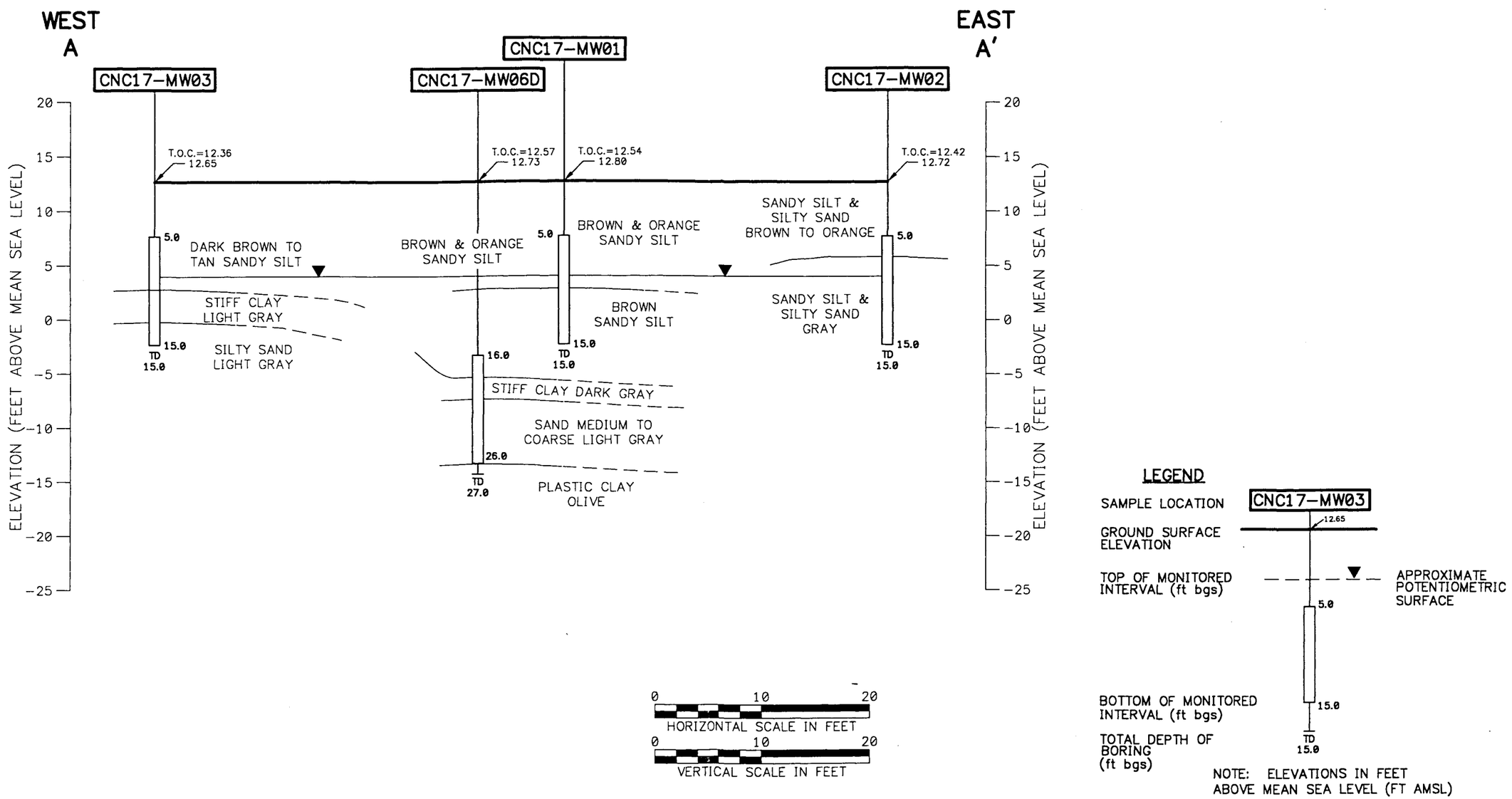
DRAWN BY MF DATE 10/4/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SITE AREA AND SAMPLING LOCATIONS
SITE 17 BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 3
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

ACAD:0124GX01.dwg 10/08/99 MF



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 10/5/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION A-A'
SITE 17, BUILDING B42
ZONE G CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 4
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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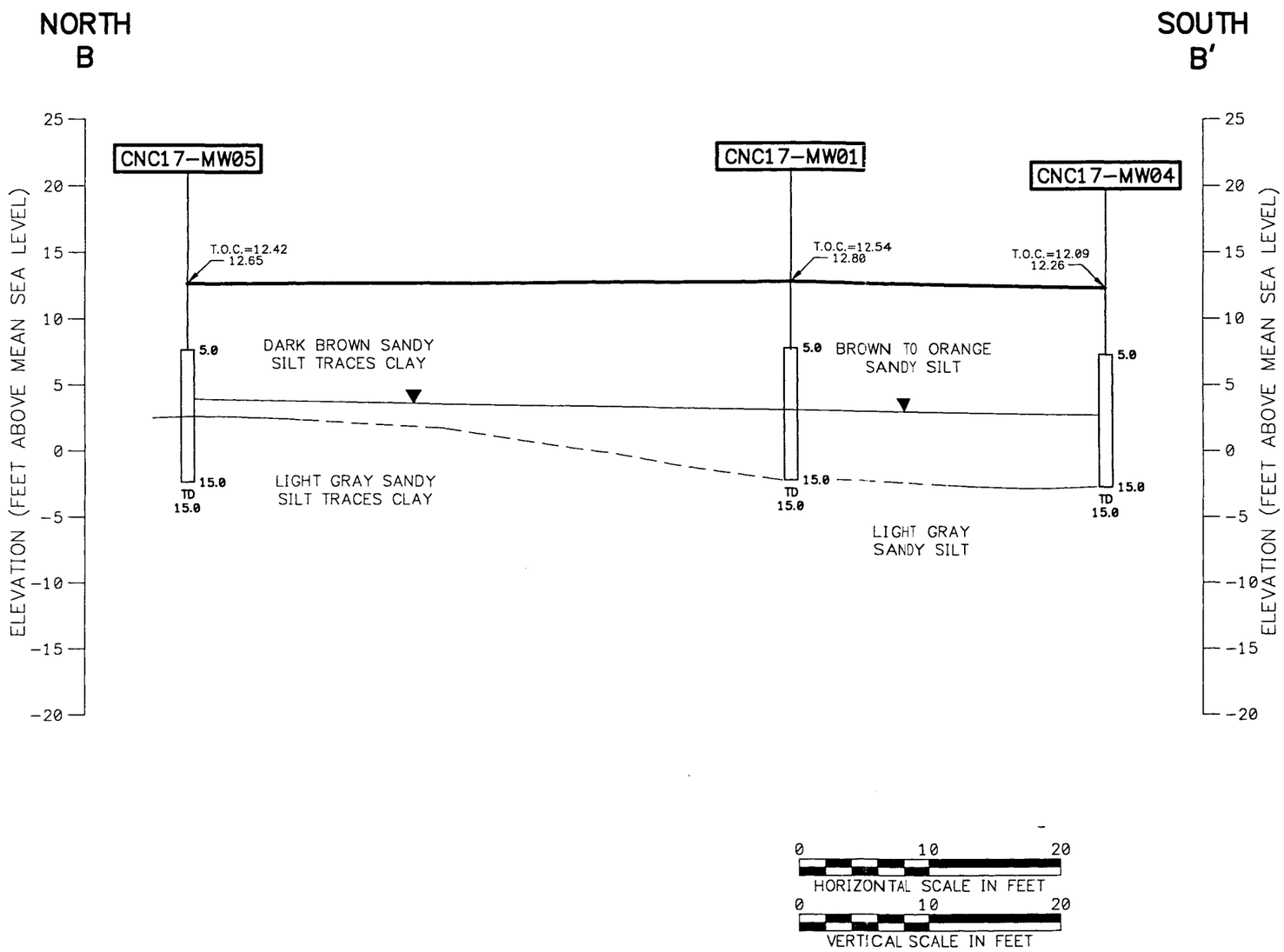
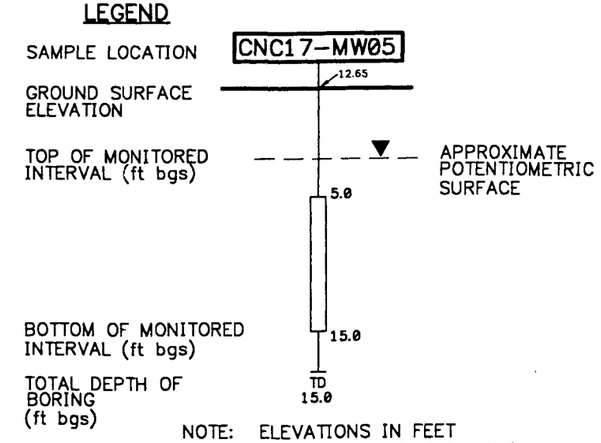


LEGEND



NOTE: ELEVATIONS IN FEET
ABOVE MEAN SEA LEVEL (FT AMSL)

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 10/5/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION B-B'
SITE 17, BUILDING B42
ZONE G CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 5
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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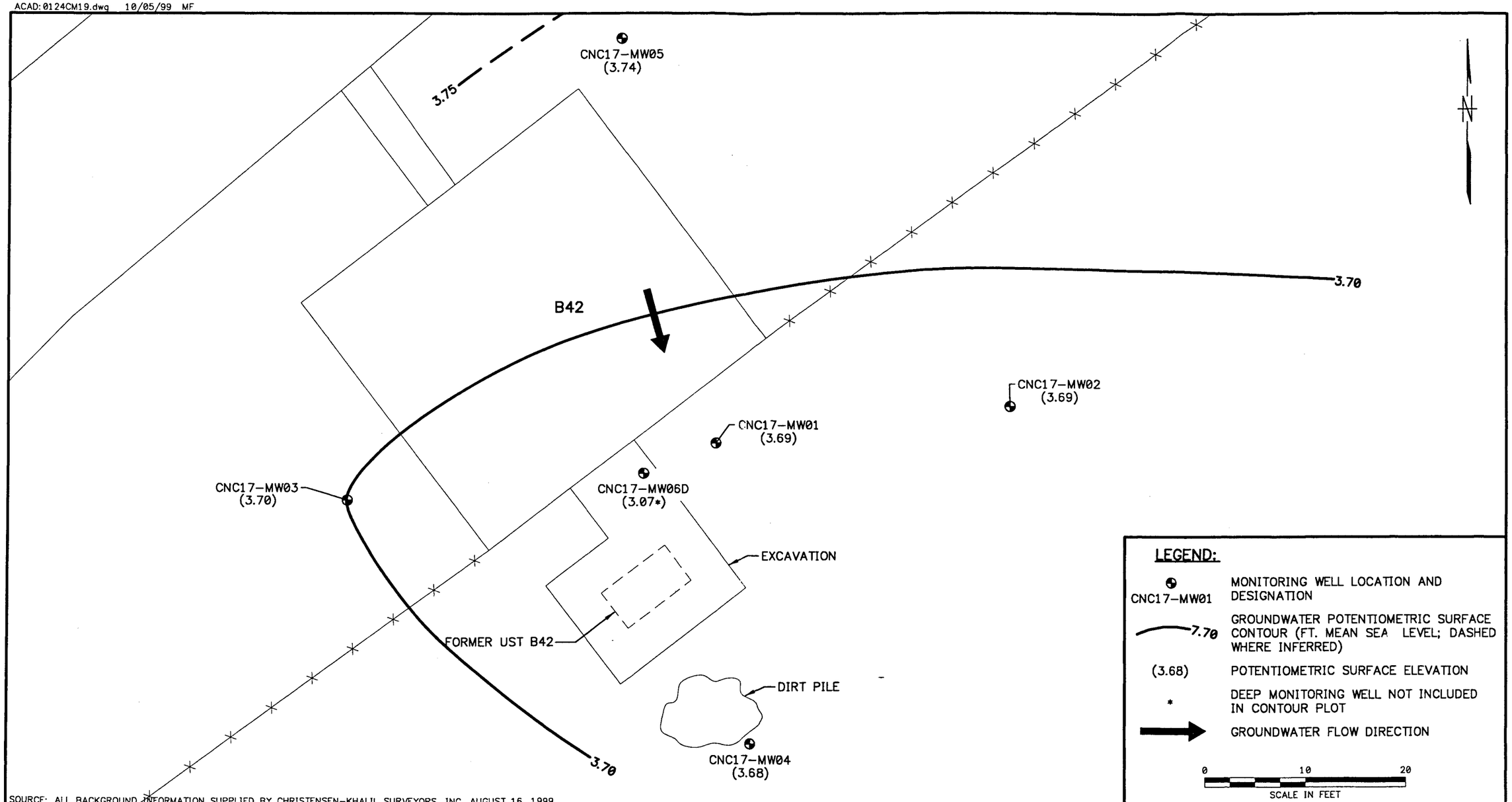


SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

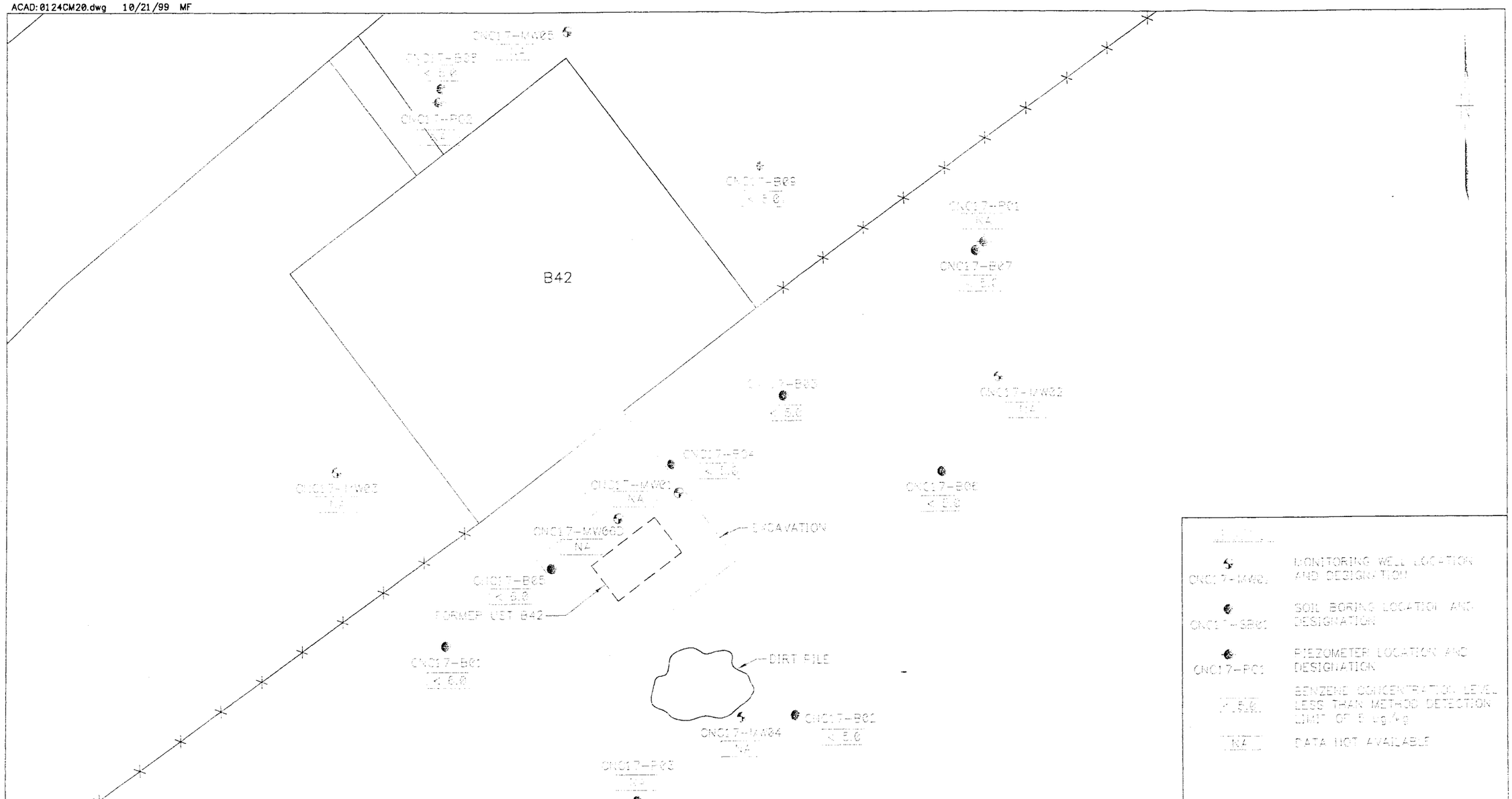
DRAWN BY MF DATE 10/5/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GROUNDWATER POTENTIOMETRIC MAP
(JULY 20, 1999)
SITE 17 BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 6
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

ACAD:0124CM20.dwg 10/21/99 MF



SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

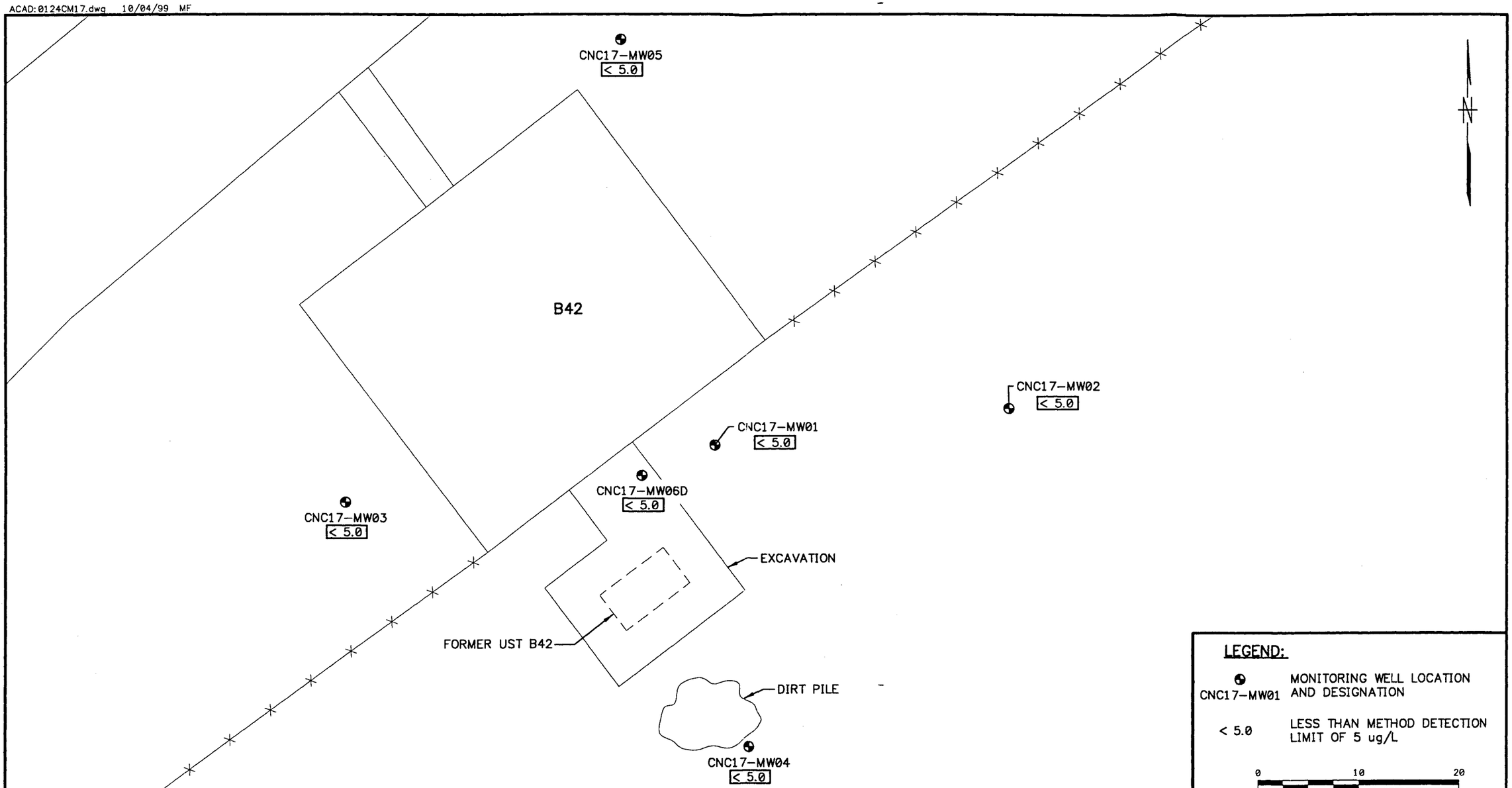
NO.	DATE	REVISION	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 10/15/99
CHECKED BY DATE
CONTRACT-AREA
SCALE AS NOTED

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

ACAD:0124CM17.dwg 10/04/99 MF



LEGEND:

CNC17-MW01 — MONITORING WELL LOCATION AND DESIGNATION

< 5.0 — LESS THAN METHOD DETECTION LIMIT OF 5 ug/L

0 10 20
SCALE IN FEET

SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

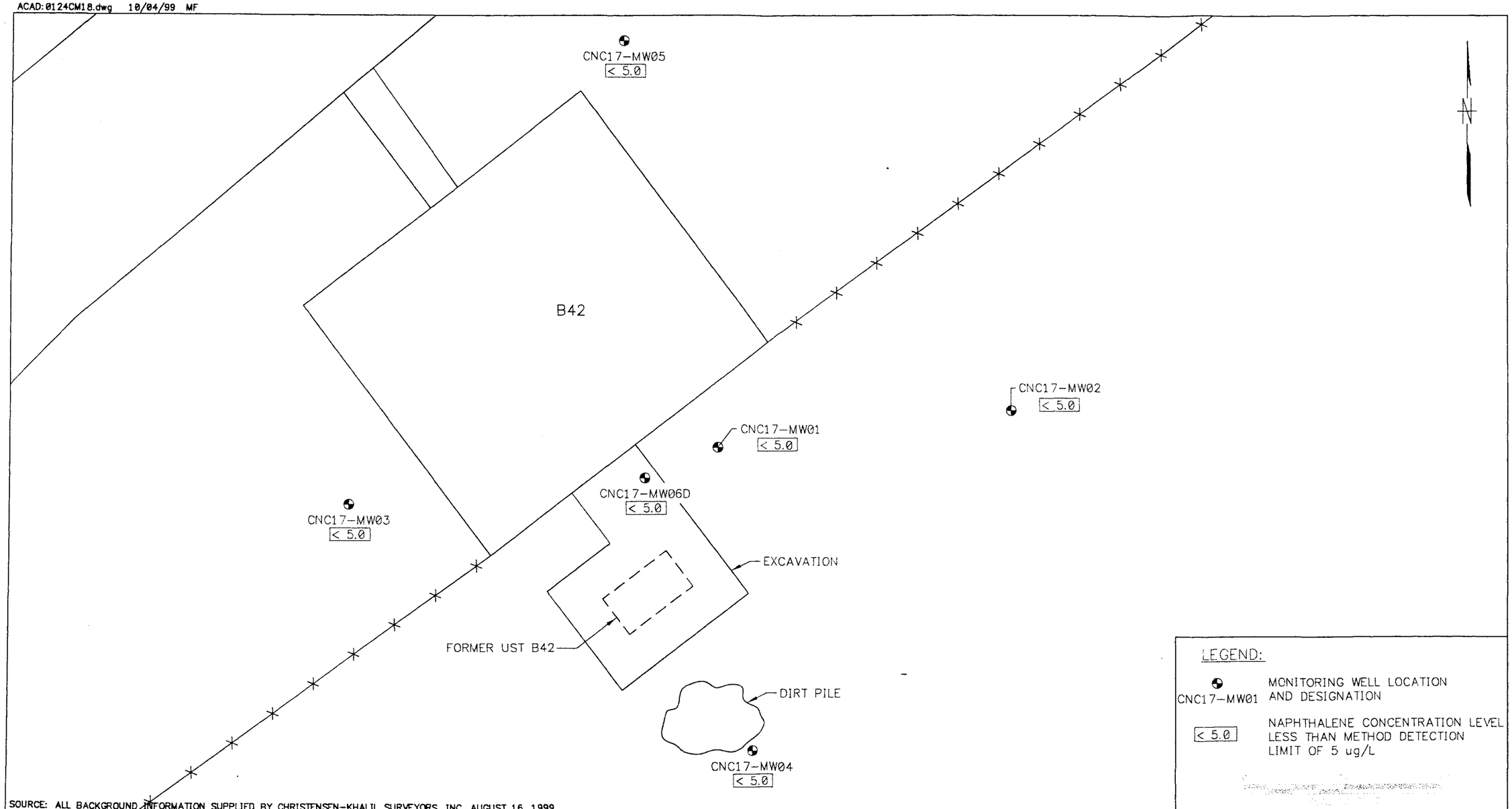
DRAWN BY MF DATE 10/4/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GROUNDWATER BENZENE CONCENTRATION MAP
(JULY 20, 1999)
SITE 17 BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 8
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

ACAD: 0124CM18.dwg 10/04/99 MF



LEGEND:

CNC17-MW01 — MONITORING WELL LOCATION AND DESIGNATION

< 5.0 — NAPHTHALENE CONCENTRATION LEVEL LESS THAN METHOD DETECTION LIMIT OF 5 ug/L

SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 10/4/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GROUNDWATER NAPHTHALENE CONCENTRATION MAP (JULY 20, 1999)
SITE 17 BUILDING B42
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 9
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98